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SCIENCE AND TECHNOLOGY FOR SUSTAINABLE FUTURE

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NAIDILE: INSTITUTIONAL INITIATIVE TO CREATE AWARENESS ABOUT THE ROLE OF INDOOR PLANTS IN SUSTAINABLE INDOOR ENVIRONMENT

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ABSTRACT

Environmental sustainability is a critical component of sustainable development. It refers to the responsible management of natural resources to meet the needs of the present generation without compromising the needs of future generations. This includes both natural environments and built environments which includes indoor and outdoor spaces where people live and work. Naidile is a worthwhile endeavour of St. Joseph's College of Education, A pioneer Teacher Education Institution, to create awareness about the sustainable indoor environment. The need for sustainable indoor environment arises from the fact that we spent the majority of our time indoor, quality of our indoor environment can have a significant impact on our health and wellbeing. Indoor plants have been recognised for their ability to enhance the visual appeal of indoor spaces, but they also play important role in creating a sustainable indoor environment. They offer numerous benefits such as improving indoor air quality by removing harmful pollutants, regulating humidity. Indoor plants also have a positive impact on the mental and emotional wellbeing of occupants, reducing stress level, increasing productivity and thereby enhancing overall sustainability of indoor spaces. In this paper we will explore various benefits of indoor plants, their role in creating sustainable indoor environments, and how they can be used to promote sustainable practices in modern architecture and design.

Keywords: Indoor environmental sustainability, Built environments, Indoor plants, Well-being

INTRODUCTION

Environmental sustainability is the concept of maintaining natural resources, biodiversity and ecosystem in a way that it ensures their longevity for future generations. It refers to the responsible management of natural resources to meet the needs of present generation without compromising the needs of future generation. Environmental sustainability is critical for ensuring the health and well-being of our planet and its occupants. This includes both natural and built environments. The sustainable natural and built environments refers to the use of ecological and sustainable principles in the development and management of both natural and human made system. This approach emphasizes the need to protect and enhance natural environment while providing the healthy and productive built environment for humans to live and work in. In case of outdoor built environments such as urban spaces and infrastructure sustainable design principle can be applied to create spaces that promote human health and well-being while minimizing environmental impact. This can involve incorporating green infrastructure such as green roofs and rain gardens, promoting alternative transport option and creating public spaces that are accessible and inclusive. In case of indoor built environments such as homes, schools, hospitals and work place, sustainable design principles can be applied to create healthy and energy efficient space. Since urban people spend 80-90% of their lives indoor (in both residential and public space), and longer for children, the elderly, and the sick and disabled (Deng et al. 2018; Pandey et al. 1989; Rinne et al. 2006), there is a growing risk associated with poor indoor environment. It has been noted that engaging with the outdoor natural environment has remarkable positive physiological and psychological health benefits. This suggests that integrating the natural environment into indoor space can be an effective way to extend engagement with nature and benefit people (task performance, health and stress) (Bringslimark et al. 2009; Shibata and Suzuki 2002). Sustainable indoor environments are necessary to promote health and well-being reduce energy consumption and greenhouse gas emissions, conserve resources, and promote environmental responsibility. They are a responsible approach to living, as they help us to reduce our impact on the environment and promote sustainable practices in our daily lives. Indoor plants can be a great way to bring a natural environment into your home, school, office and work places. It is an excellent way to add greenery and freshness to your living space, as well as a source of enjoyment and relaxation. Indoor gardening ideas include Window herb garden, Terrariums, Vertical gardens, Succulent Garden, aquaponics etc... The range of benefits that has been documented is broad: air quality is improved (Wood et al., 2002), Stress is lowered (Dijkstra et al., 2008), recovery from illness is faster (Ulrich, 1984), mental fatigue is reduced (Tennessen and Cimprich, 1995), and productivity is higher (Lohr et al., 1996). They also add an aesthetically pleasing touch to any space, making them a great addition to any indoor spaces. Overall adding indoor plants to your space can help create a more sustainable indoor environment that can improve air quality, mood, aesthetics and connection to nature. Bringing nature inside can help us feel more connected to the world around us.

BENEFITS OF INDOOR PLANTS

1. Improves Indoor air quality

Indoor air quality refers to the quality of the air inside buildings and structures, including homes, schools, offices and other indoor buildings. The quality of indoor air can be affected by various factors, outdoor pollution source, building materials, furniture, cleaning products, and activities that generate pollutants, such as cooking and smoking. Good indoor air quality is important for maintaining a healthy and comfortable indoor environment.

VOCs are organic chemical compound that can evaporate at room temperature and are emitted into the air from a variety of sources, including building materials, cleaning products, furniture, and consumer products. Some common examples include formaldehyde, benzene, toluene and xylene. These chemicals are known to cause irritation, allergic asthma, neur- asthenia, and other respiratory problems (Deng et al. 2015; Tang et al. 2009). Evidence showed that the indoor was the first- line property of statistically significant higher-level pollution than outdoor (Delgado-Saborit et al. 2009). Since people spent most of their time indoors, poor IAQ increases their risk of exposure to pollutants (Bernstein et al. 2008). A 35% lower concentration of VOCs was found in a classroom without plants (Fjeld 2000; Fjeld et al, 1998). Further research shows that plants remove many indoor pollutants, including ozone, toluene, and benzene (Darlington et al., 2001; Wood et al., 2002; Papinchak et al., 2009).

2. Psychological well being

Indoor plants have been shown to have positive effects on psychological well-being in several ways. One of the primary ways that indoor plants can improve psychological well-being is by reducing stress and promoting relaxation. Most studies found that indoor plants reduced nervousness or anxiety (Adachi et al. 2000; Chang and chen 2005), and they have potential to reduce stress (Bringslimark et al. 2007; Dijkstra et al. 2008; Evensen et al. 2015; Park and Mattson 2009). Some research suggests that having plants in the workplace can boost productivity and creativity. This may be because plants help people feel more relaxed and focused, which can make it easier to concentrate on tasks. Mental fatigue has also been shown to be reduced by plants (Tennessen and Cimprich, 1995).

Humidity

Humidity refers to the amount of water vapor present in the air. It is a measure of the moisture content in the atmosphere and can have an impact on the temperature and overall comfort level of the environment. Humidity is typically measured using a device called a hygrometer, which can determine the percentage of water vapor in the air. Indoor plants are known to be great natural humidifiers because they release moisture into the air through a process called Transpiration. When the absorbed radiative energy is less than the energy required for transpiration, the temperature of the plant will drop thus cooling the ambient

(Kichah et al. 2012; Mangone et al. 2014). A higher transpiration rate is responsible for the fact that the

leaves were cooler than the surrounding air (Montero et al. 2001). A maximum drop of 6 degree Celsius was observed with a living wall in warmer condition (Fernandez- Canero et al, 2012). Overall, indoor plants can be a great way to maintain humidity levels in a room, especially during dry seasons

Enhance the Aesthetics

Indoor plants are a great way to enhance the aesthetics of indoor spaces. There are innumerable ways indoor plants can improve the look and feel of a room. It adds natural beauty to the spaces. Indoor plants bring a touch of nature into indoor spaces, making them feel more alive and vibrant. The natural shapes, colours, and textures of plants can add beauty and create visual interest to any room. Indoor plants can be used to create visual interest and focal points in a room. They can be arranged in a variety of ways, such as in groups or as individual specimens, to add depth and dimension to the space. They potentially fills empty spaces. Indoor plants can be used to fill empty spaces in a room, making it feel more complete and polished. Plants can be used to fill corners, empty shelves, or other areas that feel bare. It complements the decor of indoor spaces. Indoor plants come in a wide range of shapes, sizes, and colours, making them a versatile accessory for any décor style. They can be used to complement existing décor by adding a pop of colour or texture that ties the room together. Overall, indoor plants are a great way to enhance the aesthetics of indoor spaces. They can add natural beauty, create visual interest, improve air quality, fill empty spaces, and complement décor. Whether you have a large collection of plants or just a few scattered throughout your home or office, they can have a big impact on the overall look and feel of the space. By selecting the right plants and placing them strategically, you can create a more beautiful, welcoming, and refreshing indoor environment.

BACKGROUND

The United Nations has a number of environmental sustainability goals that are part of the broader Sustainable Development Goals (SDGs) framework. These goals are designed to promote environmental protection, social equity, and economic development, all while ensuring that future generations can continue to enjoy a healthy and prosperous planet. Among the 17 goals, six goals focus on environment sustainability (SDG 6: Clean Water and Sanitation; SDG 7: Affordable and Clean Energy; SDG 11: Sustainable Cities and Communities; SDG 12: Responsible Consumption and Production; SDG 13: Climate Action; SDG 14: Life Below Water; SDG 15: Life on Land). Educational institutions play a crucial role in providing environmental sustainability through various initiatives that promote awareness and action towards sustainable practices. There are innumerable ways in which educational institutions can contribute to environmental sustainability. Educational institutions can incorporate environmental education into their curriculum to create awareness among students about environmental issues and the importance of sustainability. This can include topics such as climate change, pollution, waste management, and renewable energy. Educational institutions can lead by example by implementing sustainable practices on their

campus. This can include measures such as recycling, reducing energy consumption, using sustainable transportation, and using eco-friendly products. Community outreach programmes where educational institutions can engage with their local community to promote sustainable practices and raise awareness about environmental issues. This can include organizing events, workshops, and educational programs.

In this context of United Nations Sustainable Development Goals (UN SDGs) St. Joseph's College of Education, Jayalakshmi Puram has attempted various initiatives to create awareness about sustainable indoor environments, promote sustainable practices in the campus and in community level.

METHODOLOGY

Educational institutions play a crucial role in promoting environmental sensitivity and sustainability. Educational institutions can play a role in advocating for environmental policies and engaging in environmental activism. This can involve students, staff, and alumni advocating for environmentally sustainable practices and policies both on and off campus. In this context adhering to the United Nations Sustainable Development Goals (UNSDGs) St. Joseph's College of Education, Jayalakshmi Puram Mysore, A pioneer Teacher training Institute, undertook worthwhile endeavour of creating awareness about Sustainable Environment through creating Sustainable Indoor Environments. The endeavour was carried out through two major methods

1. Curricular and campus operation
2. Research and community outreach programme

1. Curriculum and Campus operation

Educational institutions can integrate environmental education into their curriculum, including subjects such as environmental science, ecology, and sustainability. This will help students develop a deeper understanding of environmental issues and equip them with the knowledge and skills to address these challenges. As a part of this we Observed World Home plants appreciation day. World Home Plant Appreciation Day is an annual celebration of the beauty and benefits of indoor plants on January 10th each year, and it aims to promote the importance of having plants in our homes, schools and workplaces. A special assembly was organised to promote awareness about the need of sustainable indoor environments and encourage students to learn about the benefits of indoor plants which in turn, which can create a more inviting and pleasant learning environment. We distributed two variety of indoor plants to each methodology classes in an intention to provide hands-on learning opportunities for students, allowing them to observe plant growth and development, learn about the natural world, and develop skills such as responsibility and nurturing. Students can also learn about the specific care requirements of different plants and develop an appreciation for the role of plants in our lives and the environment.

2. Research and community outreach programme

Integrating indoor plants into community outreach programs can be an effective way to promote environmental awareness and improve the well-being of community members. NAIDILE is an institutional initiative to create awareness among the common public about role of indoor plants in developing sustainable indoor environments, which was held on 26 January 2023, as a open stall for public. We visited about ten neighbouring nurseries, including private and government nurseries and purchased about two hundred plants of four varieties, *Crassula capitata*, Peperomia, Billbergia and Succulents. We observed that many of the people considered the plant's appearance, size, maintenance requirements, price, air-purifying properties, and personal preference. Indoor plants to the public helped us to promote environmental awareness and educate the public about the benefits of indoor plants and the importance of caring for the environment. This can be particularly valuable in areas where there may be limited access to green spaces and natural environments.

DATA COLLECTION

1. Curricular and campus operation

After one month of monitoring indoor plants in respective methodology classes, A questionnaire was sent to Teacher trainees of first and second year B.Ed. programme including Arts, Science and Commerce. The question were intended to measure the effectiveness of the awareness programme about creating sustainable indoor environments, how beneficial was the distribution of indoor plants and impact of the indoor plants in creating pleasing learning environments. We also monitored the positive behavioural change among our fellow mates.

2. Research and community outreach programme

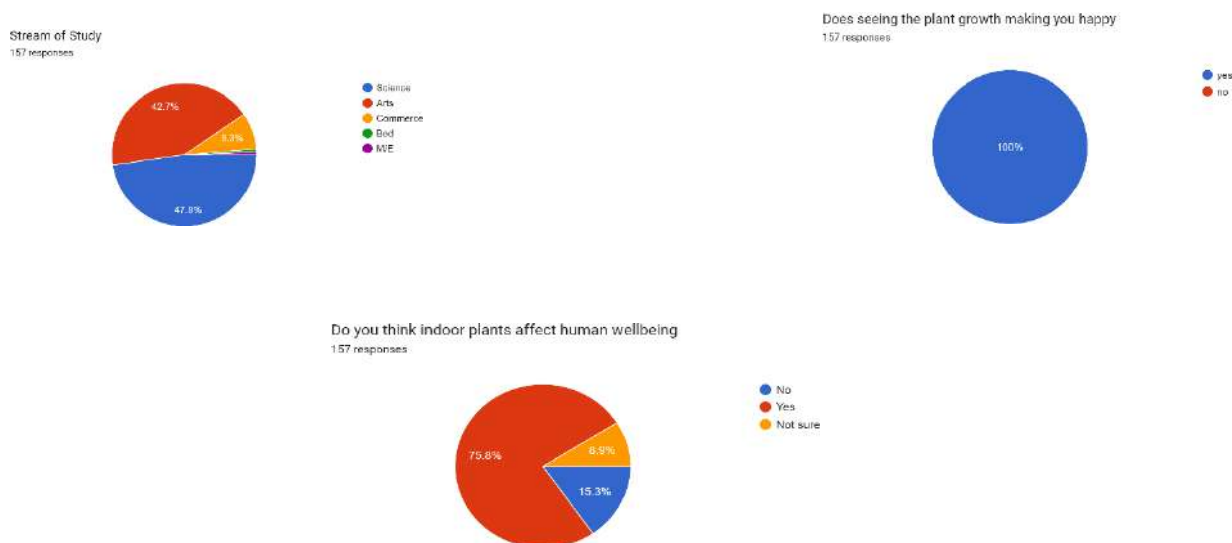
After 25 days of the community outreach programme, A satisfactory survey was conducted to analyse the impact of indoor plants in the overall well-being and their participation in creating a sustainable indoor environment.

RESULTS AND DISCUSSION

Results of curricular and campus operation

The results of the questionnaire that was sent to the teacher trainees was far reaching. An equal participation from both I year and II-year teacher trainees from various methodologies such as science (47.8%), Arts (42.7%), Commerce (8.3%) and others. 89.7% was aware of the sustainable environmental practices and 79% of the students found the awareness programme was effective. Majority of them felt the need of indoor plants and 70.1% agreed keeping house plants was effective.

This venture marked its great success by high demand of plants (94.7%) and 100% participants agreed this as a successful model and contributes to human wellbeing.

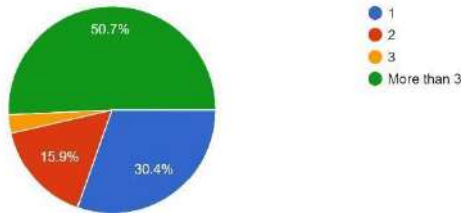


These results reveal the role of indoor plants in creating a more inviting and pleasant learning environment. It provided students hands on learning opportunity allowing them to observe plant growth and development , learn about the natural environment and develops skills such as responsibility and nurturing skills. Students have mentioned indoor plants can enhance the visual appeal of classroom and a greater sense of happiness.

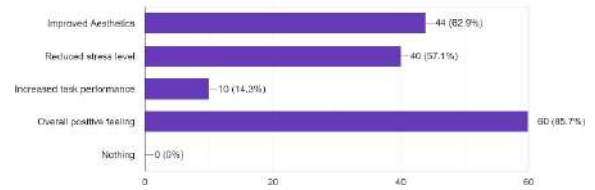
RESEARCH AND COMMUNITY OUTREACH PROGRAMME

The community outreach programme around the benefits of indoor plants in creating sustainable indoor environments was effective among varied age group of people , mainly young adults (24-26). We observed that majority of women procured indoor plants than men.Majority of them had a opinion that incorporating indoor plants into indoor spaces had a positive impact on both the aesthetic (62.3%) and overall postive feeling (87%). The pie chart revealed that (39%) being around the indoor plant helped them to reduce stress and anxiety and promote feelings of calm and relaxation. A(14.5%) incorporating indoor plants into workspaces can boost productivity and creativity, and improve overall job satisfaction. This may be because plants help to create a more comfortable and aesthetically pleasing environment, which can enhance focus and motivation. A Majority of respondent felt they would like add more plants and they contributed a little to a sustainable indoor environment incorporating indoor plants is an affordable and sustainable way to improve the quality of your indoor environment while providing a range of additional benefits.

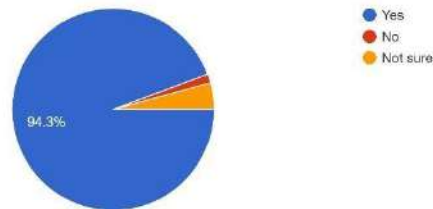
How many plants you bought?
69 responses



How did the indoor plants impacted you ?
70 responses



Did you feel anything that you contributed for sustainable indoor environment ?
70 responses



CONCLUSION AND PERSPECTIVE

Creating a sustainable indoor environment requires the adoption of small habits that can have a significant impact over time. Indoor gardening can have several unconscious effects on people, effects that we may not be aware of or may not consciously notice. NAIDILE: The institutional initiative throws light to inevitable role of indoor plants in Sustainable Indoor Environments. Indoor plants can have several unconscious effects on people that can improve our health, well-being, creativity, and mood. These effects may be subtle, but they can add up over time to make a meaningful difference in our lives

By practicing these small habits consistently, we can create a more sustainable indoor environment that benefits both our health and the environment. It is important to note that sustainable habits require time and effort to establish, but over time, they become a part of our routine and can make a meaningful difference in creating a more sustainable and healthy indoor environment.

REFERENCES

- Arif, M., Katafygiotou, M., Mazroei, A., Kaushik, A., & Elsarrag, E. (2016). Impact of indoor environmental quality on occupant well-being and comfort: A review of the literature. *International Journal of Sustainable Built Environment*, 5(1), 1-11.
- Bringslimark, T., Hartig, T., & Patil, G. G. (2007). Psychological benefits of indoor plants in workplaces: Putting experimental results into context. *HortScience*, 42(3), 581-587.

- Chappells, H., & Shove, E. (2005). Debating the future of comfort: environmental sustainability, energy consumption and the indoor environment. *Building Research & Information*, 33(1), 32-40.
- Deng, L., & Deng, Q. (2018). The basic roles of indoor plants in human health and comfort. *Environmental Science and Pollution Research*, 25(36), 36087-36101.
- Elsadek, M., & Liu, B. (2021). Effects of viewing flowering plants on employees' wellbeing in an office-like environment. *Indoor and Built Environment*, 30(9), 1429-1440.
- Han, K. T., & Ruan, L. W. (2019). Effects of indoor plants on self-reported perceptions: a systemic review. *Sustainability*, 11(16), 4506.
- Jung, C., & Awad, J. (2021). Improving the IAQ for learning efficiency with indoor plants in university classrooms in Ajman, United Arab Emirates. *Buildings*, 11(7), 289.
- Kim, J., Cha, S. H., Koo, C., & Tang, S. K. (2018). The effects of indoor plants and artificial windows in an underground environment. *Building and Environment*, 138, 53-62.
- Liu, F., Yan, L., Meng, X., & Zhang, C. (2022). A review on indoor green plants employed to improve indoor environment. *Journal of Building Engineering*, 53, 104542.
- Lohr, V. I. (2009, June). What are the benefits of plants indoors and why do we respond positively to them? In II International Conference on Landscape and Urban Horticulture 881 (pp. 675-682).
- Qin, J., Sun, C., Zhou, X., Leng, H., & Lian, Z. (2014). The effect of indoor plants on human comfort. *Indoor and Built Environment*, 23(5), 709-723.
- Raanaas, R. K., Evensen, K. H., Rich, D., Sjøstrøm, G., & Patil, G. (2011). Benefits of indoor plants on attention capacity in an office setting. *Journal of Environmental Psychology*, 31(1), 99-105.
- Suhaimi, M. M., Leman, A. M., Afandi, A., Hariri, A., Idris, A. F. A., Dzulkifli, S. M., & Gani, P. (2017). Effectiveness of indoor plant to reduce CO₂ in indoor environment. In *MATEC Web of Conferences* (Vol. 103, p. 05004). EDP Sciences.

SCIENCE AND TECHNOLOGY FOR HEALTH AND WELL BEING WITH RESPECT TO INCLUSIVE EDUCATION

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ABSTRACT: Science encompasses the systematic study of the structure and behavior of the physical and natural world through observation and experimentation. Technology is the application of scientific knowledge for practical purposes. Together science and technology has brought a revolutionary change in the global realm specifically in the health care sector. Technology enables physicians to provide optimum care and allows patients the best possible aids for recovery. Medical technology range from machines such as CT scanners to instruments used in complex surgical procedures and development of prosthetic limbs. Technology has undoubtedly saved millions of lives and benefitted in several areas. On the other hand –Inclusive Education is a significant step in the educational field where it aims at catering to all the children who are vulnerable to exclusion due to their specific problems and circumstances. Inclusion is a basic value that extends to all children. Inclusive education gives a message –Everyone belongs to school and everyone is welcome to school. This paper aims to provide the concept about how with the use of science and technology children with disabilities and other problems can enhance and improve their health and attend school along with the normal children. Also this paper critically analyzes, why inspite of all the aid technology is giving us, inclusive education is still a difficult task to accomplish.

KEYWORDS: Science, Technology, Health, Inclusive education

INTRODUCTION

–Education should train the child to use his brain, to make for himself a place in the world and maintain his rights even when it seems that society would shave him into the scrap heap

- -Helen Keller

-Every child has a different learning style and pace, each child is unique not only capable of learning but also capable of succeeding

-Robert John Mehan

Education is the key to success and it plays a crucial role in growth, development and empowerment of individuals [stain back and stain back,1984]. Inclusion requires the teacher to believe that all students have something important to offer in the classroom and that we are better off learning together. Inclusion a significant step in special education remains a complex and controversial issue but has been accepted and interpreted innumerable. The idea of inclusion is further supported by united nation's standard rule on equalization of opportunities for person with disability proclaiming participation and equality for all. According to UNICEF , inclusive education means all children in the same classroom in the same school. It means real learning opportunities for groups who have traditionally been excluded. The principle of inclusive education was adapted at the world conference on special need education access and equality[Salamanca, Spain 1994].

— The intelligent use of science and technology are the tools with which to achieve a new direction

-Jacque Fresco

— To raise new questions, new possibilities, to regard old problems from a new angle, requires creative imagination and marks advance in science

-Albert Einstein

The evolution of science is like boon to the world. Furthermore the development of technology along with the advancement in science helps to bring in a revolution in various fields such as medicine, agriculture, education, information and technology. In the present world if we think of any sort of development, then the presence of science and technology cannot be ignored. Science, technology and innovation each represent a successively larger category of activities

which are highly independent but distinct. Science contributes to technology in getting new knowledge which serves as a direct source of ideas for new technological possibilities.

Objectives

1. To identify the assistive technology that aids for Inclusive Education
2. Strategies to identify suitable technology

Method

Reviewing of secondary data and identify the resources

HEARING IMPAIRMENT: ASSISTIVE TECHNOLOGIES USED FOR DIAGNOSIS AND INTERVENTION

Hearing impairment is the inability of an individual to hear sounds adequately. This may be due to improper development, damage or disease to any part of hearing mechanism. Deafness is an invisible impairment, keen observation is necessary in order to identify a deaf child/individual. Early identification offers the best chance for cure. According to Downs[1978] children who are trained early develop better speech and language skills compared to children who are rehabilitated later. He also stated that children who are pre lingual deafness face a lot of difficulties in learning speech and language skills compared to post lingual deaf child. Two majorly used assistive technology for the diagnosis of hearing impairment are BERA test and Cochlear implant surgery

BERA Test

The brainstem evoked response audiometry [BERA] test, is an objective neurophysiological method for the evaluation of the hearing threshold and diagnosing retrocochlear lesions. BERA is the accurate and reliable estimation of hearing levels in infants and young children and helps in early identification of hearing impairment. According to a research article –Brainstem evoked response audiometry [BERA] in neonates with hyperbilirubinemia conducted BERA test for 30 children, out of 30 cases 10[33.3%] cases were found to have BERA changes in the form of absent wave forms, raised threshold and prolonged latencies.

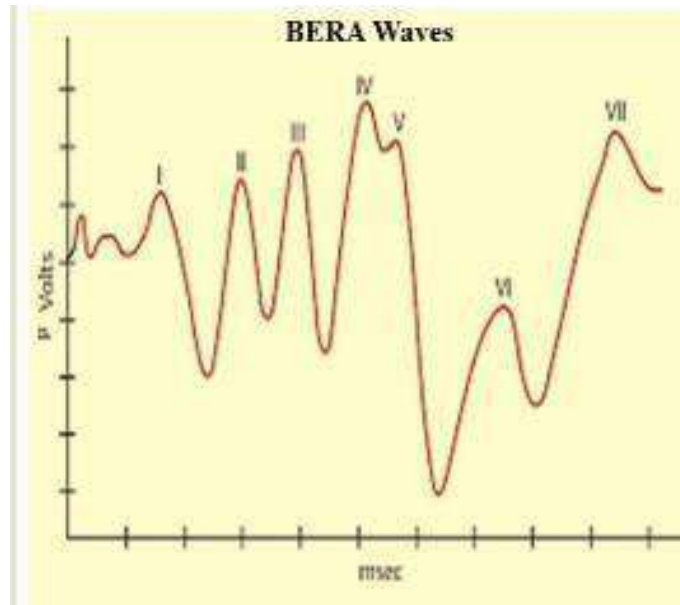


Fig .1 BERA test chart (adapted from specialist-ent.com)

Cochlear Implant Surgery

Cochlear implant surgery is done for severe and profound cases. It is a small electronic device, may be an option when hearing aids do not provide the clarity of the sound needed to understand speech and spoken language. Cochlear implant have high success rate as medical prosthesis because only less than 0.2% recipients reject them. Average price of a cochlear implant surgery is 4-5 lakhs and maximum price can go up to 20 lakhs. Universal newborn screening of hearing is made compulsory.

According to JCIH (Joint committee of infant hearing) every child should undergo screening at 3 months, diagnosed at 6 month and rehabilitated at 9 months. SAST [Suvarna Arogya Suraksha Trust] along with national programme for prevention and control of deafness [NPPCD], donated 500 cochlear implants in 2022.



Fig.2 Cochlear implant (adapted from centreforhearing.org)

SPEECH IMPAIRMENT: ASSISTIVE TECHNOLOGY USED FOR DIAGNOSIS AND INTERVENTION.

A speech disorder is a condition in which a person has problems creating or forming the speech sounds needed to communicate with others. This can make the child's speech difficult to understand. Speech disorders are different from language disorder in children. Language disorder refers to an individual having difficulty with expressive language [speaking, gesturing ,writing, facial expressions and vocalization] and receptive language [trouble understanding the message coming from others and words that they read].

According to WHO about 15% of the world's population lives with some form of disability. Approximately 18.5 million individuals have a speech voice and language [National Institute on Deafness and Communication Disorder (2010)]. India has 5 million people with communication disability. Majorly used assistive technology for the diagnosis of speech impairment are Augmentative and Alternative communication and speech therapy, speech apps, text to speech software.

Augmentative and Alternative communication device

Augmentative and alternative communication device is a tablet or laptop that helps individuals with speech or language impairment to communicate. The term AAC device is often used interchangeably with terms like speech-generating device or assistive communication device. The starting price of these devices is 1000rs. The softwares available in the augmentative and

alternative communication devices are SayI, CBoard, Touchchat, Quicktalk AAC, iCommunicate, LetMeTalk.



Fig.3 Augmentative and alternative communication device(adapted from gillettechildrens.org)

Speech Therapy

Speech therapy is treatment that helps improve speech and language skills. It helps with early language skills, voice and sound production, comprehension, fluency, clarity and expression. Speech therapy is beneficial for individuals with communication disorder like Aphasia[difficulty in reading, writing, speaking and understanding language], Apraxia [difficulty in forming the words], Articulation disorder [unable to produce certain word sounds], Resonance disorder [condition affecting the oral or nasal cavities may block air flow and alter the vibrations responsible for sound, it is linked to cleft palate, swollen tonsils]

Speech Apps

Speech apps are voice controlled and video technology used to develop speech articulation for young children with speech difficulties. Speech therapy app can support speech and language in variety of fun and engaging ways. Some of the speech therapy apps include Proloquo2Go[It's a tool used for children and adults with Autism, Cerebral palsy and Down syndrome], Speech Blubs, Articulation station pro [It offers exercise to practice 22 sounds at both the word and sentence level], Tallytots [described as action packed, this is one of the engaging speech therapy apps for toddlers. This app includes puzzles, mini games]



Fig .4 Speechify app (Adapted from steveanderson.com)

Speech to Text software

Text to speech app is a software on computer. This allows students with disability to type out what they want to say and allows the computer to read it to the other people. However this can easily be remedied using some of the best assistive technology available. Some of the text and speech software are, speechify, TTSReader, Wordtalk and Wellsaid labs.



Fig.5 Well said labs app (Adapted by globenewswire.com)

Physical Impairment: Assistive technology for diagnosis and Intervention

Physical activities and mobilities may be impaired by a number of conditions, some of which are permanent, others are temporary or intermittent in nature. Coordination and balance may be affected by several conditions, movements may be impaired by muscles, spasms, numbness or pain. It is a limitation on a person's physical functioning, mobility, dexterity or stamina. The

causes for physical impairments are various. Any person can acquire it through accident, injury, illness, post surgery effects and heredity. Some major technologies used are artificial leg[

Prosthetic Limb

Prosthetic implant is an artificial device that replaces missing body parts which may be lost through trauma, disease or a condition present at birth .prostheses are intended to restore the normal functions of the missing body part. the cost of prosthetic leg below the knee ranges from 3000rs to 24000rs. Some people still need a cane or walker or crutches to walk with a prosthetic leg, while some others can walk freely. Prosthetic technology has advanced to remarkable degree in the past two decades, driven largely by amputees demand. Today otherwise healthy individuals with mild calf amputation should be able to participate in a full range of normal responsibilities to walk without any perceptible limb, and to engage in recreational and sports activities.

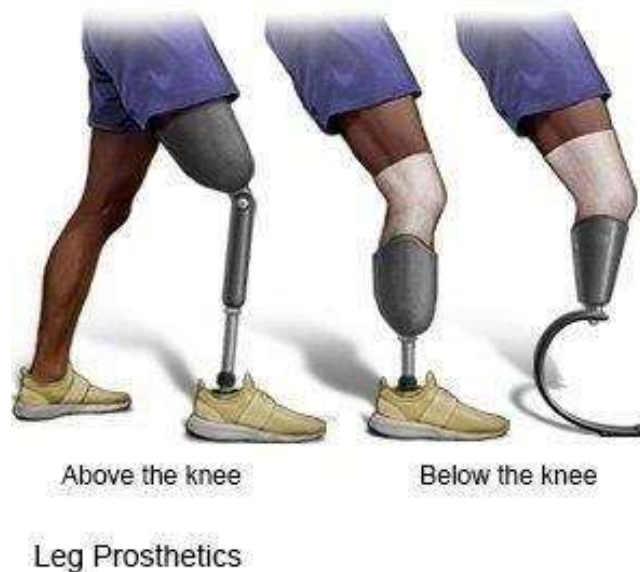


Fig .6 Lower limb prosthetic device (Adopted by drugs.com)

Splint

A splint is a treatment given to the patients who are suffering from muscular dystrophy. A Splint is a rigid or flexible device that maintains imposition a displaced or movable part, also used to keep in place and protect an injured part as a rigid or flexible material used for protection immobilizes or restrict motion in a part. there are many splint technologies such as Ankle stirrup, Finger splint, Nasal splint, Sugar tong.

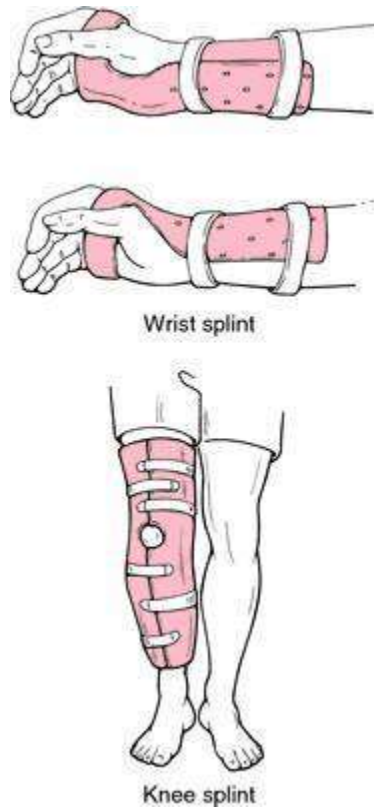


Fig .7 Wrist and knee splint device (Adopted by indiasmart.com)

Brace

Brace is a device used for people with club foot. It is often called as orthotic, it has mainly two parts a bar[usually metal] and special shoes[or boots] at attach at the each end. The bar is the same length as the distance between the baby's shoulders. Its slides are clicks into a bottom of the shoes. Once the club foot have been corrected into a normal functional position by manipulation, casting and tenotomy it needs to be braced to keep it corrected and to stop relapse.

The brace is critical for the success of the treatment programme. There are many types of braces like Steenbeek foot abduction brace, Mitchell brace, Markell brace and Iowa brace.



Fig .8 Toddler with (Adopted by limblenth.org)

VISUAL IMPAIRMENT: ASSISTIVE TECHNOLOGY USED FOR DIAGNOSIS AND INTERVENTION

Visual impairment describes an abnormal level of eyesight and there is a wide range of impairment manifestations that differs between adults and children. Visual impairment may be caused by loss of visual acuity, where the eye does not see objects as clearly as usual. Some of the common eye diseases in children are Cataract, Trachoma, Retinopathy of prematurity[ROP], Astigmatism, Glaucoma, Prosis, Hyperopia [farsightedness] and myopia[near- sightedness] and some of the major technologies used to treat these diseases are small incision surgery, extracapsular cataract surgery, intracapsular cataract surgery, bilateral tarsal rotation surgery, lens sparing virectomy along with endolaser photocoagulation, penetrating keatoplasty, deep anterior lamellar keratoplasty, laser iridotomy, trabeculectomy, prophulactic laser iridotomy, torso conjunctivo mullerectomy and frontalis sling operation.

Cataract

A clouding of the lens of the eye is called cataract. About 3 out of 10000 children have cataract. Cataract is a condition that is important to detect and treat early to minimize the impact of vision loss on the child's development and this condition can be successfully treated by a paediatric ophthalmologist. The commom surgeries done for cataract are small incision surgery [a small incision is made in the cornea to get access to the cataract lens, then an ultrasonic device that

emits ultrasound waves to break the cataract lens into tiny pieces, which can be suctioned out through the same incision], Extra capsular cataract surgery [it is technique in which a portion of the anterior capsule of the lens is removed, allowing extraction of the lens nucleus and cortex] and Intracapsular cataract surgery [ICCE involves the removal of the lens and the surrounding capsule in one piece].

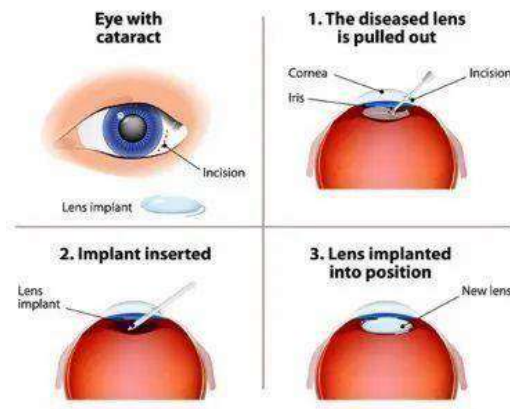


Fig .9 Cataract surgery (Adopted by eyepiecepdx.com)

Trachoma

Trachoma is a bacterial infection that affects both the eyes. It causes roughening of the inner surface of the eyelids. The main symptoms of trachoma include itching, irritation to the eyes and eyelids and discharge from the eyes. It is a disease that can be treated easily but if not treated can cause blindness. The common surgery used for trachoma is Bilateral tarsal rotation surgery [an incision is made in the scarred lid and eyelashes are rotated away from the cornea]

Retinopathy of prematurity

Retinopathy of prematurity [ROP] also known as Retrolental fibroplasia is a disease of eye affecting pre maturely born babies. When the baby is born very pre maturely, the retina and its blood vessels are not fully developed, scarring in the retina usually in both the eyes can cause blindness. The common surgery used for ROP is Lens sparing virectomy ,

Astigmatism

Astigmatism is a condition in which objects of both distance and near appear blurred, it often occurs with myopia and hyperopia. The common surgery used to treat astigmatism is penetrating keratoplasty [a circular disk shaped portion of the cornea is removed and replaced with a similarly sized portion of cornea from the donor].

Glaucoma

Glaucoma is a disease resulting in the damage of the optic nerve. Elevated pressure is the most common risk factor. The symptoms of childhood glaucoma include enlarged eyes, cloudiness in cornea, sensitive to light and excessive tearing. The common surgeries used for glaucoma is Laser iridotomy and prophylactic laser iridotomy

Hyperopia and Myopia

Hyperopia is a condition where a person can see distant objects more clearly than the near objects and myopia is a condition where a person can see near objects more clearly than the distant objects. Excessive myopia in children can lead to Amblyopia. The common surgery done for these conditions is Lasik surgery [using programmed laser, the parts of the cornea are reshaped. With each pulse of laser beam a tiny amount of corneal tissue is removed]

Challenges to implement the technologies

- Even though science and technology is giving so many solutions in every field to overcome the problems, there are many significant challenges to implement them.
- There is lack of awareness among the people about the available resources
- The birth rate in our country is very high and along with that we are severely understaffed
- Elective procedure will not be covered the medical insurance
- Many surgeries for example mid brain implant surgery and auditory implant surgery are very expensive and not everybody can afford them.

Conclusion

Inclusive education is the most effective way to give all the children a fair chance to go to school, learn and develop the skills they need to thrive. The main objective of assimilating children with special needs to regular classrooms can be leveraged with assistive devices and

technology. Despite the challenges in inclusive education, technology can be integrated to break the boundaries and remove inhibition for egalitarian society.

Reference

1. Africa clubfoot training team. (Eds). Bracing for clubfoot. Physiopedia. [https://www.physiopedia.com/bracing for clubfoot](https://www.physiopedia.com/bracing-for-clubfoot)
2. Agashe, P. (February 24, 2021). Eye diseases in children. DR Agarwals eye hospital. <https://www.google.com>
3. Al-kandari, J.M et al (January 2006). BERA in children with hearing loss and delayed speech. National library of medicine. <https://pubmed.org.in>
4. Assistive devices for people with hearing, voice, speech or language disorder. (n.d). Advancing the science of communication to improve lives. <https://www.nidcd.nih.gov>
5. Assistive technology in inclusive classrooms.(n.d). Reading rockets. <https://www.readingrockets.org>.
6. Cochlear implant surgery and rehabilitation. (February 16). Johns hopkins medicine. <https://www.hopkinsmedicine.org>
7. Eye problems in children and how they are treated. (n.d). Healthychildren.org <https://www.google.com>.
8. Jagota, U. (june 2018). Role of assistive technology in inclusive classrooms. Department of education. Punjab university Chandigarh. Volume 5, issue 6.
9. Kaur, N. and Kaur, M. (15 october 2021). Role of technology for equality, diversity and inclusivity. Department of education GNDU, Amrithsar
10. Khurana, A. K. (n.d). Comprehensive ophthalmology.
11. Lenin, I. (September 2019). Assistive technology in inclusive education and the universal design for learning, karaikudi.
12. Lynch, M (May 19, 2018). Assistive technology to help students with articulation disorder succeed academically.
13. Marks, L. J. and Michael, J. W. (n.d). Artificial limbs. Science, medicine and the future <https://www.nibinlm.nih.gov>

14. Mcpherson, D.(September 23, 2022). What assistive technology for speech and language disorders are available and how do they work? Autism parenting magazine. <https://www.austismparentingmagazine.com>
15. Orthotic device muscular dystrophy (n.d). A bionews brand. <https://muscular dystrophynew.com>
16. Prosthetic leg cost (n.d). Luxmed healthcare service. <https://luxmedprotez.com>
17. Sony, A. kanaujia, S K. and Kaushik, S. (n.d). Brainstem evoked response audiometry(BERA) in neonates with hyperbillirubinemia. Indian Journal Of Otolaryngology and Head and Neck Surgery
18. Stain back, W., and Stain back, S. (1984). A rationale for the merger of special and regular education. Exceptional children, 51(2), 102:111.
19. Singh, J.D. (2016). Inclusive education in India: concept, need and challenges
20. The ponseti method: Bracing phase (n.d). kids health.org <https://www.kidshealth.org/en>

INSTILLING VALUES FOR PEACE THROUGH MATHEMATICAL CONCEPTS

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ABSTRACT:

The core of UNESCO's mission to transform lives, foster peace, and promote sustainable development is education. Science education has been seen as a means of enhancing both human condition and competitiveness. When scientific education is practiced systemically, it frequently takes an overly simplistic form that denies instructors and students the chance to properly explore the connection between Science and peace. Particularly Mathematics, which is taught systematically and is perceived to be robotic, can never be regarded to promote peace. In an effort to change this perception of the subject and as an undertaking of Mathematics club a one-week workshop was organized on the subject of **-Instilling values through Mathematical Concepts**||. The participants were teacher trainees of St. Joseph's College of Education, Jayalakshmipuram, Mysore. During this workshop, we attempted to draw values from the concepts in the Mathematics textbooks for classes 8, 9, and 10. The impact of the workshop was evaluated, and the participation of the teacher candidates in this approach to math instruction was determined by a survey. This paper provides an insight into the effectiveness of this innovative approach to math instruction as well as the suggestions of the teacher trainees on how to put it into practice in the classroom.

Key Words: Values through Mathematical concepts, peace, sustainable development, innovative approach.

Introduction

The fundamental tenets of both education and peace are included by peace education. Although it has a similar tone, its purpose is very different from the traditional method of instruction. The idea of peace education is both broad and beneficial. As it attempts to teach every person to live in peace with one another, the necessity and significance of peace education become both apparent and evidently necessary. It encourages equality and deters aggression. Arts courses typically aim to encourage ideals via peace education. From the beginning of the twenty-first century, science and technology have taken initiatives to support peace and growth. Mathematics is a key to all other fields of science. But relating Mathematics to peace and promotion of peace still remains a difficult task for many. Savannah Yates quotes, –Mathematics may not teach us how to end world hunger, create world peace or fix a broken heart. But it does teach us that every problem has a solution.‖ This points out that mathematics too has an inner meaning that contributes to value education. For instance, ‘ With matrices we can calculate, identify chains and groups of positive and negative relations in a class of pupils or countries. With graphs we are back to geometry--mathematics for the eyes--a great tool to map what happens when the elements, the points, are human beings and the "edges", the lines, are their relations.’ (Fischer, 2012)

Literature review

Vishal and Srivatsa (2020) conducted a study to develop strategies for teaching mathematics through an integrated approach, put the strategies into practice, and assess the effectiveness of the approach in terms of students' acquisition of value conceptual knowledge and value perception in order to instill the values of equality and cooperation in students.

Anilkumar (2014) conducted a study utilising a pre-test post-test quasi experimental approach to determine the effects of value integrated education on value based student behaviour and on value attainment of students at upper primary level. According to the study, value-integrated education is beneficial in changing the behaviour and attaining values of upper primary school pupils.

Yaro (2020) reflected on their paper about their experiences teaching and working with Mathematics teachers to explore challenges and opportunities for creating mathematics tasks for peace and sustainability. They emphasized that local communities have already been colonised by globalisation. Making mathematics assignments that are issue-centric and socially relevant to address issues of the local community is still difficult due to the linked "technoscientificity," the

conservative nature of textbooks, time restraints, and the predominating force of poverty. They suggested a development of a mathematics task to illustrate the possibility of creating –a situated mathematics task‘ for students that respond to issues of local community. . They proposed the creation of a math assignment to demonstrate the potential for developing "a placed mathematics challenge" for pupils that addresses concerns of the local community.

Afolabi (2016) in his paper made a clarification on conceptual issues of education, teaching and peace and mathematics teachers were given a suggestion to emphasise the components of affective development which are also elements of peace.

Widiati (2018) pointed out that Mathematics education plays a important role in realizing Education for Sustainable Development (ESD). Through his review paper he came to an inference that the mathematics philosophy for ESD is continuous learning and synchronization between mathematics learning and character values. Also, students should be sensitive to the inherent values included in a mathematical problem so that they can assist the advancement of student life in the future.

The majority of research in this area focuses on teaching strategies that teachers might use with math classes, but does not emphasize the importance of the values derived from the concepts in the textbook.

Objectives of the study:

- To analyze the values in each of the high school level mathematical concepts using the Karnataka State textbook.
- To determine the influence of value analysis in mathematical concepts on student teachers.

Methodology and Materials:

Critical Analysis of mathematics textbooks:

In order to further the cause of peace education, we, the teacher candidates at St. Joseph College of Education, tried to find out the values in mathematical ideas through the workshop conducted. Teacher trainees of mathematics pedagogy were split up into several groups, where we did a critical Analysis of Karnataka State Mathematics Textbooks of classes 8,9,10. And we drew

potential values from different concepts. Punctuality, kindness, honesty, hard work etc are some of the values.

Survey :

A post-workshop survey was administered to assess the workshop's impact and learn more about the trainees' opinions on this system for teaching mathematics. 24 teacher trainees of mathematical method completed an online survey that was created for them. The questionnaire contained 10 questions in which majority of the questions were polar in nature, and only a few were descriptive. The survey results was taken in percentage.

Results and Discussion:

From the critical analysis of the textbook done by the teacher trainees certain values were drawn out from the concepts like co-ordinate geometry, linear equations in two variable, Area , volume, triangles, circles, probability and many more. Some of the values teacher extracted are given below.

Critical analysis of class 08 math text:

Chapter	Value	Description
Rational Numbers-		
i. Negative of a number	Stay positive. Avoid negative thoughts	When a minus sign is added, any positive number becomes negative. Similar to how a tiny negative idea or action may alter your otherwise optimistic outlook
ii. Role of zero	Respect others	Zero is always viewed as having no worth. Yet, it is capable of altering the value of any number. Everyone has their own strengths, too. Nobody should be judged or undervalued.

<p>Exponents and Powers- Negative and positive exponents</p>	<p>Positivity</p>	<p>when two numbers raised to negative exponential are multiplied, it gives a value with increased negative exponent. In case of positive exponential the result will be increased positive exponent. Similarly one should always have positive thoughts which can result in a happier life.</p>
<p>Zero Exponential</p>	<p>Equality</p>	<p>Any number raised to zero gives the answer <u>1</u>. Likewise, regardless of who they are, everyone is equal before the law.</p>
<p>Mensuration – Quadrilateral</p>	<p>Uniqueness</p>	<p>Quadrilaterals are closed geometric shapes with four sides. Nonetheless, every quadrilateral is distinct from the others in some manner. Similarly, every person in a group of the same age is distinctive in their own manner in terms of their skills and interests.</p>

Critical analysis of class 9 math text:

Chapter	Value	Description
Basic constructions and construction of triangles	Precision and Accuracy (attained through practice)	Accurate measurement and precision are necessary for the fundamental construction of triangles. This teaches us the value of being precise in our actions. Only through persistent practice this is possible.
Euclidian Geometry- Axioms and Postulates	Acceptance	Axioms and postulates are assertions that are unchangeable and don't need to be supported by evidence. They help prove or solve a number of other theorems. The same goes for accepting other individuals for who they are, abilities and all. They will make an invaluable contribution.
Heron's formula	Determination (where there is will there way)	Heron's formula is useful for calculating the triangle's area even when the triangle's height is unknown. We might infer from this that "there is always a means to attain the aim." Determination can get through any challenges.
Areas of parallelogram and triangles- Figures on same base and between same parallels.	Unity	Their areas are identical even though they are two separate figures laying on the same base and between two parallel lines. Here, a few characteristics of two distinct figures come together. Much like that, we share the same earth and sky. We should sense our shared unity despite our differences.

Critical analysis of class 10 math text:

Chapter	Value	Description
Arithmetic Progressions- Common difference	Time Management	The difference between any two consecutive terms in AP will always be the same; this is known as the common difference. This common difference contributes to the pattern's preservation. Similar to this, time management is crucial to maintaining a structured lifestyle.
Pair of linear equations in two Variables.- Simple linear equations	Importance of relationship	In two-variable linear equation, a relation is formed between the two unknowns and this relation is used to find the value of unknowns. Similarly, any good relationships in our lives aid in our ability to recognize who we are, our strengths, and our weaknesses.
Polynomials	Self awareness, power of thinking	In polynomials, the same expression contains constants, variables, coefficients, and degrees. Like to other people's lives, ours has its share of happiness, sadness, and good and evil individuals. Recognizing the ones that are constant, variables, and coefficients among them can help us make the right decisions.
Probability	Patience, confidence and futuristic	Based on the outcomes of the coin flip, any problem's outcome may be predicted in likelihood. Yet in our lives, success and failure are only two sides of the same coin. Instead of forecasting, we will make preparations based on the outcome.

Analysis of the survey:

Sl.no	Question	Yes(%)	No(%)
1	Are values for each concept time-consuming to figure out?	90.9	9.1
2	Do you struggle to determine the values in each mathematics chapter?	81.8	18.2
3	Do you find it effective to use mathematics in inculcating values in children?	90.9	9.1
4	Is it time-consuming for teachers to include values into math lessons?	50	50
5	Prior to the workshop, have you ever considered values through mathematics?	63.6	36.4
6	Was this workshop effective?	95.5	4.5
7	Do you think this is beneficial for the B. Ed trainees?	90.9	9.1(may be)

Among the surveyed teacher trainees, it was found that roughly 65% of them had not thought about the values derived from mathematical ideas prior to the workshop. Almost 91% of them thought it took a long time to draw the values, but they also thought it was good for B.Ed students to instill values through mathematics. And majority of them found the workshop useful.

Sl.no	Question	Higher primary(%)	Higher secondary	Degree	Post graduation		
8	Which age group do you think this method of teaching mathematics is most beneficial for?	45	27.3	9.1	9.1		

It was found that 45% of the surveyed teacher trainees suggested that, this value-based instruction will be beneficial in higher primary.

Sl.no	Question	Analysis
9	What techniques can teachers use to accomplish this in the classroom?	<p>Some of the methods that can be used to implement value based teaching in mathematics pedagogy as suggested by the teacher trainees are as follows:</p> <ul style="list-style-type: none"> • Have a group discussion with students about the importance of values after each concept • Illustration • Activity oriented teaching • Play way method, learning by doing. • Theoretical method with some examples related to the value found from particular topic can be helpful for the students to understand the topic clearly • Teachers can use inductive method of teaching to connect the mathematical concept to a value. Also while selecting examples for solving in classroom, teachers can choose ones that can sow the seeds of humanity in children. • Role play according to the concepts can be introduced.

10	After the workshop, what's your current perspective on the topic?	Analyzing the perspectives of the teacher trainees revealed that although time consuming to bring out a value and relate it to a mathematical concept, it would be beneficial to the learner group by humanizing Mathematics. Most Students view mathematics as a rigid subject and thus lose interest in the long run. By inculcating values in teaching mathematics, one can take a humane approach in embracing the subject, known for its beautiful complexities that is fundamental to the functioning of the world.
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Despite concentrating on these values, each mathematical notion provided us with additional benefits, and it even altered our perception of those concepts.

Conclusion:

The study of mathematics involves more than just numbers. Its significance to societal wellbeing is always being contested. All math enthusiasts are looking for persuasive answers to all of these questions. If properly executed, this novel way of teaching mathematics would be a really compelling concept. Always, the material is made intriguing or uninteresting by the teacher. Getting students to talk about concepts, methods, and understandings is the best approach to enhance their understanding of science. Like it did for physics, mathematics for peace may lead to new peace prospects. A little arithmetic could be able to open up some undiscovered or secret peaceful realms.

References

- Afolabi, S. s. (2016). Mathematics for Peace and National Development in Focus. *Nigeria Journal of Education, Health and Technology Research*.
- Anilkumar, P. (2014). A Study on Value Integrated Education and Student Behaviour a Constructive and Experimental Study .
- Fischer, J. G. (2012). *Peace Mathematics*. Transcend University Press.
- Juandi, I. W. (2019). Philosophy of Mathematics Education for Sustainable Development. *Journal of Physics Conference Series*.
- Kwesi yaro, D. W. (2020). Situated Perspectives on Creating Mathematics Tasks for peace and Sustainability. *Canadian Journal of Science Mathematics and Technology Education*.
- Lal, D. (2014). Can mathematics Educate for peace? *International Journal of Education for Peace and Development*.

Mathematics Textbook , Eighth Standard, (Part1 and Part2). (n.d.). Karnataka textbook Society.

Mathematics Textbook ,Ninth standard (part 1 and part 2). (2005). Karnataka Textbook Society.

Mathematics, tenth standard (part1 and part 2). (2006). Karnataka Textbook Society.

Srivatsa, V. M. (2020). Teaching of Mathematics through Integrated Approach for Value .

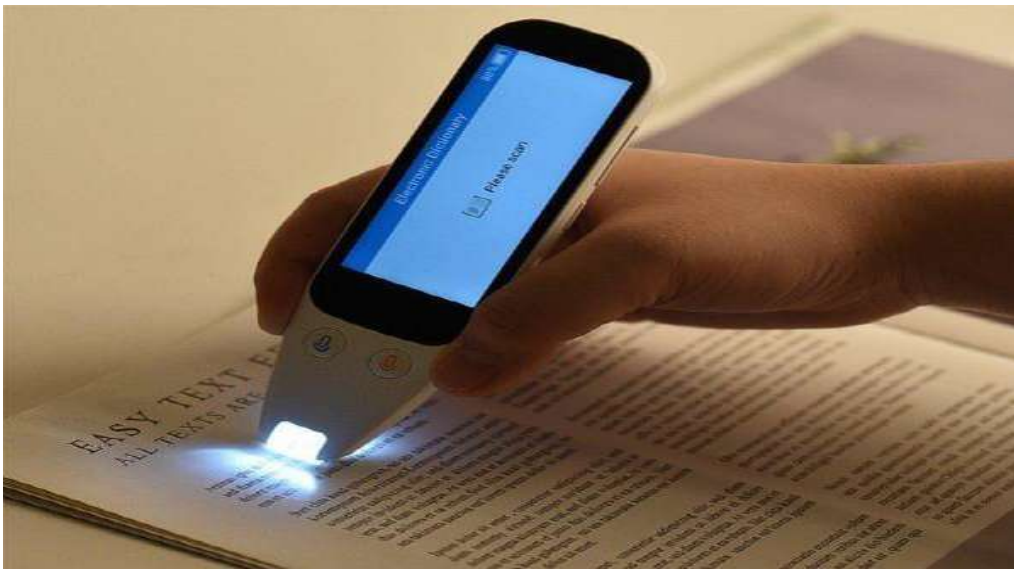
INTERNATIONAL JOURNAL FOR INNOVATIVE RESEARCH IN MULTIDISCIPLINARY FIELD.

Wagner, D. (2002). Teaching Mathematics for Peace. *Connections.*

Thematic Paper

Digital Dictionary as an aid for learning Economics

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Abstract

Dictionary is a reference book that lists words in order and gives their meanings. In addition to its basic function of defining words, a dictionary may provide information about their pronunciation, grammatical forms and functions, etc. Systematic dictionaries are lacking in social sciences like economics when compared to different science subjects. Even when they are available, it is not widely used. So it was felt important to find out whether a digital dictionary will be helpful for Economics learners or not. This paper is prepared after carefully going through the studies of different scholars on digital dictionary and drawing inferences from them.

Introduction

One basic issue confronted by students during self learning is to understand the meaning of difficult terms which are sometimes specific to one subject alone. In this electronic era, digital dictionary is the best application where students could rely upon during such a situation. And when compared to physical dictionaries, they are able to store more and updated data, which make them a sustainable choice. Until now digital dictionaries are more used for language learning or just to casually know the meaning of unknown words. As being a widely studied subject in the world, it's important to know how digital dictionaries could be helpful for learning of Economics.

Most digital dictionaries are either portable or can be accessed remotely. As a result, dictionary users are relieved of the burden of having to carry around the bulky medium on which dictionary contents reside. Gone are also the pressures to compress and condense dictionary content in an attempt to keep the total size manageable: these same pressures which have effectively given rise to the many lexicographic conventions related to textual condensation and compression, conventions which all too frequently leave dictionary users stumped. Although considerations of space are largely immaterial at the level of the cumulative dictionary content, problems remain when it comes to presenting the content to the dictionary user, and these problems become particularly acute on small-screen devices. Several scholars now believe that an optimal digital dictionary should only present users with that which is relevant to them, considering the task in which they are engaged and which prompted dictionary use.

Theoretical Framework

Digital Dictionary :- A digital dictionary is a computer-controlled and functionally automated linguistic reference device which is specially designed to serve the lexicographic requirements of the target audience in a web-based online language learning interface.

A digital dictionary is a type of reference tool that provides definitions, spellings, and other information about words, phrases, and expressions in a digital format. Digital dictionaries have become increasingly popular in recent years due to the widespread use of computers, smartphones, and other digital devices. In this literature review, we will examine some of the research on digital dictionaries, including their advantages and disadvantages, user preferences, and design features.

Advantages of Digital Dictionaries:

Accessibility: Digital dictionaries can be accessed from anywhere and at any time, as long as the user has an internet connection.

Convenience: Unlike printed dictionaries, digital dictionaries are typically more compact and easier to use, with the ability to search for words and phrases quickly.

Multi-functional: Digital dictionaries can include a variety of features such as audio pronunciations, images, and synonyms, and can often be integrated with other applications on a user's device.

Timeliness: Digital dictionaries can be updated regularly, ensuring that users have access to the latest information and definitions.

Customization: Users can personalize their digital dictionary experience by selecting their preferred language, font size, and other settings.

Disadvantages of Digital Dictionaries

Dependence on technology: Digital dictionaries rely on digital devices and internet connectivity, which can be a disadvantage if a user does not have access to these resources.

Distractions: The convenience of digital dictionaries can also be a disadvantage if users are easily distracted by other applications on their device.

Less context: Digital dictionaries may not provide the same level of contextual information as printed dictionaries, which can be a disadvantage for some users.

Cost: Some digital dictionaries require users to pay for access or have limitations on usage, which can be a disadvantage for users on a tight budget.

User Preferences: Research has shown that user preferences for digital dictionaries vary depending on a variety of factors, including their age, language proficiency, and educational level. For example, younger users tend to prefer digital dictionaries with more interactive features, while older users may prefer more traditional dictionary formats. Similarly, users with lower language proficiency may prefer digital dictionaries with more visual aids, while more advanced users may prefer dictionaries with more detailed definitions and etymologies.

Design Features: Design features of digital dictionaries can also have an impact on user satisfaction and usage.

Example for digital economics dictionary – Oxford Dictionary of Economics App

This is an authoritative and comprehensive dictionary containing 2,500 key economic terms with clear, concise definitions. It could be downloaded from playstore.

Review of Literature

Robert Lew, (2013), conducted a study on evolving dictionary skills as digital dictionaries are replacing paper dictionary, in which it was quoted that successful dictionary use depends on two factors that is user-friendliness of dictionaries and good dictionary reference skills of their users. As the world moves from paper to electronic dictionaries, we need to realize that the skills needed to use modern digital dictionaries are not necessarily identical to those for traditional print dictionaries.

Aslı Maden, (2020) has compared the attitudes of middle school students towards printed and digital dictionary use, in which it was quoted that student attitudes towards dictionary use improved with the increase in grade level, and the dictionary use attitudes of the students who started to use printed dictionaries during primary school or before were higher when compared to other students.

Robert Lew, Gilles-Maurice De Schryver, (2014) studied about Dictionary users in the digital revolution and established that the challenge to produce efficient and effective dictionaries is best seen in the context of dictionary users' reference skills, which now tend to overlap with digital literacy.

À Michael Hancher, (2014) conducted study among students about what dictionaries they generally consult, and few name a printed dictionary. Webster does get mentioned, ambiguously; occasionally Merriam-Webster, and even the Oxford English Dictionary—but the latter two are available online and are often consulted online. By far the most popular answer is Dictionary. Com. Free Online Dictionary gets mentioned.

Michael Rundell, (2014) conducted a study after which it was suggested that with easy access to numerous free reference sites, users searching for lexical information have a huge variety of options. Consequently, publishers are under pressure to continually broaden the range of content they supply, to improve the quality of the design and –user experience, and above all to stay abreast of language change.

E Raupp, V Raupp, (2018), conducted a study about Dictionary of economic terms and quoted that in a sense, every university class is a foreign language class. Economics fits that model. There are strange words, like –oligopsony, and words that are familiar but have different meanings to economists, like –elasticity. This book aims to help students to make sense of the vocabulary of economics.

William Walstad, Michael Watts, (1985), conducted a review about Teaching economics in the schools and quoted that Instruction in economics tends to be minimal (or nonexistent) for many students, and teacher training in economics is limited. Curriculum structure, teacher training, and the development and use of materials are interrelated problems facing economic education.

Doreen Massey, (2013) conducted study on Vocabularies of the economy and observed that the language we use to discuss about economy, shapes the way we think about it, and thus reinforces neoliberal values as common sense. The vocabulary of

customer, consumer, choice, markets and self interest molds both our conception of ourselves and our understanding of and relationship to the world.

Need of the study

Economics is a subject which consists of certain terms which people do not use in their normal communication. Majority of the terms are originated from western languages making it extremely difficult of Indian students to understand their meaning. Some students may even misinterpret the meaning of such terms. As systematic dictionaries are lacking in social sciences like economics students cannot rely on them. Even when they are available , it is not widely used due to low availability. In this case, it's important to know whether digital dictionaries with its specific features will be able to help students in such a situation.

Objectives

To briefly describe about merits of using digital dictionary for learning.

To identify the factors which influence usage of digital dictionary.

Scope of the study

Help to understand the uses of digital dictionary while learning economics.

Promote sustainability by sharing idea about digital dictionary.

Develop basic idea about the concept before doing systematic research on the subject.

Inferences from literature review

- Special skills are required for using digital dictionary.
- Digital dictionary serve user better than physical ones.
- Students give more preference to digital dictionaries.
- Students familiar with paper dictionary find it easy to use digital ones.

- It could support learning meaning of unknown economic terms.

Suggestions

- Developing of Digital Economics dictionary will be supportive for learners.
- Basic computer skills to use must inculcated among students

Conclusion

Learning process in economics subject requires a complete understanding of the certain key terms from the part of the students. But sometimes students could feel difficulty in finding the meaning of certain unknown words. This may happen especially when they are involved in self study and self revision. In such situations digital dictionary will help to find out the meaning of unknown words easily and with less effort. The flexibility of the digital platform opens up opportunities to solve many of the problems that users of traditional print dictionaries have confronted for centuries.

References

Robert Lew, (2013), From paper to electronic dictionaries: Evolving dictionary. skills, repozytorium.amu.edu.pl.

Aslı Maden, (2020), Comparison of student attitudes towards printed and digital Dictionary use: A case of middle school, *Journal of Language and Linguistic Studies*.

Robert Lew, Gilles-Maurice De Schryver, (2014), Dictionary users in the digital revolution, *International Journal of Lexicography*.

À Michael Hancher, (2014), Digital Dictionaries: Introduction, Journal of the Dictionary Society of North.

Michael Rundell, (2014), Macmillian English Dictionary: The End of Print ?, journals.uni-lj.si

E Raupp, V Raupp, (2018), Dictionary of economic terms, academia.edu.

William Walstad, Michael Watts, (1985), The Journal of Economic Education, Teaching economics in the schools: A review of survey findings, The Journal of Economic Education, 1985 - Taylor & Francis.

Doreen Massey, 2013, Vocabularies of the economy, ingentaconnect.com.

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Leveraging Artificial Intelligence for Sustainable Development

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Abstract

Artificial Intelligence, commonly known as AI, is an area of computer science that focuses on the development of intelligent machines that are able to think and act like a human being. Artificial intelligence is gradually becoming more and more influential in the modern world, and its impact on our daily lives is only expected to grow. AI has the potential to revolutionize the traditional education system. It can provide personalized learning experiences, offer real-time feedback, and make the learning process more interactive and engaging. AI-powered virtual assistants can also help students with their studies, answer their questions, and provide guidance and support. AI can also be used to enhance the assessment process. By analyzing data and learning patterns, AI can provide more accurate and timely feedback to students and teachers, making it easier to identify areas where students need improvement. Moreover, AI can also help teachers manage administrative tasks such as grading and record-keeping, giving them more time to focus on teaching and engaging with students. This paper discusses about the scope and opportunities about AI in education, health, industry and banking sector. However, implementing AI in schools also comes with challenges. There are concerns about data privacy and security, and there is a need to ensure that the AI systems used in schools are fair and unbiased.

Keywords : Artificial Intelligence(AI), Sustainable development, Education, Machine Learning (ML), Robots.

Introduction

The emergence of artificial intelligence (AI) is determining an increasing range of sectors. AI, for instance, is anticipated to have both immediate and long-term effects on global productivity, equality and inclusion, environmental results, and a number of other domains. Both positive and negative effects on sustainable development are indicated by the reported potential effects of AI. The idea of AI is often associated with robots and other heavily automated machines, Artificial Intelligence, commonly known as AI, However, the core concept of AI has continuously been to create machines that were capable of thinking like humans (Marr, 2018). Artificial intelligence is gradually becoming more and more influential in the modern world, and its impact on our daily lives is only expected to grow.

-It took approximately 200,000 years for humankind's intelligence to evolve from *natural* to *artificial*, and 10 years to cut the ties with 'earth' to move to the 'cloud' (Garimella & Fingar, 2018, p. 7). AI systems must be able to learn and make decisions on their own. To facilitate decision-making, AI systems use a combination of data and algorithms to determine the best course of action. AI systems also use algorithms to understand language and generate natural-sounding responses. AI has the potential to revolutionize how we work and how we interact with technology. AI can automate inefficient processes, identify patterns, and make more informed decisions than humans. For example, AI can be used to create personalized customer experiences, predict outcomes, and optimize scheduling. AI can also be used in fields such as health care, transportation, education, and manufacturing (DonHee Lee and Seong No Yoon, 2021).The idea of AI is often associated with robots and other heavily automated machines, but it can also take the form of software, like chatbots or recommendation engines. AI can also be found in more subtle forms, like voice recognition services, spam filters, and automated translation. AI has the potential to support sustainable development in several ways by providing new tools and addressing some of the world's most pressing environmental challenges.

Sustainable Development

Sustainable development is a concept that emphasizes meeting the needs of the present generation without compromising the ability of future generations to meet their own needs (Morelli, 2011). It involves finding a balance between economic growth, social development, and environmental protection. The idea of sustainable development emerged in the 1980s as a response to concerns about the negative impacts of economic growth on the environment and social equity. The concept recognizes that economic development and environmental protection are interdependent and must be integrated to ensure long-term sustainability.

The United Nations has played a key role in promoting sustainable development through its Sustainable Development Goals (SDGs), which were adopted in 2015 as part of the 2030 Agenda for Sustainable Development. The SDGs provide a framework for global action on issues such as poverty, hunger, health, education, gender equality, clean water and sanitation, affordable and clean energy, responsible consumption and production, climate action, and biodiversity.

Achieving sustainable development requires a shift towards more sustainable patterns of production and consumption, as well as the adoption of policies and practices that promote social

inclusion, environmental protection, and economic growth. This requires collaboration between governments, businesses, civil society, and individuals at all levels, from local to global.

Review of Literature

Masson-Delmotte et al., (2018) in their study revealed that ML has been utilized extensively in AI solutions for sustainability. ML uses patterns and relationships observed in the historical data for learning and making predictions. Numerous research groups such as the Intergovernmental Panel on Climate Change (IPCC) are building simulation models to predict possible future scenarios with increases from 1° C to 6° C in global average temperature.

Rohit Nishant (2020) identified that AI for sustainability extends across many disciplines and domains and addresses environmental challenges. Biodiversity, water, energy, and transportation are rich areas of investigation for AI. Researchers have applied machine learning (ML) models to environmental, economic, and, to a lesser degree, social inquiry, particularly regarding climate change and smart cities, which are particularly fertile areas for AI research.

Ricardo Vinuesa et al (2019) reviewed and analysed the role of artificial intelligence in achieving Sustainable Development Goals found out that AI can support the achievement of 128 targets across all Sustainable Development Goals.

Working paper (August 2019) ARTIFICIAL INTELLIGENCE FOR SUSTAINABLE DEVELOPMENT: challenges and opportunities for UNESCO's science and engineering programmes identified that the predictive and prescriptive capabilities of AI systems have enormous potential for fields as diverse as medical research and diagnostics, ecological and biodiversity research, freshwater management, geoscience research, disaster risk reduction and strategic foresight.

Rusul, Hussein, Sohani, Saeed, (2019) in their study of artificial intelligence and transport identified that AI can address the challenges of transport system.

Demerci et al, (2019) in their study identified the role of AI in maintaining stream flow and water quality parameters.

Rationale of the study on Artificial Intelligence and Sustainable Development

Artificial intelligence (AI) has become increasingly important in recent years due to its ability to solve complex problems, automate routine tasks, and improve decision-making processes. Here are some of the key reasons why AI is needed in various sectors like education, health, business, science and technology and environment:

1. Efficiency: AI can automate routine tasks, freeing up time for humans to focus on more complex and creative work. Increased productivity, efficiency, and cost savings may result from this.

2. Accuracy: AI can analyze large amounts of data quickly and accurately, which can help to identify patterns, make predictions, and reduce errors in decision-making.
3. Personalization: AI can analyze individual preferences and behaviors to provide personalized recommendations, services, and products, which can improve customer satisfaction and loyalty.
4. Innovation: AI can help to identify new opportunities and develop innovative solutions to complex problems, which can drive growth and competitiveness.
5. Safety: AI can help to improve safety in a wide range of industries, from healthcare to transportation, by detecting and preventing accidents and errors.
6. Sustainability: AI can help to address some of the world's most pressing environmental and social challenges, such as climate change and poverty, by enabling more efficient and effective use of resources and promoting sustainable development.

Overall, the need for AI is driven by the increasing complexity of our world, the growing volume of data and information, and the desire to improve efficiency, accuracy, and innovation in all areas of our lives. Horvitz in a study opined about warnings of our foremost thinkers and opinion leaders that super intelligent machines are poised to outstrip human control and abilities. He argued that these technologies will have both positive and negative effects on society (Markoff, 2014). Along with the advancement of AI, it is obligatory on the part of the personnel's and advocates who promote AI for better living condition to strike a balance between technology and sustainable development. As teachers and teacher educators, the mandate to promote sustainable development and create awareness about the proper use of AI in the upcoming generation is vested upon them. There is a great emergency in developing positive attitude among the learners, hence this study is highly relevant at this juncture.

Sustainable development is necessary to ensure that the economic, social, and environmental needs of present and future generations are met. Here are some of the key reasons why sustainable development is needed:

1. Environmental Protection: Sustainable development is necessary to protect the natural environment, which provides us with resources such as clean air, water, and soil. It is essential to prevent environmental degradation, reduce pollution, and preserve biodiversity to ensure a healthy planet for future generations.
2. Social Equity: Sustainable development is needed to promote social equity and reduce poverty. It aims to provide access to basic needs such as food, water, healthcare, education, and housing, regardless of economic or social status.
3. Economic Growth: Sustainable development is necessary to promote economic growth that is equitable, inclusive, and environmentally responsible. It focuses on creating long-term value rather than short-term gains, and encourages innovation and entrepreneurship to build a strong and resilient economy.

4. **Climate Change:** Sustainable development is essential to address the urgent challenge of climate change. It seeks to reduce greenhouse gas emissions, promote renewable energy, and adapt to the impacts of climate change.
5. **Global Cooperation:** Sustainable development requires global cooperation and partnership between governments, businesses, civil society, and individuals. It is a collective responsibility to ensure a sustainable future for all.

Overall, the need for sustainable development is driven by the need to ensure a sustainable and equitable future for all, to protect the natural environment, and to address the urgent challenges of poverty, inequality, and climate change.

Objectives of the Study

- To Study about the opportunity of AI in Various sectors of human life.
- To Study about the role of AI in sustainable development.

Method

The paper is based on secondary data. The researchers have collected data from different sources-reports, articles and websites. This paper will give a brief description on the need and importance of AI in sustainable development. The study identify the following scope of AI after reviewing relevant literature and secondary sources pertaining to artificial intelligence and sustainable development.

Scope of Artificial Intelligence

1. AI in Science and Research

Science has made significant progress with AI. Large amounts of data can be handled and processed by artificial intelligence more quickly than by human brains. This makes it ideal for studies where the sources have large amounts of data. In this area, AI has already made strides. A great example is ‘_Eve,’ which is an AI-based robot. It discovered a component in toothpaste that has the potential to treat a deadly condition like malaria. Between 2011 and 2016, the supply of industrial robots worldwide increased by about 31% per year. By 2020, there were about 3 million operational robots. Most robots are employed in the automotive industry (35%), the electronics and electrical industry took 31% of the market in 2016, including in China, Japan and the Republic of Korea (IFR, 2017).

2. AI in Cyber Security

Cyber security is another field that’s benefitting from AI. The threat of hackers is getting worse as businesses move their data to IT networks and the cloud.

Cognitive AI is an excellent example of this field. It detects and analyses threats, while also providing insights to the analysts for making better-informed decisions. By using Machine Learning algorithms and Deep Learning networks, the AI gets better and more durable over time. This makes it able to combat potential future, more sophisticated threats. Many institutions are using AI-based solutions to automate the repetitive processes present in cyber security. Another field is fraud detection. AI can help in detecting frauds and help organizations and people in avoiding scams. For example, Recurrent Neural Networks are capable of detecting fraud in their early stages. They can quickly scan enormous volumes of transactions and categorise them based on their reliability.

3. AI in Data Analysis

Data analysis can benefit largely from AI and ML. AI algorithms are capable of improving with iterations, and this way, their accuracy, and precision increase accordingly. AI can help data analysts with handling and processing large datasets.

AI can identify patterns and insights that human eyes can't notice without putting in a lot of effort. Moreover, it is faster and more scalable at doing so. For example, Google Analytics has Analytics Intelligence, which uses machine learning to help webmasters get insights on their websites faster. The scope of AI in data analytics is rising rapidly. AI systems can handle tons of data and process it much faster than humans. So, they can take customer data and make more accurate predictions of customer behavior, preferences, and other required factors. Helixa.ai is a great example of such an AI application.

4. AI in Transport

The transport sector has been using AI for decades. Although the presence and scope of artificial intelligence have been theoretically existent for some time now, only a few people are aware that we use it on a regular basis. The scope of AI is quite advanced because it can learn automated manual tasks just like humans. Since automation is becoming more prevalent, time-consuming tasks are being taken over by AI. Any system that has AI shows the same amount of potential that human intelligence shows. These AI-powered machines can carry out jobs that require critical thinking and decision-making processes all by themselves. Several businesses in the transportation sector have been taken over by AI so that they can stay ahead in the market.

Autopilot helps the human operator and assists them in heading in the right direction forecasting the weather and maintaining the trajectory of the plane.

Another area where the future scope of AI is quite broad is driverless cars with lower emissions and enhanced road safety. For example, self-driving cars will be free from human errors, which account for 90% of traffic accidents. Many companies, including Tesla and Uber, are developing these vehicles. AI come with several benefits like an increase in safety of the passengers, fewer accidents, lesser traffic congestion, lesser carbon emissions, and reduced financial expenses.

5. AI in Home

AI has found a special place in people's homes in the form of Smart Home Assistants. Amazon Echo and Google Home are popular smart home devices that let you perform various tasks with just voice commands.

You can order groceries, play music, or even switch on/off the lights in your living room with just a few voice commands. Both of them rely on Voice Recognition technologies, which are a result of Artificial Intelligence and Machine Learning. They constantly learn from the commands of their users to understand them better and become more efficient.

Smart assistants are also present in mobile phones. Apple's Siri and Google Assistant are great examples of this sort. They also learn to recognize their users' voices to interpret them better all the time. And they can perform a plethora of tasks. Microsoft also has a smart assistant, which is called Cortana.

6. AI in Healthcare

AI is helping medical researchers and professionals in numerous ways. For example, the Knight Career Institute and Intel have made a collaborative cancer cloud which helps doctors in making a better diagnosis. The UK's National Health Service uses Google's Deep Mind platform to detect health risks in people through apps. AI can help doctors in avoiding these errors by providing them with relevant databases and recommendations. It can analyze the database of patients with similar symptoms and suggest the treatment that was the most successful in those cases.

Many major organizations, including IBM and Microsoft, are collaborating with medical institutions to solve the various problems present in the healthcare sector.

AI can also help in reducing medical costs by preventing diseases beforehand and helping doctors in making better diagnoses. BCIs (Brain-computer Interfaces) is another area where the medical sector is utilizing AI. These interfaces help in predicting problems related to speaking or moving that might develop due to problems in the brain. They use AI to help these patients overcome these issues, too, by decoding neural activities.

7. AI in business

Artificial intelligence scope has also been the reason why businesses have been transformed from the core, and it is only expanding. Conducting an online business appears to be an easy task, but that is far from the truth. Many businesses have gone online to satisfy their customers' needs and deliver a unique and comfortable experience. For businesses to make better and more informed decisions, they have to manage massive amounts of data generated each second. Artificial intelligence has played a huge role in this procedure. The scope of AI is prominent in all aspects of business, like sales, marketing, customer support, and the HR department. For example, a company like Amazon uses AI to provide the most accurate services to its customers. They give personalized recommendations of the products they think the customers will use based on their web behavior. This AI algorithm is responsible for almost 40% of the entire business of a company like Amazon.

8. AI in Education

Artificial intelligence plays a huge role in every aspect of education. Here are some of the leading roles of AI. Here are some of the applications of AI in education: Personalized Learning, Intelligent Tutoring Systems, Adaptive Assessments, Natural Language Processing, Intelligent Content Creation, Predictive Analytics, Augmented reality, Voice recognition, Biometric attendance

Artificial intelligence for sustainable development.

Artificial intelligence (AI) has the potential to contribute significantly to sustainable development in various ways. Here are some examples:

Climate change: AI can help monitor and predict climate patterns and make more accurate predictions of weather events. It can also help to optimize the use of energy resources and reduce energy consumption, resulting in a reduction of greenhouse gas emissions.

Agriculture: AI can help farmers to optimize crop yields by providing them with accurate data on soil conditions, weather patterns, and plant health. This can result in a reduction in the use of pesticides and other harmful chemicals, leading to sustainable and environmentally friendly farming practices.

Healthcare: AI can help to improve healthcare by providing faster and more accurate diagnoses, personalized treatment plans, and improved patient outcomes. This can lead to a more sustainable and efficient healthcare system. The computer compared 25,000 clinical tests, 1.2 million patient files and two million scientific articles (Otake, 2016).

Transportation: AI can help to optimize traffic flow and reduce congestion, resulting in a reduction of carbon emissions from vehicles. It can also improve safety by detecting and avoiding potential accidents and optimizing vehicle routes.

Waste management: AI can help to optimize waste management processes by predicting and identifying areas where waste is likely to accumulate. It can also be used to monitor the impact of waste on the environment and optimize recycling and waste disposal processes.

Overall, AI can play an important role in achieving sustainable development by providing accurate and real-time data, optimizing processes and systems, and reducing waste and inefficiency. However, it's important to ensure that the development and implementation of AI are ethical, transparent, and inclusive, to avoid exacerbating existing inequalities and unintended consequences.

Conclusion

Artificial intelligence has the potential to significantly contribute to sustainable development goals in many ways. By providing new and innovative solutions to complex challenges, AI can help us achieve environmental sustainability, economic growth, and social progress. For example, AI can improve energy efficiency, reduce waste, optimize resource allocation, and enable more sustainable manufacturing processes. AI can also help us address climate change by facilitating better understanding of environmental phenomena, predicting natural disasters, and supporting climate change adaptation and mitigation efforts.

However, to fully realize the potential of AI for sustainable development, it is important to ensure that AI is developed and used in an ethical, transparent, and responsible manner. This means considering the potential negative impacts of AI and taking steps to mitigate them, while also promoting its positive impacts. It also means promoting collaboration and partnerships between different stakeholders, including government, industry, civil society, and academia, to ensure that AI is used to benefit society as a whole.

It's important to note that many of the risks are not inherent to AI itself, but rather to how it is developed and used. By being aware of these risks and taking steps to mitigate them, we can work to ensure that AI is used in ways that benefit society as a whole. People in advanced countries may fear job loss due to AI, in low-income countries people may see AI as offering new opportunities to break the cycle of poverty (Lohr, 2018). AI has the potential to play a vital role in sustainable development, but it must be approached in a thoughtful and responsible way. By harnessing the power of AI for the greater good, we can work towards achieving a more sustainable and equitable future for all.

Reference

1. Abduljabbar, R., Dia, H., Liyanage, S., & Bagloee, S. (2019). Applications of artificial intelligence in transport: An overview. *Sustainability*, 11(1), 189.
2. Beck, R., Avital, M., Rossi, M., & Thatcher, J. B. (2017). Blockchain technology in business and information systems research.
3. Kumar, A., Kaur, A., & Kumar, M. (2019). Face detection techniques: a review. *Artificial Intelligence Review*, 52(2), 927-948. Kurdi, M. Z. (2017).
4. Morelli, J. (2011). Environmental sustainability: A definition for environmental professionals. *Journal of environmental sustainability*, 1(1), 2.

5. Goralski, M. A., & Tan, T. K. (2020). Artificial intelligence and sustainable development. *The International Journal of Management Education*, 18(1), 100330.
6. Celine Herweijer (PwC UK), Benjamin Combes (PwC UK), Pia Ramchandani (PwC US), Jasnam Sidhu (2018) Harnessing Artificial Intelligence for the Earth, Fourth Industrial Revolution for the Earth Series; In Collaboration with PwC and Stanford Woods Institute for the Environment
7. Nishant, R., Kennedy, M., & Corbett, J. (2020). Artificial intelligence for sustainability: Challenges, opportunities, and a research agenda. *International Journal of Information Management*, 53, 102104.
8. Pedro, F., Subosa, M., Rivas, A., & Valverde, P. (2019). Artificial intelligence in education: Challenges and opportunities for sustainable development.
9. Al Mubarak, M. (2022). Sustainably developing in a Digital World: harnessing artificial intelligence to meet the imperatives of work-based learning in Industry 5.0. *Development and Learning in Organizations: An International Journal*, (ahead-of-print)
10. Galaz, V., Centeno, M. A., Callahan, P. W., Causevic, A., Patterson, T., Brass, I., & Levy, K. (2021). Artificial intelligence, systemic risks, and sustainability. *Technology in Society*, 67, 101741.
11. Vinuesa, R., Azizpour, H., Leite, I., Balaam, M., Dignum, V., Domisch, S., Felländer, A., Langhans, S.D., Tegmark, M. and Fuso Nerini, F., 2020. The role of artificial intelligence in achieving the Sustainable Development Goals. *Nature communications*, 11(1), p.233.
12. Mota-Valtierra, G., Rodríguez-Resendiz, J., & Herrera-Ruiz, G. (2019). Constructivism-based methodology for teaching artificial intelligence topics focused on sustainable development. *Sustainability*, 11(17), 4642.
13. Demirci, M., Unes, F., & Korlu, S. (2019). Modeling of groundwater level using artificial intelligence techniques: A case study of Reyhanli region in Turkey.

Best Practices for Promoting Sustainable lifestyle among B. Ed Students

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Abstract

Sustainability has emerged as a pressing concern in the 21st century, with climate change, environmental degradation, and social inequality posing significant challenges for present and future generations. As a result, there is a growing interest in promoting sustainable patterns among individuals, including students, who play a crucial role in shaping the future. A generational change could be brought about by promoting sustainable practices in the builders of the nation. This change can be facilitated in the training of student teachers. This paper aims to check the awareness about sustainability and suggest creative solutions to adopt a sustainable lifestyle with the sample constituting of student teachers. 120 respondents undertook this study under survey method, which were analysed quantitatively. The results of the study indicate that the student teachers are aware about sustainable practices, but are unsure about the steps to be taken to adopt the same in day to day lives. This research paper provides a first look at Sustainable practices that are observed in St. Joseph's College of Education, Mysore that could be motivation for others.

Keywords: Sustainability, future generations, sustainable living practices, teacher trainee, motivation, student teacher.

Introduction

In the 20th and 21st century, humans have experienced unprecedented growth which is placing extreme pressure on our planet and its natural resources - from floods to draughts, food shortages, economic inequality, social inability to loss of animal and plant species. It is

important for us now more than ever to start identifying and adopting sustainable practices while at the same time phasing out unsustainable practices.

The concept of sustainable living has gained a lot of attention in recent years, as the impact of human activities on the environment has become increasingly evident. Sustainable living refers to the practice of living in a way that minimizes one's negative impact on the environment, and helps to preserve natural resources for future generations. Students are a key demographic in this effort, as they represent the future leaders and decision-makers who will shape our society's approach to sustainability. Hence a sustainable lifestyle is one of the initiatives to address the unsustainable consumption pattern among people (Black & Cherrier, 2010).

The integration of environment and sustainability to education is seen from many years. It began in late 19th century with the idea of nature conservation education that focused on reconnection with nature. Later, the movement of environmental education was added in the 1960s. Ecological literacy took main role during this movement. The wave then shifted to citizen engagement and capacity building with sustainability education dating back to the 1992 Earth Summit (Wals, A. E. J., 2012). At present, all these themes are blended and more emphasis is given to global citizenship in environmental and sustainability education (Wals & Benavot, 2017).

Teachers in this context play an important role, because they mould the future of this society. The responsibility of building a mindful generation for a better tomorrow falls under the purview of teachers. Hence it is crucial to train the student teachers and teacher trainees to follow sustainable practices, which in turn would affect the future of the world in the long run. Tuncer et al. (2009) insists that only when teachers are equipped with knowledge and positive attitude towards environment, they can instil environmental literacy in students. Also, it is necessary to address the teacher's beliefs, before implementing any innovation in teaching practices for the accomplishment of sustainable thinking in students (Burmeister & Eilks, 2013).

A Review of the Definitions of Sustainability

Sustainability has various definitions which are contradicting in a manner. The most commonly accepted definition of –Sustainability‖ is given by the United Nations' World Commission on Environment and Development (Brundtland Commission) in their cited report, *Our Common*

Future, –Humanity has the ability to make development sustainable—to ensure that it meets the needs of the present without compromising the ability of future generations to meet their needs! (World Commission on Environment and Development(WCED),. 1987). According to Curran, Sustainability is a destination we aspire to reach with the election of sustainable pathways that we choose as we proceed along the journey (Curran, 2009) .

Sustainability has taken up like a storm and has its roots dipped into every discipline of life. The different varieties range from ecological sustainability, economic and social sustainability, land restorativeness, environmental soundness, economic viability and social acceptability, sustainability of all agricultural resources, and sustainability from a political economy and political ecological perspective (Liu, 2009). Rosen (Rosen, 2009) uses a pragmatic approach to demonstrate that several crucial factors need to be taken into consideration appropriately to achieve energy sustainability, and hence allow it to contribute to sustainable development. Many concepts of sustainable agriculture have emerged. They include fertility agriculture, organic agriculture, biodynamic agriculture, biological agriculture, integrated agriculture, agro-ecological engineering, bio-ecological agriculture, ecological agriculture, scientific ecological agriculture, regenerative agriculture, and conservational agriculture (Liu, 2009). Liu concludes that in developed countries across the world, sustainable programs are cost-effective and therefore make use of locally sourced materials and skills whereas the conservation programs are not economically restricted (Hoag & Skold, 1996). According to Liu, in many developing countries, however, conservation and sustainable agriculture are considered to be one and the same. Conservation stands for the act to conserve the land to increase productivity and correspondingly income. It also includes prevention of degradation, and achievement of sustainable development. i.e., it uses local materials and skills to be cost-effective.

Aim of the Study

The aim of the study is to provide data regarding the awareness of Sustainable practices among student teachers. The paper also explores the knowledge and attitude regarding sustainable practices among the student teachers.

Method and Sample

Questionnaire

The study is based on a questionnaire, which was done using an online survey method. The questionnaire consists of three parts.

- a) The first part collects general information on the participants' Name, age group, field of study, year of study.
- b) This portion consists of questions enquiring into the participants' knowledge and understanding of the technical terms such as 'sustainability' and 'sustainable development', including 'barriers in practicing a more sustainable life'.
- c) The final part of the questionnaire focuses on the participants' first-hand involvement in adopting sustainable practices.

The instrument was further scrutinised to obtain a more structured outlook, that would facilitate the study.

Sample

The study collected data from student teachers during their university teacher preparation program. The sample consists of 120 participants, comprising of student teachers in their various year of study.

Findings and Discussion

Awareness about 'sustainability'

When asked for the awareness about the term sustainability, the majority of the participants said that they are aware. Of the 120 participants, 109 participants said that they were aware of the term sustainability. Whereas 8 participants said that they may be aware, while 3 participants said that they were unaware of the term 'sustainability' (refer fig 1).

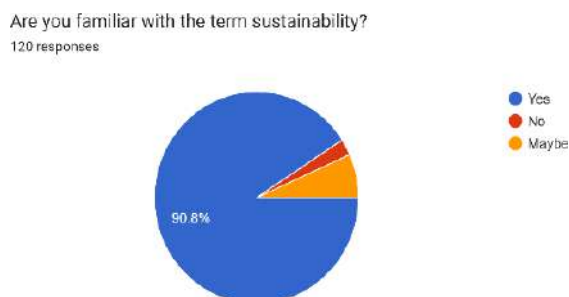


Figure 1: Pie Chart showing the number of participants that are aware of the term 'Sustainability'

It can be observed that although the student teachers are exposed to years of formal schooling before entering the stream of education, there are few who are still unaware about the term 'sustainability'.

Where have you heard about the term sustainability?

120 responses

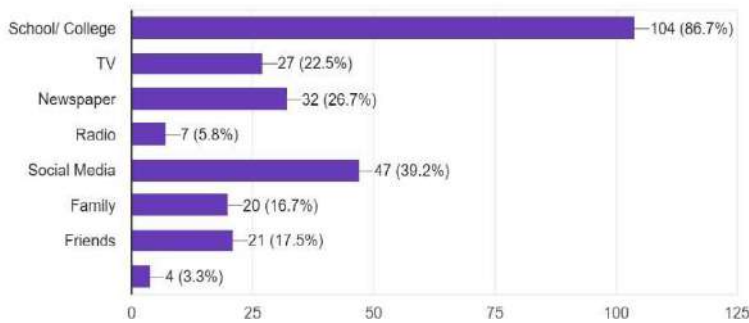


Figure 2: Student teachers' sources of knowledge of the term 'Sustainability'.

It is found that the majority of participants (86.7%) were introduced to the term sustainability in Schools/Colleges (Refer fig 2). It is very evident from the results that most student teachers have heard of the term 'sustainability' in schools and colleges. Thus, it is important now more than ever, to capitalise on this aspect and use schools and colleges as centres to create awareness. The next big information source was the social media which comprises of 39.2% of the participants. This aspect can be positively utilized by educationists and prospective teachers, to create awareness among the student community through social media.

When given various practices, and asked to choose the ones that the student teacher thinks are sustainable practices, a vast majority (80.8%) associate the term with -Reduce, Reuse and Recycle. It is also observed that sustainable practices are used synonymously with the use of eco-friendly products by 61% of the respondents (Refer fig 3). It is to be noted that all the

Which among the following is sustainability?

120 responses

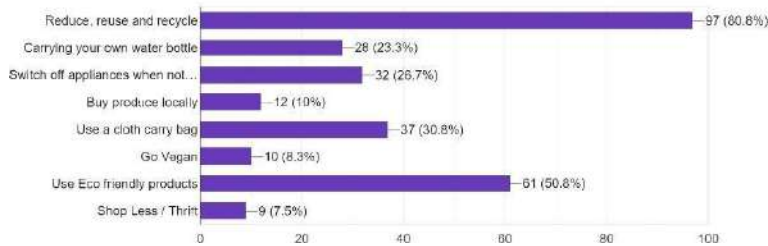


Figure 3: Student teachers' perception of sustainable practices

practices mentioned in the questionnaire are in fact sustainable practices, but hardly few could associate all the given practices with sustainable living. This reveals that no accurate information is provided regarding sustainable

practices for the student teachers to make the necessary connections. It could also be inferred that certain practices have become a norm in life, and hence the student teachers might not be aware that the existing practices are in fact sustainable. Therefore, it is crucial to highlight the existing practices as sustainable and create awareness about the measures that could be taken for adopting a sustainable lifestyle.

Sustainable Development according to the student teachers

What do you understand by the term sustainable development?
120 responses

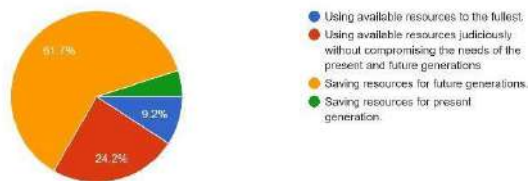


Figure 4: Pie Chart representing the understanding of student teacher of the term 'Sustainable Development'.

When the student teachers were asked about their understanding of the term Sustainable development, 61.7% of the respondents felt that saving resources for future generations to be the rationale. Whereas 24.2% of the respondents have a good understanding about Sustainable

Development (Refer fig4). It was appalling to find out that 9.2% of the respondents thought that 'using available resources to the fullest' to be sustainable development, which in reality is the complete opposite. Although the students said that they are aware of sustainability and the relevant practices, this particular response to the question sheds light on the misconceptions of sustainable development. Hence proper information should be rendered within a classroom setup for effective utilization of sustainable practices. Due diligence should be done while creating awareness regarding the sustainable practices to prevent such misinterpretation.

Barriers in living a Sustainable life

'Lack of support within the community' was the leading barrier in practising a sustainable lifestyle among the student teachers. With 45.8% of the respondents feeling that there is no proper support from within the reaches of the community to lead a sustainable lifestyle is a major concern (Refer fig 5). It is a pressing concern, when 36.7% of the participants are unsure

What are your barriers to living a more sustainable life?
120 responses

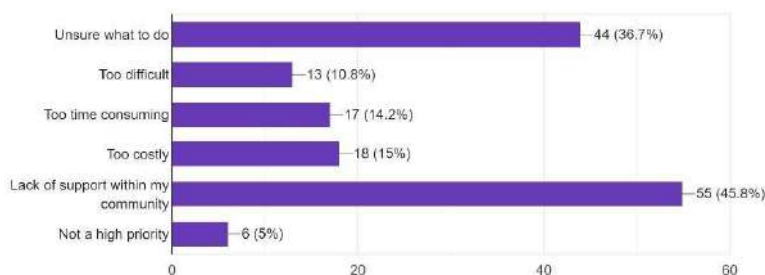


Figure 5: Barriers to living a sustainable lifestyle

of what could be done to adopt a sustainable life. It is to be noted that 15% of the participants found that, leading a sustainable lifestyle is a costly affair. 14.2% of the respondents said that, leading a sustainable life,

is a time-consuming process.

The barriers are all man made and can be overcome with a collective effort. In this study, the main barrier is that of lack of support from within the community, which can be overcome by educating the community about the benefits of sustainable practices. Student teachers can be instrumental in bringing about awareness regarding the sustainable practices at the grassroots level. Creating widespread awareness will create a sense of clarity in the measures that can be taken to lead a sustainable life. The student teachers when equipped with a strong sense of commitment to make this world sustainable, can use the information to further their cause by creating widespread awareness among their peer group and in the community in the long run.

Call out Unecological behaviour

Of the sample pool, 12.5% of the respondents said that they always point out unecological behaviour and a shocking 14.2% of the respondents said they never call out unecological behaviour. Which leaves 73.3% who point out unecological behaviour, at times. This huge margin can be converted and utilised in a positive manner to create awareness and in turn change the attitude of the student teachers. Therefore, a widespread awareness regarding ethical behaviour can be given to the student teachers.

Discuss Environmental Issues

A good number of 27.5% of the respondents said that they always discuss environmental issues with peer group, family and friends. Whereas 68.3% of the respondents discuss environmental issues sometimes. 4.2% (i.e., 5 student teachers) of the respondents said that they never discuss any environmental issues. Education on a broader view, aids in facilitating a productive dialogue to encourage the addressal of environmental issues. When student teachers are encouraged to voice their opinion for the hope of a better tomorrow, they indirectly sponsor the wellbeing of the world. The prospective teachers will in turn inculcate the habit of healthy debates that further the cause of a sustainable future, among young learners.

Effective Strategies placed by various programmes

Leicht et al. (2018) speaks about the need for implementation of education for sustainable development in the following ways:

- As a means to transfer appropriate set of knowledge, attitude, values and behaviour.

- As a means to expand people's capacities and opportunities to play a part in solving sustainability issues so that they themselves can discover and practice alternative ways of living.

The growing discussion on sustainability development has influenced institutional changes - from sustainability in operations and management to modifications in teaching, curriculum and research. It addresses the importance of participation by the institution in strengthening sustainable development in the surrounding communities. Japan's National Institute for Education Policy Research found that Integrated Study can be incorporated in pedagogical strategies. The integration could be with Sustainability and the other subjects in curriculum (Buckler & Creech, 2014). Sustainability covers many disciplines - environment, biology, medicine, nutrition, agronomics, geography, engineering, architecture, citizenship, sociology, psychology, political science, history, law, economics and business. Hence sustainability education cannot be pursued in isolated disciplines alone (Annan-Diab & Molinari, 2017).

Buckler and Creech (2014) mention that more student driven projects or field trips can enhance the attitude towards sustainability. Thailand's integrated curriculum has promoted Education for Sustainability Development (ESD) in 5 ways; ESD topics are incorporated into all subject areas; student character development is defined by eight characteristics which includes sufficiency lifestyle and public mindedness; undertaking project based learning activities such as natural preservation and environmental clubs and camps; specific learning modules such as renewable energy or sustainable economy are developed and taught; and finally the inclusion of decentralised locally based subjects (Didham & Ofei-Manu, 2011). There are also teacher programmes that help in guiding student teachers to develop methods and materials for the purpose of incorporating sustainability mindset during teaching learning process (Lenglet, F, 2015). Cebrián and Junyent (2015) stresses on adding a section of competencies in Education for Sustainability Development that can be assessed and evaluated in student teachers. Leicht et al. (2018) also highlights the importance of studying 'transformative pedagogy' by student teachers.

Institutions also develop sustainable attitude through radical changes in the system as seen in the case of the Green School of Bali, Indonesia. The school has avoided concrete pavements and laid gravel for the same. The school has a section for growing organic food and food is served in plates made with natural materials. Classrooms have no walls with blackboards and desks made out of natural materials (Green School Bali). A case study in Leicht et al. (2018)

highlights the initiative taken by Handprints for change (India). The programme involved students addressing various issues within learning environments. One certain example is with respect to food wastage. Data was collected based on the amount of food wasted in school and college canteen. Campaigns and skits were arranged to increase awareness regarding the same. In three months, they reported a reduction in food wastage by 50%. This also led to the development of a compost pit to utilise organic waste from canteen. This programme has seen other implementations too such as, institutes reusing old textbooks rather than buying a new batch every academic year. A high school in South Africa has also adopted the practice of recycling plastic materials to make –green benchesll.

When considering a specific subject like Biology, Jeronen et al. (2016) points out the importance of outdoor teaching. The outcomes of outdoor learning are – connectedness to nature, positive environmental attitudes and environmental consciousness. An important precursor to understanding sustainability is developing a relationship with nature. This can be addressed through field work activities.

‘Free choice learning’ is a term used for informal learning taking place without any prior planning for learning. This takes place in visits to natural environments. Ballantyne and Packer (2005) discuss the impact of school field trips on behavioural changes in children. Teaching through ‘modeling’ is another concept provided by the studies by Higgs and McMillan (2006). The modeling was administered through different means; individual role models, school facilities and operations, school governance and school culture. This emphasised on Bandura’s social learning theory.

Best Practices undertaken in St. Joseph’s College of Education

Prohibition of Polystyrene

The foremost initiative applied to in-college activities such as preparation of teaching aids, decoration items or models is the prohibition of usage of Polystyrene, commonly known as Thermocol. This initiative is implemented in view of the excessive usage of this one material as a base for various articles. The student teachers are advised to make use of other options available – such as paper, cardboard, cloth, scrap metal, etc. The prohibition extends to rejection of the student teacher’s performance as well as reduction of marks for the same. This has built a conscious mentality among the student teachers in planning and preparing teaching

learning materials. The prohibition has led to the reuse of materials for multiple other purposes rather than being discarded after single use. This practice has now become a norm, thus promoting the use of sustainable materials in the learning activities.

Eco Club – notepads

Eco Club, an initiative by the Chemistry Biology Department fabricated handmade notepads. These notepads were made of unused papers from assignment books, and the cover was made using card sheets, which were previously used as TLM. The cover of the notepads was personally designed by the Eco Club members, with environmental taglines. The notepads were launched for use, on the occasion of World Environment Day 2022.

Preparation of Sustainable Decorative Articles

The second problem dealt with was that of the amount of material used and discarded after every programme such as Graduation Day, Cultural Exchange, Teacher's Day, etc. These paper-based articles prepared were functional only to a maximum of two usages. Taking this into consideration, an Art Workshop was held under the leadership of Assistant Professor Dr. Chaluvaramaswamy K. T. from February 9, 2023 to February 13, 2023. The workshop focused on the production of necessary decorative articles for various programmes scheduled for the academic year. The distinguishing fact was that of the Cora Cotton Cloth used as the base material. Several Indian as well as global art was referred, to be drawn and painted on these to finally assemble a repository of artwork. This accounts to be an initiative for sustainability movement as the articles produced can be used for multiple purposes with proper storage.

Distribution of plantable seed pencils

On account of Fresher's Day, plantable seed pencils were distributed as a welcome gift for the I year students on February 17, 2023. These pencils contained seeds of particular plants such as Onion, Tomato, Marigold, etc. Once the pencils are used till the end of the lead, they can be planted. The pencils are made with a dissolvable material, leaving no residue when planted. Such an initiative brings awareness among students about the variety of products available in the market that uphold sustainable practices.

Conclusion

The need to engage student teachers to be aware of the concept of sustainability and to adopt it in one's lifestyle is a significantly pressing issue. In analysing the inputs from student

teachers, we can state that although school/college is the place where most heard about the term sustainability, a larger portion of participants were also unsure of what to do about sustainability. This highlights the importance of education for sustainability. A few practices are indeed taken up by the student teachers, however when asked direct questions about sustainability and its meaning, the answers are vague. This suggests that it is important to model practices in colleges along with a clearly specified aim of the practice. This puts meaningful weight to the practice, which can lead to better spread of awareness. Initiatives taken by colleges play a major role in moulding the individual's mindset towards sustainability. Hence, it is important to be proactive in conducting operations and instilling sustainable lifestyles in teacher education institutes so as to develop the role models for the succeeding generation. Education can be used as a tool to reduce or halt unsustainable habits and move toward environmentally sustainable societies.

References

- Abas, M. A., Yusoh, M. P., Sibly, S., Mohamed, S., & Wee, S. T. (2020, December). Explore the community understanding and practices on sustainable lifestyle in Kelantan, Malaysia. *IOP conference Series: Earth and Environmental Science*, 596(1), 012054.
- Annan-Diab, F., & Molinari, C. (2017). Interdisciplinarity: Practical approach to advancing education for sustainability and for the Sustainable Development Goals. *The International Journal of Management Education*, 15(2), 73–83. <https://doi.org/10.1016/j.ijme.2017.03.006>
- Ballantyne, R., & Packer, J. (2005). Promoting environmentally sustainable attitudes and behaviour through free-choice learning experiences: what is the state of the game? *Environmental Education Research*, 11(3), 281–295. <https://doi.org/10.1080/13504620500081145>
- Black, I. R., & Cherrier, H. (2010). Anti-consumption as part of living a sustainable lifestyle: Daily practices, contextual motivations and subjective values. *Journal of Consumer Behaviour*, 437-453.
- Buckler, C., & Creech, H. (2014). *Shaping the future we want: UN Decade of Education for Sustainable Development; final report*. The United Nations Educational, Scientific and Cultural Organization.

- Burmeister, M., & Eilks, I. (2013). An Understanding of Sustainability and Education for Sustainable Development among German Student Teachers and Trainee Teachers of Chemistry. *Science Education International*, 24(2), 167–194. <http://files.eric.ed.gov/fulltext/EJ1015833.pdf>
- Cebrián, G., & Junyent, M. (2015). Competencies in Education for Sustainable Development: Exploring the Student Teachers' Views. *Sustainability*, 7(3), 2768–2786. <https://doi.org/10.3390/su7032768>
- Conway, G. (1985). *Agonist*. *Agr. Admin*, 20, 31-55.
- Curran, M. A. (2009). Wrapping our brains around sustainability. *Sustainability*, 1, 5 - 13.
- Didham, J., & Ofei-Manu, P. (2011). *Monitoring & Evaluation of Education for Sustainable Development*. *Green School International* | *Green School International is giving its students a natural, holistic and student-centered education in one of the most amazing environments on the planet.* (n.d.). <https://www.greenschool.org/>
- Higgs, A. L., & McMillan, V. M. (2006). Teaching Through Modeling: Four Schools' Experiences in Sustainability Education. *The Journal of Environmental Education*, 38(1), 39–53. <https://doi.org/10.3200/joe.38.1.39-53>
- Hoag, D. L., & Skold, M. D. (1996). The relationship between conservation and sustainability. *J. Soil Water Conserv*, 1996, 292-295.
- Jeronen, E., Palmberg, I., & Yli-Panula, E. (2016). Teaching Methods in Biology Education and Sustainability Education Including Outdoor Education for Promoting Sustainability—A Literature Review. *Education Sciences*, 7(1), 1. <https://doi.org/10.3390/educsci7010001>
- Leicht, A., Heiss, J., & Byun, W. J. (2018). *Issues and trends in education for sustainable development*. Van Haren Publishing.
- Lenglet, F. (2015). ESD and Assessing the Quality of Education and Learning. In: Thoresen, V., Doyle, D., Klein, J., Didham, R. (eds) *Responsible Living*. Springer, Cham. https://doi.org/10.1007/978-3-319-15305-6_5
- Liu, L. (2009). Sustainability: Living with one's own ecological means. *Sustainability*, 1, 1412-1430.
- Rosen, M. A. (2009). Energy sustainability: a pragmatic approach and illustrations. *Sustainability*, 1, 55-80.

- Tuncer, G., Tekkaya, C., Sungur, S., Cakiroglu, J., Ertepinar, H., & Kaplowitz, M. (2009). Assessing pre-service teachers' environmental literacy in Turkey as a mean to develop teacher education programs. *International Journal of Educational Development*, 29, 426–436.
- Wals, A. E. J. (2012). Learning our way out of un-sustainability: The role of environmental education. In S. Clayton (Ed.), *Oxford handbook on environmental and conservation psychology*. London: Oxford University Press.
- Wals, A. E. J., & Benavot, A. (2017). Can we meet the sustainability challenges? The role of education and lifelong learning. *European Journal of Education*, 52(4), 404–413. <https://doi.org/10.1111/ejed.12250>
- World Commission on Environment and Development(WCED). (1987). *Our Common Future*. New York, NY, USA: Oxford University Press

Bibliography

- Anderson, A. (2012). Climate Change Education for Mitigation and Adaptation. *Journal of Education for Sustainable Development*, 6(2), 191–206. <https://doi.org/10.1177/0973408212475199>
- Annan-Diab, F., & Molinari, C. (2017). Interdisciplinarity: Practical approach to advancing education for sustainability and for the Sustainable Development Goals. *The International Journal of Management Education*, 15(2), 73–83. <https://doi.org/10.1016/j.ijme.2017.03.006>
- Ballantyne, R., & Packer, J. (2005). Promoting environmentally sustainable attitudes and behaviour through free- choice learning experiences: what is the state of the game? *Environmental Education Research*, 11(3), 281–295. <https://doi.org/10.1080/13504620500081145>
- Bell, D. (2016). Twenty-first Century Education: Transformative Education for Sustainability and Responsible Citizenship. *Journal of Teacher Education for Sustainability*, 18(1) 48–56. <https://doi.org/10.1515/jtes-2016-0004>
- Buckler, C., & Creech, H. (2014). *Shaping the future we want: UN Decade of Education for Sustainable Development; final report*. he United Nations Educational, Scientific and Cultural Organization.

- Burmeister, M., & Eilks, I. (2013). An Understanding of Sustainability and Education for Sustainable Development among German Student Teachers and Trainee Teachers of Chemistry. *Science Education International*, 24(2), 167–194. <http://files.eric.ed.gov/fulltext/EJ1015833.pdf>
- Carley, M., & Spapens, P. (2017). *Sharing the world: sustainable living and global equity in the 21st century*. Routledge.
- Cebrián, G., & Junyent, M. (2015). Competencies in Education for Sustainable Development: Exploring the Student Teachers' Views. *Sustainability*, 7(3), 2768–2786.
- Conway, G. (1985). *Design for Sustainability*. *Agr. Admin*, 20, 31-55.
- Cubukcu, E. (2013). Walking for sustainable living. *Procedia-Social and Behavioral Sciences*, 85, 33-42.
- Didham, J., & Ofei-Manu, P. (2011). *Monitoring & Evaluation of Education for Sustainable Development*.
- Green School International* | *Green School International is giving its students a natural, holistic and student-centered education in one of the most amazing environments on the planet.* (n.d.). <https://www.greenschool.org/>
- Higgs, A. L., & McMillan, V. M. (2006). Teaching Through Modeling: Four Schools' Experiences in Sustainability Education. *The Journal of Environmental Education*, 38(1), 39–53. <https://doi.org/10.3200/joee.38.1.39-53>
- Jeronen, E., Palmberg, I., & Yli-Panula, E. (2016). Teaching Methods in Biology Education and Sustainability Education Including Outdoor Education for Promoting Sustainability—A Literature Review. *Education Sciences*, 7(1), 1. <https://doi.org/10.3390/educsci7010001>
- Kagawa, F. (2007), "Dissonance in students' perceptions of sustainable development and sustainability: Implications for curriculum change", *International Journal of Sustainability in Higher Education*, Vol. 8 No. 3, pp. 317- 338. <https://doi.org/10.1108/14676370710817174>
- Kanapathy, S., Lee, K.E., Sivapalan, S., Mokhtar, M., Syed Zakaria, S.Z. and Mohd Zahidi, A. (2019), "Sustainable development concept in the chemistry curriculum: An exploration of foundation students' perspective", *International Journal of Sustainability in Higher Education*, Vol. 20 No. 1, pp. 2-22. <https://doi.org/10.1108/IJSHE-04-2018-0069>

- Leicht, A., Heiss, J., & Byun, W. J. (2018). *Issues and trends in education for sustainable development*. Van Haren Publishing.
- Lenglet, F. (2015). ESD and Assessing the Quality of Education and Learning. In: Thoresen, V., Doyle, D., Klein, J., Didham, R. (eds) *Responsible Living*. Springer, Cham. https://doi.org/10.1007/978-3-319-15305-6_5
- Li, P., & Wu, J. (2019). Sustainable living with risks: meeting the challenges. *Human and Ecological Risk Assessment: An International Journal*, 25(1-2), 1-10.
- Liu, L. (2009). Sustainability: Living within one's own ecological means. *Sustainability*, 1(4), 1412-1430.
- McMillin, J., & Dyball, R. (2009). Developing a Whole-of-University Approach to Educating for Sustainability: Linking Curriculum, Research and Sustainable Campus Operations. *Journal of Education for Sustainable Development*, 3(1), 55–64. <https://doi.org/10.1177/097340820900300113>
- Tuncer, G., Tekkaya, C., Sungur, S., Cakiroglu, J., Ertepinar, H., & Kaplowitz, M. (2009). Assessing pre-service teachers' environmental literacy in Turkey as a mean to develop teacher education programs. *International Journal of Educational Development*, 29, 426–436.
- Wals, A. E. J. (2012). Learning our way out of un-sustainability: The role of environmental education. In S. Clayton (Ed.), *Oxford handbook on environmental and conservation psychology*. London: Oxford University Press.
- Wals, A. E. J., & Benavot, A. (2017). Can we meet the sustainability challenges? The role of education and lifelong learning. *European Journal of Education*, 52(4), 404–413. <https://doi.org/10.1111/ejed.12250>
- World Commission on Environment and Development(WCED). (1987). *Our Common Future*. New York, NY, USA: Oxford University Press.

Social Integration of the Visually Impaired through Technological Interventions

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Abstract

The disabled population at large, and especially the visually impaired within it, face several kinds of issues because they are a 'separate' category. Although disability studies and inclusive practises have spread across the globe, there is a lack of awareness about this life condition and proper strategies to deal with such issues. That is why the social integration of the visually impaired is a serious concern in modern society. In the age of advanced technology, the integration or inclusion of the visually impaired is even easier with the help of technological interventions that are accessible to all. Research and development in the field of assistive technology ensure a significant contribution to this process. A variety of items are being designed and brought out specifically to help people with low vision and visual impairment, including everything from screen readers for blind individuals or screen magnifiers for low vision computer users to braille watches, etc. However, a long way still needs to be covered in order to fulfil the dream of a world of equity and complete accessibility. It is no doubt that technological advancements and their proper usage will bring about this destiny soon. The government has a pivotal role to play in facilitating the process of integration with the help of advanced technology, which also requires proper study and planning.

Key Words

Social integration, visually impaired, accessibility, technological intervention

1. Introduction

Differently abled people always face the issue of either being treated as a sympathy subject or as superhumans with extraordinary skills. There is no middle position possible for them. This derogatory perception that views them either through a charity-tinted lens or an extra-ordinary lens is not actually the lived reality of the differently abled, specifically the visually impaired. They are also individuals with rights and dignity. Although restricted by their physical or mental disability, they are also integral members of society. Another important

fact is that being able-bodied is a temporary experience. Thus, the social integration of the so-called "disabled" is not something that has to be enforced by laws or policies. It must come naturally from the realisation that the dividing line between the able-bodied and the disabled is nothing but an illusion. Differently abled people can have an equal footing with normal people that require a huge transformation of the mindset of the society towards integration of all groups of people despite of their physical condition. Specifically focusing on the visually impaired people, the society still needs to cover a long way in realising a world that ensures equity, accessibility and social integration of them. As science and technology progress rapidly, bringing in tremendous improvement in every walk of life, this dream is not an unreachable destiny.

2. What is Social Integration

An integrated society is one in which 'normal' people and persons with disabilities, particularly those who are blind, coexist and benefit from a full and fulfilling life. In an inclusive society, visual impairment does not hinder a person from achieving their life's aspirations and offers everyone the opportunities they need to succeed in all facets of life. According to UN Division for Social Policy and Development the aim of social integration is to –create –a society for all in which every individual, each with rights and responsibilities, has an active role to play. Such an inclusive society must be based on respect for all human rights and fundamental freedoms, cultural and religious diversity, social justice and the special needs of vulnerable and disadvantaged groups, democratic participation and the rule of law. (2007)

As visually impaired people is a disadvantaged group, they are characterised by certain special needs. In order to create "a society for all," their needs must be satisfactorily fulfilled. For this, the UN Division for Social Policy and Development also lays down three main building blocks:

- **The main ingredients:** *inclusion, participation, and justice*/social justice*
- **The interventions:** a range of interventions in different domains of society, from the psychological through the social and cultural to the economic and political, are available to facilitate social integration processes

- **The stakeholders:** the change agents consist of groups and individuals in societies that influence, or can influence, decision-making, and that need to be part of implementing plans and solutions. (2007)

Interventions in various fields, especially in this era of cutting-edge technology, are really fruitful in facilitating the process of integration. In fact, technological interventions are the key to an inclusive, integrated society. Furthermore, different stakeholders that include government and non-governmental organisations, private individuals, and civil society organisations have to work hand in hand towards this dream.

2.1 Significance of Social Integration

Currently, there are an estimated 4.95 million blind persons and 70 million vision impaired persons in India, out of which 0.24 million are blind children. (Mannava et al., 2022) Considering the fact that India is home to a huge number of people living with various kinds of visual impairment, the process of their social integration is a serious concern. Increasing public awareness about visual impairment, rights of visually impaired people, responsibilities of ordinary people and governments in this issue, and importance of integrating them into different levels of society is the first and most crucial step for achieving our goal of inclusive society. Transforming our society into inclusive society is a goal which needs constant efforts, struggle, and time. However, technology, which has the ability to eliminate barriers, can boost the process.

3. Technological Support for the visually impaired

With the help of modern technology, people with vision loss can do numerous things such as read and write documents, browse the internet and send and receive emails and so on. Screen Reading software and special talking and Braille devices allow them to use computers, cell phones and other electronic devices independently. Similarly, people with low vision can use screen magnifiers and such devices that will allow them to see letters, pictures and other objects more clearly. This technology – commonly known as assistive or adaptive technology – is continually evolving, and has removed many access barriers for people with vision loss.

Technology not only allow them to complete routine tasks at work and school, but also enables to be more independent at home. From audio books, accessible computer games, smart phones with inbuilt software to devices that give step-by-step walking directions to unfamiliar places helps them to live without another person's support to a great extent. Besides, there are

also devices like talking watches, thermometers, scales, blood glucose and blood pressure monitors that help them to be self-dependent on health matters.

Advancements in information and communication technology has brought substantial changes. According to The Chicago Lighthouse –Tablets and cell phones enable people with visual impairments to do things that were previously impossible, or – at the very least – challenging. It is now possible for the iPhone, for example, to describe the color, shape and size of objects to someone who is blind thanks to an app called TapTapSee. Furthermore, other apps, such as Be My Eyes, connect blind or visually impaired individuals with a sighted person, who will then assist them by describing things. To put it simply, the sighted person (who can be located almost anywhere in the world) can be a virtual pair of eyes for the blind individual. (2016)

3.1 Legal Framework for the Inclusion of the Visually Impaired

It is also pertinent to mention the rights of visually impaired people according to the legal measures as far as technology is concerned for integration. The Rights of Persons with Disability Act 2016 Section 42 requires the appropriate government to ensure that all content in audio, print and electronic formats are accessible, that there is access to electronic media for all by providing audio descriptions, sign language and close captioning and that daily use electronic goods are available in universal design. Furthermore, Section 29 talks about making art accessible to persons with disabilities, redesigning courses in cultural and arts subjects to enable participation and access for persons with disabilities, developing technology, assistive devices, and equipment to facilitate access and inclusion for persons with disabilities in recreational activities. (2016)

In light of the above-mentioned directions as per the law, attempts have been made to enhance technological support for the visually impaired by the government and various other stakeholders. Most of the print and electronic materials are now accessible with the help of screen readers and image-to-text converters. Various civil society organisations and groups actively engage in helpful and productive activities that cater to the needs of the visually impaired. What's App groups for reading inaccessible materials for the visually impaired are such initiatives. People from different walks of life come under an umbrella to read books, text books, and other materials that are inaccessible to them. There are separate groups for children who are doing their schooling. Moreover, Governments provide financial and technological support by giving smart phones, laptops etc,

3.2 Issues with Technological Accessibility

Even though, with various devices, almost every material is readable, there are also both electronic and print materials that are not readable or convertible. During the exam season, it is common that plenty of materials will be coming in that are not accessible for them, says Safar Ali, group admin of Hridyam, a WhatsApp group of readers for the visually impaired. (Personal Communication, December 2, 2022) Thus, technology should be developed to make it possible to read every material. These groups also feed recorded books into their digital audiolibrary, which is an excellent collection of audio materials. A coordinated effort to consolidate all such initiatives under an umbrella will be a benefiting move so that an extensive audio library for the visually impaired in a national or state level can be established. In addition to it, large scale training and awareness programmes for the visually impaired can be conducted to update with new technology and helpful devices.

Technology has evolved to such an extent that the visually impaired can now participate in group chats, send messages instantly, and communicate in any media. However, certain limitations hinder the complete accessibility of such a medium. For example, all the emojis are readable for a visually impaired person in WhatsApp communication. But stickers that are common in chatting today are not readable. It is just an instance where technology has its limitations in making all the features equally accessible. Hopefully, technology might evolve to a greater extent where it can cater to the needs of all people without much lacuna between the complete and the maximum.

It is the duty of the government to instruct and be the perfect example of accessibility standards in making the websites, applications etc, differently abled friendly. At times, they also fail in adhering to the accessibility protocols. During the pandemic period central government came up with Arogya Setu application that contained pandemic related information and services. According to a white paper released by Broadcast Forum India titled –Priorities for a COVID-19 World: ICT Accessibility for Persons with Disabilities in India, the app had accessibility issues which made them unusable by persons with vision impairments. Similarly, a large number of websites, apps and most ATM's of financial institutions are inaccessible, which makes it very difficult for persons with disabilities to withdraw cash or access other services... There have been numerous instances of information or notifications being circulated as inaccessible scanned images or infographics and audio-visual content being communicated without captioning. Not only does this hinder access to services, but also

endangers life and safety of people and places them in situations of stress. (2020). Thus, it is very crucial to make all the official websites and applications and e services accessible for all.

Online gaming is an important recreational activity for most of the visually impaired people because it is challenging, competitive and an effective way to spend their leisure time. Though there are games developed with audio descriptions and screen readers, much more must be done in this field of technological intervention. As the survey presented in a paper titled "Overview of Visually Impaired Gamers and Game Accessibility" observes:

The participants were very fond of gaming, considering it a very important part of their lives. Sadly, neither of them felt that the gaming industry is making any effort for improving accessibility. The interviewees did not feel represented by the gaming industry and most of their feelings arose from the fact that games were not accessible for them, therefore needing the help of a sighted person. Moreover, the very few games designed for them were considered *childish, boring and too simple*. (2020)

According to the directions of the section 29 of the RPWD Act, technological interventions are to be made in order to provide equitable recreational opportunities. Thus, the gaming industry and the governments should consider the present state of recreational facilities available for the visually impaired and take steps to improve facilities.

Television shows and movies can now be more easily accessed by blind or visually impaired viewers with the help of audio description (also known as "video description" or simply "description"). During a scene, a narrator (also known as an audio describer) verbally describes important actions or visual components, such as what the characters are wearing, doing, or even important facial expressions. The creative content of TV shows and movies can be more fully accessed by blind or visually impaired individuals, enabling them to participate in society to a greater extent. Mereijn van der Heijden emphasizes on this in his research article titled –Making Film and Television Accessible to the Blind and Visually Impaired

The hearing of visually impaired people is not better than that of other people, but it is used more optimally and is more trained. Auditory information obtained from surrounding sounds and the nature of the human voice compensate the lack of visual information as much as possible. This informative character of sound is essential for the blind and visually impaired to function in society. (Heijden, 2009)

Nowadays, many OTT platforms such as Netflix come up with audio descriptions in the series and movies which is appreciable. Nevertheless, it should be extended to all possible platforms and services. There are many more problems of accessibility related to technology. Thus, focus of future research should expand to all the other areas to find and resolve issues.

3.3 Adoption of Best Practices Across the Globe

Another important aspect in this regard is the adoption of best practises across the globe according to their practicality and applicability. Government-level research and development bodies can be constituted in order to stay updated on the latest technology and find solutions to problems. A yellow stripe runs down the middle of many sidewalks in Japan. Slightly elevated from the surrounding surfaces, the line of tactile tiles marks a safe path for blind and visually impaired pedestrians walking the streets. In addition to the tactile tiles, Japan uses music at intersections and braille signage to help the blind and partially blind travel more safely and independently. The Be My Eyes application, created in 2015 by Hans Jorgen Wiberg, pairs volunteers with blind or visually impaired people in need of help with small, everyday tasks. It is a platform comprises of more than six million volunteers and four lakh blind individuals. Blind persons can use this application to seek help in fulfilling their everyday tasks from reading a captcha to reading the number of a switch in an elevator. The idea behind such an application can be transformed and applied in local situations where volunteer and scribe banks for the visually impaired can be created under the supervision of respective governments. American Federation of the Blind publishes a monthly magazine that covers new technological developments for the visually impaired along with detailed descriptions of its usage. Such initiatives are really helpful for updating with newer developments across the world which can be used for improving existing facilities.

Spreading awareness about the lived realities of blind individuals is another effective means of integration using technology. Many blind bloggers and vloggers come up with useful content on media in line with advocacy and public awareness. More visibility in the public sphere will facilitate the process of integration. Dileep K, who is perhaps the first blind vlogger from Kerala, regularly posts videos and shorts on social media platforms with the help of technological assistance. The description of his channel says:

This channel primarily aims to unveil the stigmas surrounding blindness through series of videos that demonstrate how people with vision impairment tackle various

problems of their day-to-day life. The contents of the channel include Anecdotes on how I manage to integrate myself into mainstream society as a visually impaired, vlogs on how people with vision impairment make use of assistive technologies to solve the issue of inclusion into society, interviews of visually impaired people who achieved success in their careers, vlogs in general from the point of view of a person with vision impairment, etc. (You tube, n.d)

Content related to their daily life, use of devices and technological support gives lots of information for the public. Such efforts should be encouraged and supported with necessary assistance.

4. Conclusion

It is undoubtedly proven that technology can be the game changer for the social integration and inclusion of the visually impaired. It can be an effective tool in spreading awareness, developing more assistive devices, improving the quality of life and so on. Towards this end different stakeholders should work hand in hand to bring fruitful results. In alignment with the CRPD and SDG goals, in June 2020, the UN Secretary-General released a ‘_Roadmap for Digital Cooperation,’ designed to enhance public-private partnerships towards achieving greater digital inclusion. As stated in the report, –Digital cooperation is a multi-stakeholder effort, and while Governments remain at the centre, the involvement of the private sector, technology companies, civil society, and other stakeholders is essential. It is vital to engage with the private sector, the technical community and civil society from the beginning if realistic and effective decisions and policies are to be made.¶ Thus, a coordinated effort with the support of technology will facilitate the process of social integration for the visually impaired and the creation of a society for all.

References

- Heijden, M. van der. (2009, June 13). *Open academic graph*. Microsoft Research. Retrieved February 20, 2023, from <https://www.microsoft.com/en-us/research/project/open-academic-graph/>
- How does technology help people who are blind or visually impaired?* The Chicago Lighthouse. (2016, January 22). Retrieved February 24, 2023, from <https://chicagolighthouse.org/sandys-view/assistive-technology/>

- Mannava, S., Borah, R. R., & Shamanna, B. R. (2022, June). *Current estimates of the economic burden of blindness and visual impairment in India: A cost of illness study*. Indian journal of ophthalmology. Retrieved February 22, 2023, from <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9359234/>
- Overview on visually impaired gamers and game accessibility*. (2020, July). Retrieved February 23, 2023, from https://www.researchgate.net/publication/343419037_OVERVIEW_ON_VISUALLY_IMPAIRED_GAMERS_AND_GAME_ACCESSIBILITY
- Priorities for a COVID-19 World: ICT Accessibility for Persons with Disabilities in India*. Broadband India Forum. (2020, August 8). Retrieved February 24, 2023, from <https://broadbandindiaforum.in/>
- The rights of persons with disabilities act, 2016 ... - legislative*. (n.d.). Retrieved February 21, 2023, from https://legislative.gov.in/sites/default/files/A2016-49_1.pdf
- United Nations. (2007, May 7). *E-Dialogue "Creating an Inclusive Society: Practical Strategies to Promote Social Integration"*. United Nations. Retrieved February 22, 2023, from https://www.un.org/esa/socdev/sib/inclusive_society/social%20integration.html
- United Nations. (n.d.). *Secretary-general's roadmap for digital cooperation*. United Nations. Retrieved February 24, 2023, from <https://www.un.org/en/content/digital-cooperation-roadmap/>
- YouTube. (n.d.). *Njan VI vlogger by Dileep K*. YouTube. Retrieved February 24, 2023, from <https://www.youtube.com/@NjanVIVloggerByDileepK/about>

GREEN SYNTHESIS OF ZINC OXIDE NANOPARTICLES USING ALOE BARBADENSIS MILLER LEAF EXTRACT

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Abstract

Biological method for nanoparticle synthesis has been suggested as possible eco-friendly alternatives to chemical and physical methods. In this paper, Zinc oxide nanoparticles were synthesised by using the medicinal plant, aloe vera. Characterisation of biosynthesised zinc oxide nanoparticles were carried out by various technique such as powder X-ray diffraction, scanning electron microscope, elemental analysis, ultraviolet-visible, and Fourier-transform infrared spectroscopy. The synthesized nanoparticles have the hexagonal wurtzite structure of average crystalline size of 29.89nm was confirmed from powder XRD analysis. The SEM results revealed ZnO nanoparticles have nanorods and nanoplates structure. Chemical compositions were analysed through EDS and the optical band gap of ZnO nanoparticles was found to be 3.2 eV. Studies of antibacterial activity show that the biosynthesised nanoparticles have potential applications in this field.

Keywords: Biological method, Aloe vera, Zinc oxide nanoparticles, Antibacterial activity

1. Introduction

Nanotechnology is –technology on nanoscale. It works on matter at a dimensions of nanometre scale length (1–100 nm), which can be used for a wide range of applications and the creation of various types of new nanomaterials, nanosize components and nanodevices. The integration of nanotechnology into larger systems has provided breakthrough solutions to many current environmental, medical, and industrial problems, including smart materials, nanomanufacturing, electronics, drug delivery, energy and water, biotechnology, information technology, and national security.

In recent times zinc oxide (ZnO) is widely used because it has high electron mobility, high thermal conductivity, good transparency, wide and direct bandgap (3.37 eV), and large exciton binding energy; it can also be grown easily in various nanostructure forms. The size, crystallinity, and morphology of the nonmaterial can greatly influence their catalytic, magnetic, electronic, and optical properties. The ZnO nanoparticles (NPs) are of significant interest as they provide many practical applications worldwide.

Green synthesis has become a popular way to synthesize these NPs due to its low cost, environment compatibility, synthesizable in ambient atmosphere and non-toxicity. Recently, Biological nanoparticles were found to be more pharmacologically active than physiochemically synthesized nanoparticles. Biosynthesis of zinc oxide nanoparticles have been reported from different plants and microorganisms. Aloe vera belongs to the lily family of Aloe barbadensis group, is well known for its medicinal properties and its gel contains different types of vitamins such as A (beta-carotene), C, and E, which acts as antioxidants. The peel extract contains reducing agents, which can be used to synthesize nanoparticles with good crystalline structure and optical properties. Keeping in view the importance of aloe vera in medicine, the present study was aimed to synthesize, characterize and check antimicrobial activities of zinc oxide nanoparticles against gram - positive and gram - negative bacteria.

2. Experimental details

2.1 Preparation of aloe vera leaf extract

The leaf of aloe vera were separated from plant, which was washed thoroughly and cut into small pieces. 25g of aloe vera in 100 ml of distilled water was heated at 90⁰C for 2 hrs. The extract was filtered using filter paper. The filtrate was stored for the synthesis of nanoparticles.

2.2 Synthesis of aloe vera capped ZnO nanoparticles

For the synthesis of ZnO nanoparticles, 0.4 g of Zn (OAC)₂ were dissolved in 50 mL distilled water. Then 4 mL of aloe vera extract were added and the resulting mixture stirred for 20 min using a magnetic stirrer. In order to adjust the pH of the solution to pH 12, NaOH pellets were added while stirring. After the end of the reaction the white crystalline precipitate were collected using centrifugation. Then the material was dried by placing it in furnace at 120⁰C for 4 hrs and sample was crushed. The powder was annealed at 600⁰C for 1 hr, the material was further crushed into fine powder and stored in airtight container for further analysis.

3. Results and discussion

3.1 X-Ray Diffraction analysis

The XRD pattern of the biosynthesized ZnO NPs have hexagonal wurtzite structure. The sharp and narrow peaks indicated that the biosynthesized ZnO NPs were highly crystallized. Additionally, ZnO NPs were free of impurities where no characteristic XRD peaks other than zinc oxide peaks were observed. The average crystallite size of ZnO was found using scherrer's formula is 29.89 nm. The lattice constant for hexagonal ZnO structure was calculated as $a=3.240\text{\AA}$ and $c= 5.199\text{\AA}$ which matches well with the standard lattice constant $a= 3.249\text{\AA}$ and $c= 5.206\text{\AA}$.

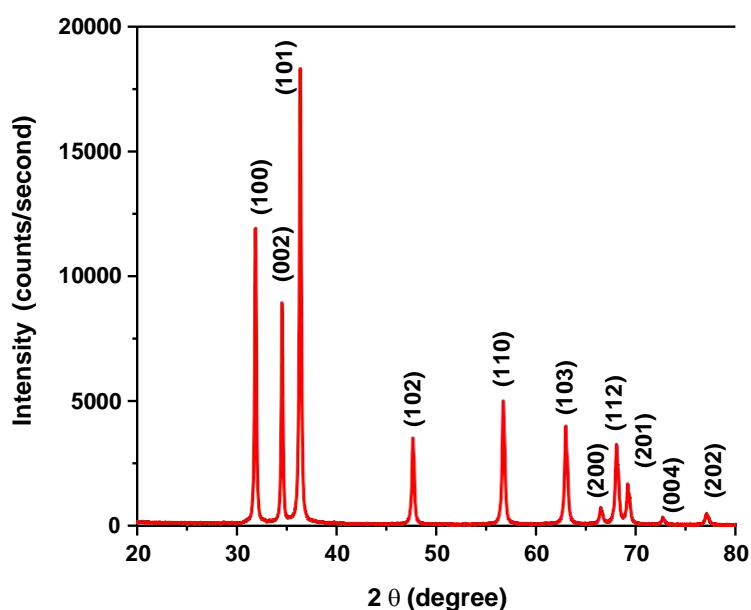


Fig 3.1 The XRD pattern of biosynthesised ZnO nanoparticles

3.2 Scanning Electron Microscope (SEM)

Scanning electron microscopic image confirmed the surface morphology of Zinc oxide nanoparticles at different magnifications as shown in Fig 3.2. The biosynthesised zinc oxide nanoparticles consist of nanorods and nanoplates structures.

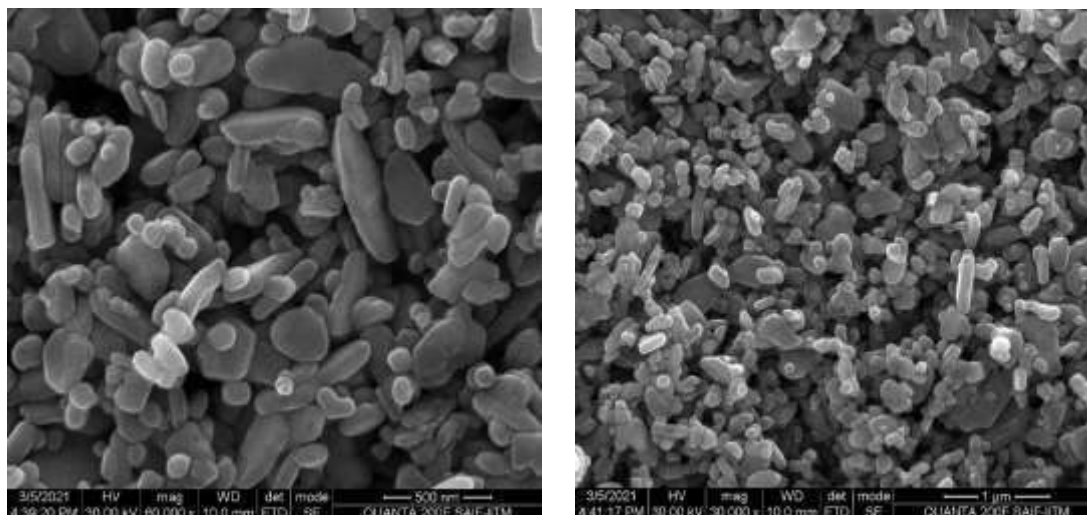


Fig 5.2 zinc oxide nanoparticle visualised through SEM at different magnifications

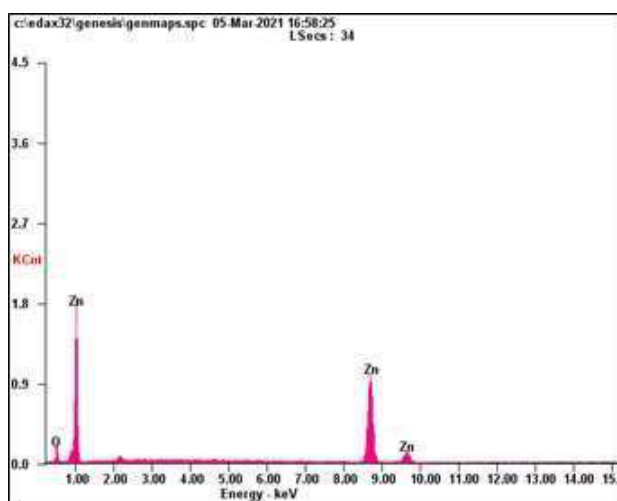


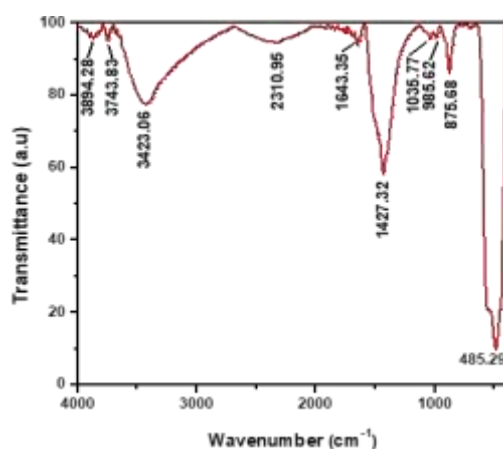
Fig 5.3 The EDS pattern of biosynthesised ZnO nanoparticles

The elemental composition of ZnO nanoparticles was analysed through EDS and found that the material comprised of Zinc (60.01%) and oxygen (39.99%) by atomic concentration.

3.4 Fourier transform infrared spectroscopy (FTIR)

The FTIR spectrum of ZnO nanoparticles is shown in Fig 3.4. This spectrum exhibited a broad peak at 3423 cm^{-1} assigned to the OH group from phenol present in the extract. The C=C

stretching group around 1643 cm^{-1} is responsible for aloe vera capping on the ZnO sample. The absorption peak at 1427 cm^{-1} (C=O stretching vibration), and 1035 cm^{-1} , 985 cm^{-1} (C-C stretching vibration) were observed. The high intensity band around 485 cm^{-1} is due to stretching of zinc and oxygen (Zn-O) bond. Thus, these peaks indicate different functional groups involved in the synthesis of zinc oxide nanoparticles.



3.5 UV-DIFFUSED REFLECTANCE SPECTRAL ANALYSIS

Optical characterization was performed by measuring the UV-Vis diffuse reflectance spectrum to determine the band gap, E_g value of ZnO nanoparticles. The UV-visible analysis showed that the optical band gap of ZnO nanoparticles was found to be 3.2 eV.

3.6 Antibacterial test

The antibacterial activity of the synthesized ZnO NPs was tested for gram-positive and gram-negative bacteria. Analysis of zone of inhibition was carried out after 24h incubation at $37\text{ }^\circ\text{C}$ are shown in Table 3.6.1. The experimental outcomes undeniably suggest an effective growth inhibitory activity of the ZnO NPs upon the micro-organisms.

Sample name P.1	Zone of inhibition (mm)				
GNB-1	11±1.0	6±1.15	7±0.5	8±0.5	9±1.15
GNB-2	13±1	5±0.5	5±1.15	5±1.15	5±1.15
GNB-3	11±1.5	7±1.5	8±1.0	9±1.0	9±1.0
GNB-4	16±1.15	8±1.52	9±1.52	7±1.52	11±1.52

GNB-5	13±2	8±1.52	9±1.73	9±2.0	9±1.52
GPB-1	14±0.5	8±2	9±1.52	5±1.52	9±1.52
GPB-2	14±1.15	6±1	7±1.5	8±1	9±1
GPB-3	13±1	7±1.0	8±0.5	9±1.15	10±0.5
GPB-4	14±1	5±1	6±1.15	8±1.54	10±1
GPB-5	16±1.15	8±0.5	10±1.0	11±1.15	12±1.0

Table 3.6.1 antibacterial activity of biosynthesised zinc oxide nanoparticles

4. Conclusion

Green synthesis has become popular way to synthesis nanoparticles due to its low cost, environmental compatibility and non-toxicity. In this study, ZnO NPs were synthesized by using *Aloe Vera* leaf extract. The phytochemicals present in the plants reduced zinc acetate. The crystalline structure of ZnO NPs was confirmed by XRD. The SEM results revealed that the biosynthesised zinc oxide nanoparticles consist of nanorods and nanoplates structures. The antibacterial studies confirmed that the synthesized ZnO NPs have effective growth inhibitory activity upon the micro-organisms.

5. References

1. Singh, Priyanka, Kim, Yu-Jin, Zhang, Dabing, Yang, Deok-Chun, Biological Synthesis of Nanoparticles from Plants and Microorganisms, 2016.
2. Hadi Mofid, Mirabdollah Seyed Sadjadi , Moayed Hossaini Sadr, Alireza Banaei, Nazanin Farhadyar, Green synthesis of zinc oxide nanoparticles using Aloe Vera plant for investigation of antibacterial properties, advances in nanochemistry, 2020.
3. Nurul Izwanie Rasli, Hatijah Basri, Zawati Harun, Zinc oxide from aloe vera extract: two-level factorial screening of biosynthesis parameters, Heliyon, 2020.
4. D. Mahendiran, G. Subash, D. Arumai Selvan, Dilaveez Rehana, R. Senthil Kumar, A. Kalilur Rahiman, Biosynthesis of Zinc Oxide Nanoparticles Using Plant Extracts of Aloe vera and Hibiscus sabdariffa: Phytochemical, Antibacterial, Antioxidant and Anti-proliferative Studies,2017.
5. K. Ganapathi Rao, CH Ashok, K. Venkateswara Rao, CH Shilpa Chakra, Pavani Tambur, Green synthesis of TiO₂ nanoparticles using aloe vera extract,international journal of advanced research in physics, 2015.

6. Gunalan Sangeetha, Sivaraj Rajeshwari, Rajendran Venckatesh, Green synthesis of zinc oxide nanoparticles by aloe barbadensis miller leaf extract: Structure and optical properties, material research bulletin, 2011.
7. Asha chundhary, Naresh kumar, Ravinder Kumar, Raj Kumar Salar, Antibacterial activity of zinc oxide nanoparticles synthesised from aloe vera peel extract, SN, 2018.

SYNTHESIS AND CHARACTERIZATION OF ASPIRIN LOADED ZINC SULPHIDE NANOPARTICLES FOR HEALTH

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Abstract

Nanotechnology can be defined as the science and engineering involved in the design, synthesis, characterization, and application of materials and devices whose smallest functional organization, in at least one dimension, is on the nanometer scale or one billionth of a meter. At these scales, consideration of individual molecules and interacting groups of molecules in relation to the bulk macroscopic properties of the material or device becomes important, as it has a control over the fundamental molecular structure, which allows control over the macroscopic chemical and physical properties. Nanotechnology has found many applications in medicine and this articles outlines some such applications. The aspirin loaded ZnS nanodrugs were synthesized by co precipitation method and characterization of synthesized material is done by external devices such as X-ray diffraction, FTIR and UV-Visible spectroscopy. The diffraction pattern of the ZnS nanoparticles were measured and compared with already known standards databases to identify it. Purpose of the study was to find the reduction of toxicity in the aspirin when it is loaded with ZnS NPs and it could be analysed by biological characterization.

INTRODUCTION

Nanotechnology can be defined as the science and engineering involved in the design, synthesis, characterization, and application of materials and devices whose smallest functional organization, in at least one dimension, is on the nanometer scale or one billionth of a meter. At these scales, consideration of individual molecules and interacting groups of molecules in relation to the bulk macroscopic properties of the material or device becomes important, as it has a control over the fundamental molecular structure, which allows control over the macroscopic chemical and physical properties. Nanotechnology has found many applications in medicine and this articles outlines some such applications.

ZnS is one of the first semiconductors discovered which shows that the remarkable properties which can be exploited for versatile applications including field emitters, electroluminescence, electro catalyst, biosensors. When we are comparing with the bulk ZnS, nano ZnS possess anomalous physical and chemical properties such as: enhanced surface to volume ratio, the quantum size effect, surface and volume effect and macroscopic quantum tunneling effect, more optical absorption, chemical activity and thermal resistance, catalysis, and therefore the low freezing point. It has been extensively studied for a variety of applications, e.g., in optical coatings, catalysts, electronic modulators, field-effect transistors, optical phosphors, and light- emitting materials. It has better chemical stability then other chalcogenides. Zinc Sulphide (ZnS) may be a vital II-VI semiconductor that has been researched widely thanks to its broad spectrum of potential applications. In this study Zinc sulphide is prepared by using co-precipitation method.

METHODOLOGY

Co-precipitation method

Co-precipitation is the carrying down by a precipitate of substances normally soluble under the condition employed. It is cost effective and fast process, easily transposable on a larger scale for industrial applications. It grants the nanomaterial with high purity through an eco-friendly route, without requiring hazardous organic solvents, or treatments under high pressure or temperature.

Synthesis of ZnS by Co-precipitation Method:

The principle involved in this technique is the precipitation of metal ions with sulphide ions in the solution.⁽⁶⁾ For this, 0.1M of zinc chloride (ZnCl_2) 0.272g and 0.1 M of sodium sulphide (Na_2S) 0.156g are dissolved separately in 20ml distilled water. Then these solutions are mixed together by continues stirring. After the completion of the reaction a white precipitate of ZnS is obtained, which is separated by filter paper and washed with distilled water. The precipitate is dried in oven at 150°C for 2 hours to get powder sample. The dried sample is powdered into nanoscale by using mortar and pestle.

Preparation of Nanodrugs by Doping Aspirin with ZnS (A-ZnS)

For the preparation of drug, aspirin and ZnS were taken in the ratio 1:3. Aspirin solution were prepared by dissolving 0.025M powdered aspirin (aspirin is powered by using mortar and pestle) in 14ml water and 6ml DMSO (here DMSO act as dissolving agent). By mixing of 0.1M Zinc chloride solution and 0.1M Na₂S solution, we get ZnS solution. Both ZnS and aspirin solutions are mixed together by continues stirring and centrifuged for 20 minutes. The obtained white precipitate is separated from the solution and dried by using mortar and pestle. This powdered nanocrystal is used for further studies.

Synthesis of ZnS by Co-precipitation Method:

The principle involved in this technique is the precipitation of metal ions with sulphide ions in the solution.⁽⁵⁾ For this, 0.1M of zinc chloride (ZnCl₂) 0.272g and 0.1 M of sodium sulphide (Na₂S) 0.156g are dissolved separately in 20ml distilled water. Then these solutions are mixed together by continues stirring. After the completion of the reaction a white precipitate of ZnS is obtained, which is separated by filter paper and washed with distilled water. The precipitate is dried in oven at 150°C for 2 hours to get powder sample. The dried sample is powdered into nanoscale by using mortar and pestle.

RESULTS AND DISSCUSSION

XRD Analysis Here, XRD analysis is performed to determine the crystalline structure and phase formation of zinc sulphide nanoparticles. Fig.2.2 represents the XRD pattern for the ZnS nanoparticles (synthesized in 1:1 ratio at 150°C, 2 hours), it is obtained by plotting the angle of diffraction (2θ) on x-axis and intensity of diffracted beam along y-axis. By analyzing the datas from XRD pattern we can find out the parameters such as grain size, interplanar distance and lattice parameters and it is compared with the standard JCPDS data confirmed the formation of ZnS nanostructures.

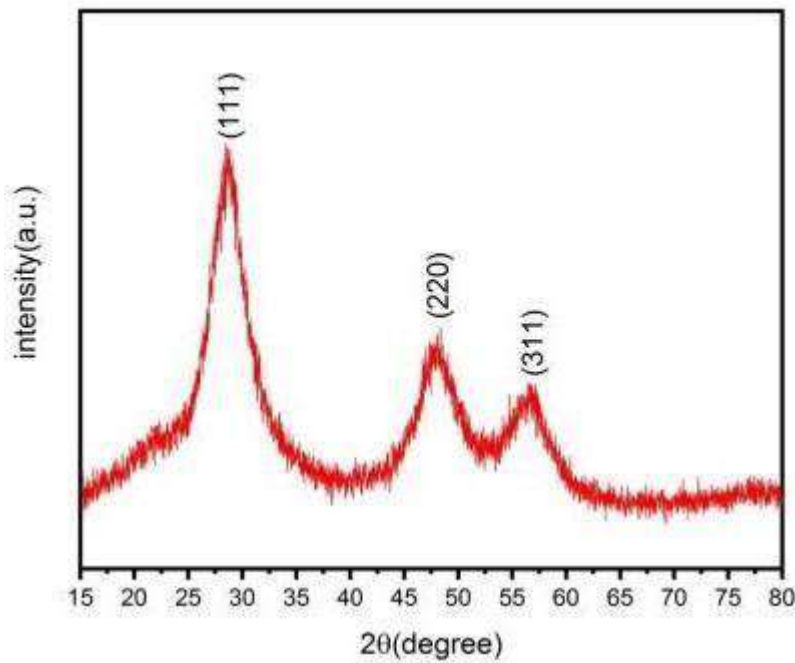


Figure1: represents XRD pattern of prepared ZnS:

XRD pattern of ZnS nanoparticles shows three diffraction peaks at 28.6°, 48.1°, 56.1° corresponding to (111), (200), and (311) plane, in good agreement with the standard JCPDS #80-0007. From XRD results it is confirmed that the pure ZnS material has cubic structure. (4) When the XRD

pattern is analyzed it is observed that there is no impurity phase. Using the obtained data the grain size and lattice parameter is calculated.

Table 1: d spacing, lattice parameter, and grain size are calculated from the XRD analysis

Peak No.	Diffraction angle (2θ) (degrees)	hkl	FWHM (degrees)	Interplanar distance (nm)	Lattice parameter, a (A°)	Grain size (nm)
1	28.6	111	4.6	3.1	5.4	2.2
2	48.1	220	3.5	1.9	5.3	2.4
3	56.1	311	5.6	1.6	5.4	1.6

Average lattice parameter = 5.4 A°
 Average grain size = 2.1 nm

FTIR Analysis

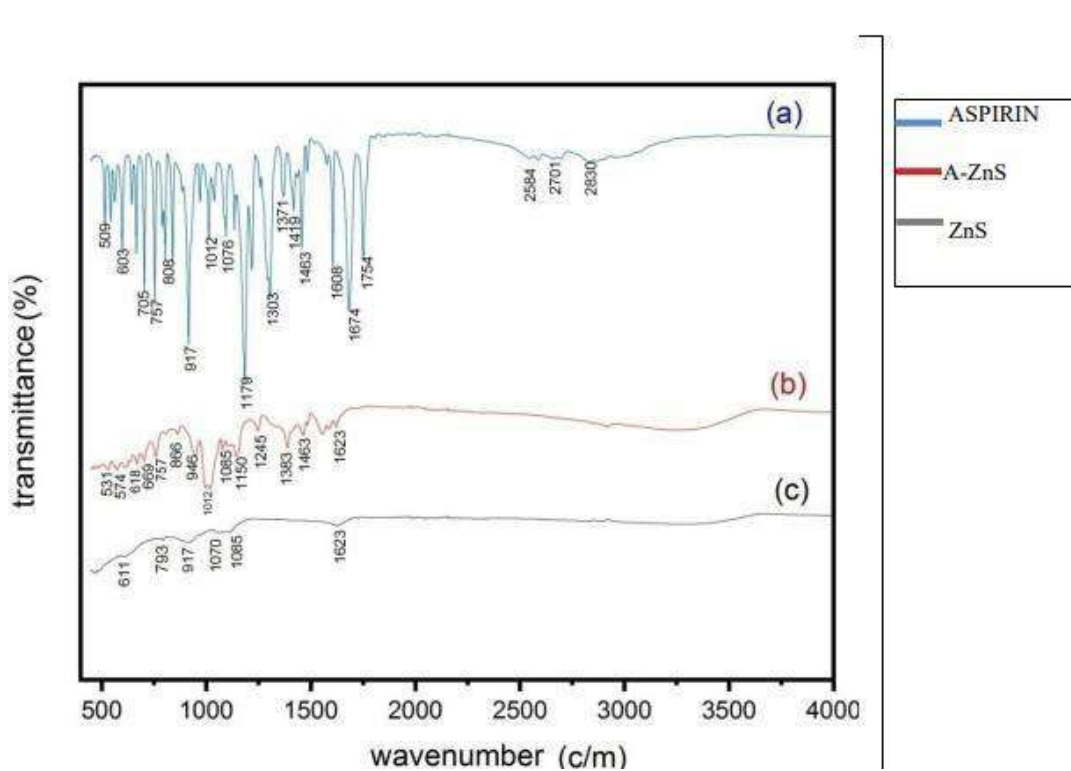


Figure 2: represents FTIR analysis of aspirin, Aspirin loaded ZnS and ZnS

The spectrum shows the IR absorption due to the various vibration modes.

The peak observed at 1623cm^{-1} corresponds to the O-H bending of water molecules. Absorption at 1085cm^{-1} was assigned to SO_4^{2-} . Some weak additional bands observed at 917cm^{-1} indicate the presence of resonance interaction between vibration modes of sulphide ions in the crystal. Medium and strong band at 611cm^{-1} is assigned to the ZnS band which is corresponding to sulphides.⁽⁵⁾ In FTIR spectra of pure aspirin, there is two C=O peaks should be expected in the region 1800cm^{-1} - 1680cm^{-1} .⁽⁹⁾ One occur at a slightly higher frequency due to ester type C=O vibrations and other at slightly lower frequency due to the acid type C=O vibration. In the present work (Fig 4.2), the acid C=O stretching mode of aspirin is observed at 1608 and 1674cm^{-1} . Also stretching of ester C=O group is identified as a strong band at 1754cm^{-1} . The C—O stretching of carboxylic acid appears near the region 1320cm^{-1} - 1210cm^{-1} . In this present spectra (Fig4.2) C—O stretching of carboxylic acid is identified at 1303cm^{-1} and 1179cm^{-1} . Stretching modes of C—O ester group is identified at 1012cm^{-1} . The O—H vibration from CO—OH group observed at $3100\text{-}2800\text{cm}^{-1}$, in this present spectra(Fig.4.2), wavenumber observed at 2830cm^{-1} . The absorption band at 2999cm^{-1} IR spectrum is attributed in antisymmetric —CH₃ stretching vibration.⁽⁸⁾ The antisymmetric and symmetric deformation modes of CH₃ group absorb nearly at 1465cm^{-1} . The ring carbon carbon (C=C) stretching vibration occurs nearly in the region 1600cm^{-1} and 1500cm^{-1} and is usually stronger.^(7,8) From the analysis of FTIR graph we can find that, some bonds corresponding to aspirin such as (509), (808), (917), (1076), (1371), (1608) cm^{-1} and are shifted to (531), (866), (946), (1085), (1383), (1623) cm^{-1} respectively in AZnS. From this study we can clearly say that aspirin is doped in ZnS.

UV- Visible Spectroscopy Analysis:

The optical characterization of pure aspirin and A-ZnS was done by UV-Visible spectroscopy.

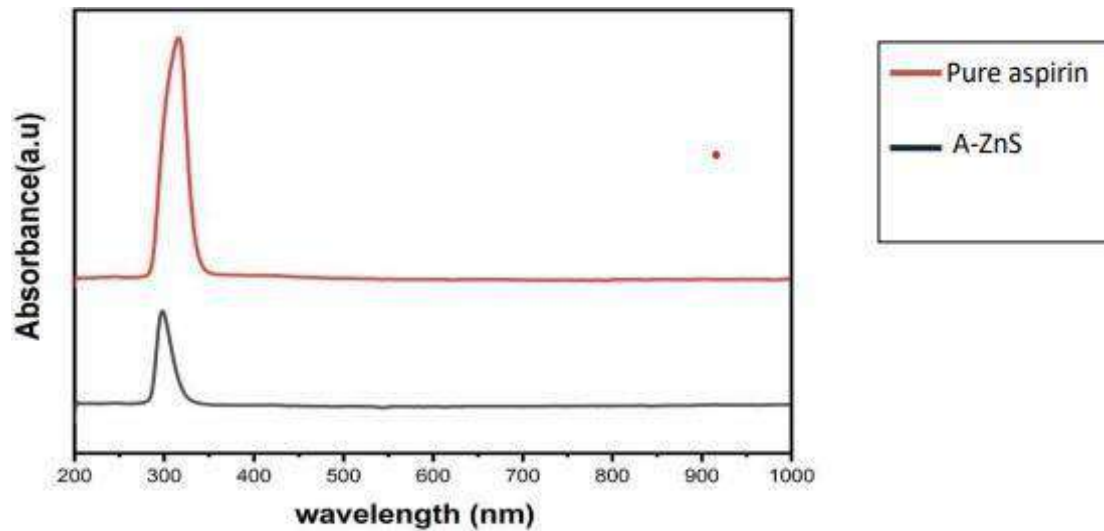


Figure 3: **Absorption spectrum of A-ZnS and pure Aspirin**

From the graph it is observed that absorption band of the pure aspirin showed a shift in higher λ_{max} of 315nm to a lower λ_{max} of 298nm when it is conjugated with ZnS NPs.

The tauc plot is drawn to calculate the bandgap of the samples

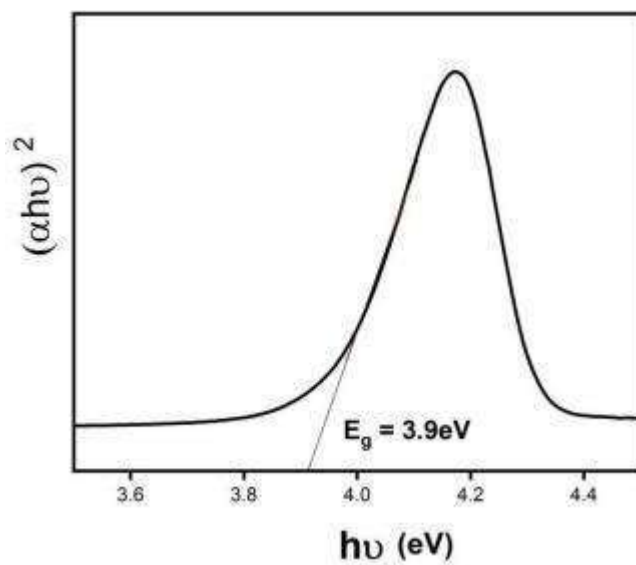


Figure 4: Tauc plot for pure aspirin

From the plot band gap of pure aspirin obtained as 3.9 eV.

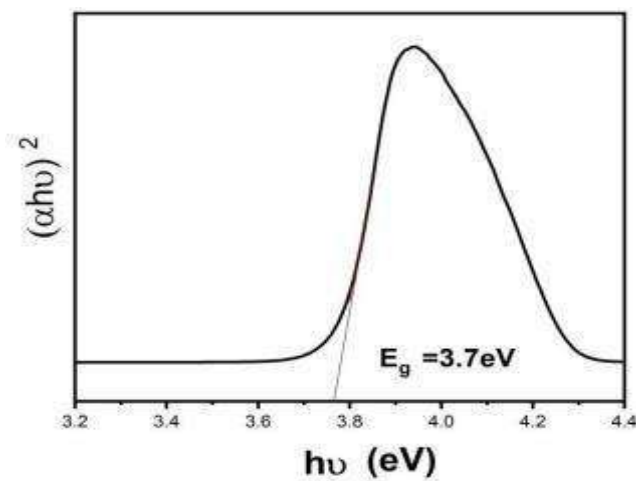


Figure5 : Tauc plot for A-ZnS

From the plot, band gap of A-ZnS is obtained as 3.7eV

CONCLUSION

The aspirin loaded ZnS nanodrugs were synthesized by co precipitation method and characterization of synthesized material is done by external devices such as X-ray diffraction, FTIR and UV-Visible spectroscopy. The diffraction pattern of the ZnS nanoparticles were measured and compared with already known standards databases to identify it. The diffraction peaks obtained from the XRD analysis are at 28.6° , 48.1° and 56.1° which is corresponding to the planes (111), (200) and (311) respectively. X-ray diffraction pattern indicates the cubic structure of ZnS nanoparticles. The chemical composition of the A-ZnS was determined by FTIR analysis. Some bonds corresponding to aspirin such as (509), (808), (917), (1076), (1371), (1608) cm^{-1} and are shifted to (531), (866), (946), (1085), (1383), (1623) cm^{-1} respectively in A-ZnS. The shifting of bond indicates that aspirin is well doped with ZnS NPs. From the absorption spectrum, observed that absorption band of the pure aspirin showed a shift in higher λ_{max} of 315nm to a lower λ_{max} of 298nm when it is conjugated with ZnS NPs. Fom the tauc plot, the direct bandgap of material is calculated and obtained as 3.9eV for aspirin and 3.7eV for A-ZnS. Purpose of the study was to find the reduction of toxicity in the aspirin when it is loaded with ZnS NPs and it could be analysed by biological characterization.

References

(1) Kaur N, Kaur S, Singh J, Rawat M. -A Review on Zinc Sulphide Nanoparticles: From Synthesis, Properties to Applications. J Bioelectron Nanotechnol 2016;1(1): 5.

(2) A Tiwari, SJ Dhoble -Stabilization of ZnS nanoparticles by polymeric matrices: syntheses, optical properties and recent applications - RSC advances, 2016 - pubs.rsc.org

(3) Dayeh, Shadi A., "Structural and Room- Temperature Transport Properties of Zinc Blende and Wurtzite InAs Nanowires." Advanced Functional Materials 19.13 (2009): 2102-2108.

(4) Pathak, C. S., M. K. Mandal, and V. Agarwala. "Synthesis and characterization of zinc sulphide nanoparticles prepared by mechanochemical route." Superlattices and Microstructures 58 (2013): 135-143. —

(5) Parvaneh, Iranmanesh, Saeednia Samira, and Nourzpoor Mohsen. "Characterization of ZnS nanoparticles synthesized by co-precipitation method."

INFLUENCE OF EDUCATION, SCIENCE AND TECHNOLOGY ON GENDER IDEOLOGY AND BEHAVIOUR OF PARENTS IN CREATING GENDER ROLE ATTITUDES IN CHILDREN

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ABSTRACT

Gender, a word in common use which defines the characteristics of women, men, girls and boys that are socially constructed. Through this study we are trying to find out *'Influence of Education, Science and Technology on Gender ideology and Behaviour of Parents in creating Gender role attitudes in Children'*. The method adopted for this study is Questionnaire survey method, involving sample size of 30. By asking a total of 17 questions regarding the same topic through online questionnaire, this study completed with a result and conclusion that, Gender ideology and gender behaviour showcased by parents do influence gender role attitudes of children, where the children actually reflect what they have experienced so far in their lives. At the same time, the developments in education, science and technology has helped the society in realizing what is gender equality and how equity should be taken care of while treating people. Key words: Gender ideology, Gender role attitude, Education, Science, Technology.

NEED AND SIGNIFICANCE

'Sex' and 'Gender' are two terms that we use interchangeably, despite having difference in meaning like day and night. Sex is a set of biological attributes in organisms, defined by chromosomes, gene expressions, hormonal changes etc. Gender refers to socially constructed

roles, behaviours, expressions and identities of people. It influences peoples' perception about themselves and others as well as about the distribution of power and properties.

Gender ideology refers to attitudes regarding the suitable roles, rights and responsibilities of women and men in society. Traditional gender ideologies emphasize the value of distinctive roles for women and men where men fulfil their family roles through breadwinning activities and women fulfil their roles through homemaker and parenting activities. Gender ideology also refers to societal beliefs that reinforces gender inequality. Gender ideology of parents often affect the gender role attitudes in children since parents are those who teach them what to do and what not to do.

Gender role attitudes in children – Most children start understanding gender roles at around 2 to 3 years of age. By the time they reach 3 years old, most children prefer to play games which they think fit their gender. They may start choosing toys, colours, dress and everything that is supposed to be assigned to their prescribed sex. E.g.: boys may play together with trucks and girls may play together with dolls. Children learn from a very young age that they should follow rules based on their assigned sex and gender. Growing up, they naturally and automatically learn what they are supposed to do, like boys has to earn for family and girls has to look after family at home.

Education, science and technology are three terms that go together. Science encompasses the systematic study of the structure and behaviour of the physical and natural world through observation and experiment, and technology is the application of scientific knowledge for practical purpose. Education is a purposeful activity directed at achieving specific aims, such as providing knowledge or fostering skills and character traits. The developments that takes place in these three domains influence the human life to an extent. Even with the gender ideology of parents. Both men and women who achieves greater educational qualifications seems to be more mature about their view points. The developments in science and technology has brought much change in the social medias as well, because of which more people receives information about recent developments, recent social scenarios that eventually brings out a change in their perspective about gender roles, gender ideology. The developments in science and technology indirectly influences the mind-set of people and prepares them to break the age old social norms and restrictions on the basis of gender.

To find out if these interpretations are right or wrong, Survey method seems to be the most appropriate out of all. Survey research is defined as –the collection of information

from a sample of individuals through their responses to questions (Check & Schutt, 2012 cited in J. Ponto, 2015). As this method provides an opportunity to use it either in quantitative data collection or quantitative data collection it can well explore human behaviour, so it is often used in social and psychological research (Singleton & Straits, 2009 cited in J. Ponto, 2015).

Here, taking a survey from parents in general seemed less effective for this topic, so we chose a sample of 15 couples with both girl and boy child at same time, so finding out their gender ideology can be easier. So the survey focused on 15 couples of varying age from Kannur district as sample.

REVIEW OF LITERATURE

A. Bishop. (2017), He examined whether parents' modelled behaviour or their own gender ideology was a better predictor of adolescents' egalitarian or non-egalitarian gender beliefs. Parents and their adolescent children were assessed in terms of gender ideology and perceptions of parent marital equality. Bivariate correlations showed that parent gender ideology was a significant predictor of adolescent gender ideology.

H. P. Halpern *et al.*, (2016), utilized longitudinal, self-report data from a sample of 109 dual-earner, working-class couples and their 6-year old children living in the north-eastern United States. Research questions addressed the roles of parents' gender ideology and gendered behaviours in predicting children's development of gender-role attitudes. Parents responded to questionnaires assessing their global beliefs about women's and men's -rightfull role in society, work preferences for mothers, etc. The data were collected at multiple time points across the first year of parenthood, and during a 6-year follow-up. They concluded that mothers and fathers played unique roles in their sons' and daughters' acquisition of knowledge about gender stereotypes.

A. Croft *et al.*, (2014), Conducted tests with 326 children and their parents to investigate do parents' beliefs about gender and their gendered behaviours affect their children's aspirations. It found that mothers' explicit beliefs about gender roles such as associating women with the home and men with work- predicted their children's beliefs. Further, fathers' participation in domestic work and their implicit beliefs about gender roles specifically impacted their daughter's aspirations. So the study suggests that parents' endorsements of

gender equality as well as their household behaviours play an important role for children's perspectives of gender.

METHODOLOGY

Sample: - The 30 participants involved in this study were parents selected from 15 families with both girl and boy child. 15 couples answered the questionnaire individually by both mother and father. The couples were selected randomly from different places in Kannur district.

Tools: - The material used for this particular study was a questionnaire regarding the topic containing total of 17 questions. 4 questions regarding general information followed by 13 MCQ questions were included for convenience in answering amidst busy schedule they might be having. The questionnaire was created by help of a play store app in mobile phone called *Forms app*.

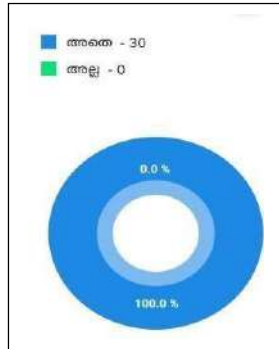
Procedure: - Gender equity, it is the fairness in providing equal access to everything, including getting respect and freedom regardless of gender. Gender equity leads to gender equality. Society has always considered parents as model figures for children to look up to and to copy in life. Thoughts, ideologies and behaviours of parents can easily influence the behavioural aspects of children unknowingly. Gender ideology and behaviour are two different things. A boy child who grow up seeing his father treating his mother like a cook, will automatically consider himself superior over his sister/ girls and will behave the same way towards girls later in his life. Same goes for a girl child, when she sees her mother being always busy with household chores and teaching her those works will automatically consider herself as someone to stay in the house while her brother goes out and enjoy his life. So gender ideologies and behaviour of parents do influence gender role attitudes of children and at the same time those parents who have more educational qualification and information about science and technology seems to have developed an attitude of gender equality. This has been our hypothesis and it is what this study is trying to find out and confirm. To collect data, we chose to form an online questionnaire test that can be very easily shared over WhatsApp.

The questionnaire was shared to their respective WhatsApp numbers asking for their kind participation within 3-hour time limit. Once we received 30 responses, from the 15 families we selected, the survey was stopped and data were saved in the phone itself.

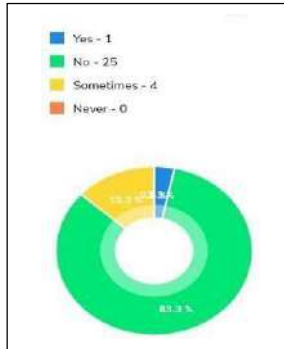
ANALYSIS

Results are shown by means of pie chart

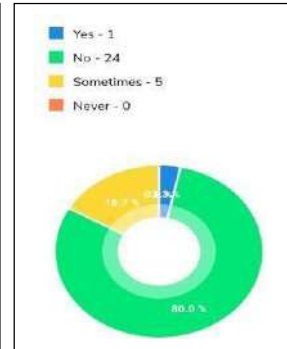
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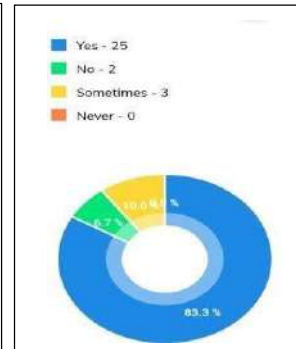
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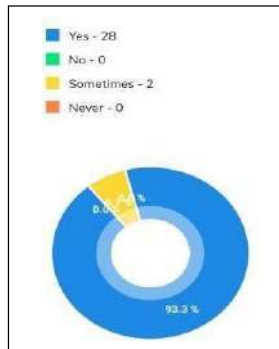
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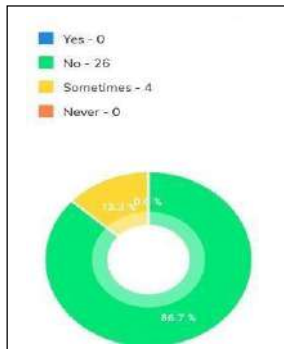
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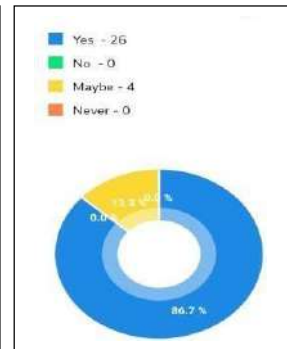
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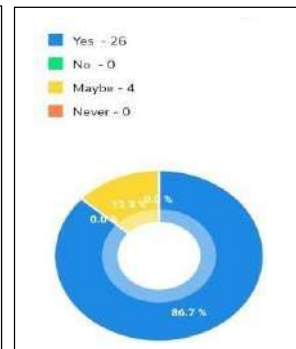
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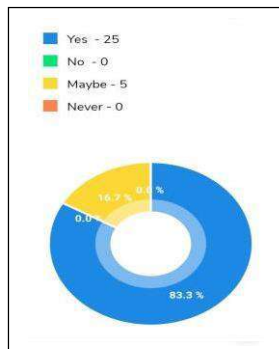
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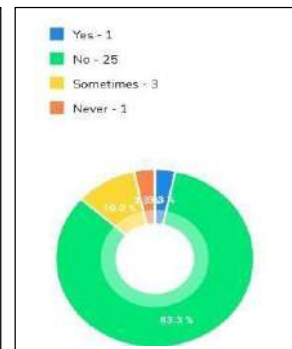
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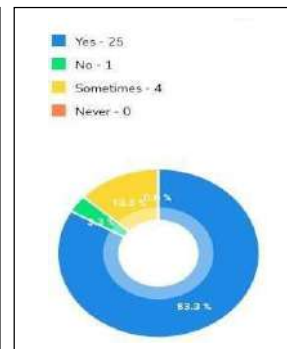
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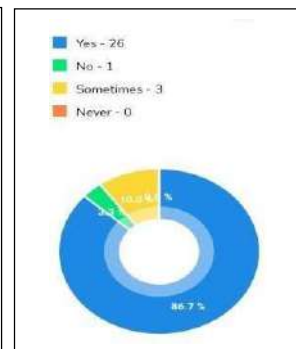
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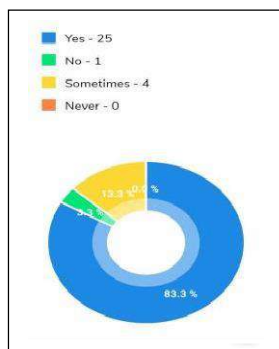
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Question no.16



Question no.17



DISCUSSIONS AND CONCLUSION

According to the results I have obtained from this study, the hypothesis we formulated at the first has been proved to be right. Among the 30 participants, there were 15 female parents and 15 male parents. The questions that we used here were solely MCQ questions except for the four short answer questions that were asked to gather general information such as gender, age etc. Starting with 4 short answer questions for the general information, this survey directly provided them with 13 MCQ questions related with their gender ideology and behaviour they showcased in front of their children as well as their children's behavioural aspects. Among the 13 MCQ questions asked, 11 questions focused on their gender ideology as well as their real behaviour at home whereas the remaining two questions were related to their children's behaviour that comes out as a reflection of parent's attitudes. When they were asked about the distribution of household chores and outside chores, above 80% participants responded in favour of gender equality, where both parents shared every chore respectfully. When we asked the question regarding parent's attitude towards marriage of daughters only after perusing a job, surprisingly 93% of parents supported that concept regardless of gender, and the remaining parents were not totally sure about it. Questions that followed also received majority of favourable responses while the minority were not totally sure about their answer and chose to say 'sometimes'. The two questions that actually asked them about their children's behaviour was a reflection of their own behaviour at home and those questions demanded more attention. Those children whose parents showcased better gender equality at home by giving equal respect to each other and distributing every chore almost equally, happened to have clear and fair attitude regardless of gender where they both seem to be willing to do the chores equally and both having equal mental strength as well. Those same parents also agreed that their gender ideology and behaviour do reflect on their children's behaviour. These responses backed up our hypothesis. The final question, were they were asked their opinion such as do they believe that educated people have more courage to break age old social norms and ensure gender equality, 86.67% of them agreed to it completely. Pointing out major findings: -

- The present society has started thinking beyond the conventional gender ideology
- Parents who are more equipped with technological knowledge and who have more educational qualification has started following gender equality at home.
- Gender ideology and behaviour of parents at home do influence gender role attitudes of children

- Children who learn better gender equality concept at home, seen to be having no hesitation in doing whatever chore they are asked at home. Both boy and girl of such family is seen to be having almost equal mental stability and courage.
- The developments in science and technology has improved the social medias as well, which automatically brought more insight into human and made them think beyond the b conventional gender ideology.
- Those parents who have comparatively less educational qualification seen to supporting the patriarchal gender concept.

While comparing this results with the findings of A. Bishop. (2017), He examined whether parents' modelled behaviour or their own gender ideology was a better predictor of adolescents' egalitarian or non-egalitarian gender beliefs. His Bivariate correlations showed that parent gender ideology was a significant predictor of adolescent gender ideology. H. P. Halpern *et al.*, (2016), utilized longitudinal, self-report data from a sample of 109 dual-earner, working-class couples and their 6-year old children living in the north-eastern United States. They concluded that mothers and fathers played unique roles in their sons' and daughters' acquisition of knowledge about gender stereotypes. A. Croft *et al.*, (2014), Conducted tests with 326 children and their parents to investigate do parents' beliefs about gender and their gendered behaviours affect their children's aspirations. The study suggests that parents' endorsements of gender equality as well as their household behaviours play an important role for children's perspectives of gender. Our study also concluded the same, so our findings and their conclusions do complement each other.

So this study can be considered as a proof to show that Gender ideology and behaviour of parents do influence gender role attitudes of children. Gender is simply a concept created by the society, or certain expectations a society keeps about male, female, girl and boy. Once the concept is broken, gender equality could be achieved. This is what we proved through our study. Our conventional society has always treated women as someone to be at home and man as the one to go and work for the family, women given with less freedom than man and so on.

BIBLIOGRAPHY

- ❖ A. Bishop. 2017. Integrational transmission of gender ideology: The unique associations of parental gender ideology and gendered behaviour with adolescents' gender beliefs. *Mountain Scholar*.
- ❖ H. P. Halpern & M. P. Jenkins. 2016. Parents' Gender ideology and Gendered behaviour as Predictors of Children's Gender-Role Attitudes: A longitudinal Exploration. *Sex Roles*.2016 May; 74(11): 527-542.
- ❖ J. Ponto. 2015. Understanding and Evaluating Survey Research. *J Adv Pract Oncol.*, 6(2): 168-171.
- ❖ A. Croft *et al.* 2014. The Second Shift Reflected in the Second Generation: Do parents' Gender Roles at Home Predict Children's aspirations? *Psychological Science*.
- ❖ Check, J., & Schutt, R. K. (2012). *Research methods in education*. Thousand Oaks, CA: Sage.

PHYTOREMEDIATION USING WATER PLANTS AGAINST HEAVY METAL POLLUTION

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ABSTRACT

Increasing urbanization, industrialization and over population is one of the leading causes of environmental degradation and pollution. Heavy metals such as Pb, Zn, Cd, As etc are one of the most toxic pollutants which disrupts the food chain and is lethal even at low concentrations. The prevailing purification technologies used for removal of contaminants from waste water are not only very costly but causes negative impact on ecosystem subsequently. Phytoremediation, an eco friendly technology which is both ecologically sound and economically viable is an attractive alternative to the current cleanup methods that are very expensive. This technology involves efficient use of aquatic plants to remove, detoxify or immobilize heavy metals. Present study addresses phytoremediation as an innovative technology and its usefulness and potential in the remediation of lead contaminated water.

INTRODUCTION

Water contamination by heavy metals in some area is practically inevitable due to natural process (weathering of rocks), and anthropogenic activities (industrial, agricultural and domestic effluents). Environmental exposure to toxic heavy metals is one of the main important issues on environment and public health (Ansam *et al.*, 2015). Usual discharged heavy metals in water are As, Pb, Hg, Cd, Cu, Cr, Ni, and Zn. Due to the critical issue of heavy metals in waste water many researchers tried to develop co-efficient bio remediation techniques. Conventional remediation techniques such as coagulation, flocculation, adsorption membrane filtration with flotation ozone/hydrogen peroxide, photo catalytic degradation and electro chemical methods to remediate heavy metals has been widely used. Lead is accounted significant pollutant due to solubility in water, which results in wide distribution in aquatic eco systems, is strongly toxic to organisms. The excessive amount of lead in water cause many physiological and biochemical

stress symptoms in plants such as growth reduction, disturbed mineral nutrition, water imbalance, growth productivity, and root elongation, when they inside the cell wall like any other heavy metals. It produces an oxidative stress in plant and leads to cell damage (Phetsombhat *et al* .,2006).

MATERIALS AND METHODS

from the brief survey of literature and based on local availability of aquatic plants ,it was understood that aquatic plants such as *Salvinia* and *Hydrilla* species are widely used for the purpose of removal of heavy metals from waste water. For the present study used *Salvinia* and *Hydrilla* for phytoremediation of lead.

1. SELECTION OF AQUATIC PLANTS

- ***Salvinia molesta***

It is a small floating aquatic with creeping stems, branched bearing hairs on the leaf surface papillae but no true roots. Leaves are trimerous whorls,with 2 leaves green, sessile, or short petiolate, flat, entire, floating and one leaf finely dissected ,petiolate, root like and pendent.

- ***Hydrilla verticillata***

Aquatic plant having stem of 1-2 meter long, leaves are arranged in whorls of 2-8 around the stem, each leaf 5-20 mm long and 0.72 mm broad with serrations

2. Collection and growing of *Hydrilla verticillata* and *Salvinia molesta*

Collection of both submerged plants of *Hydrilla verticillata* and floating plants of *Salvinia molesta* . The plants were well washed and placed in three plastic containers filled with tap water of 750 ml. A lead metal was transferred to each containers by using lead acetate of 1.5, 2.25 and 3.75mg concentrations. After that, the plants are transferred to 20 days growing for successful accumulation of lead. The controls were kept with pure water under same conditions.

3. Drying and powdering of plants

The plants after 20 days successful accumulation of lead goes to drying. Before drying, plants are washed and transferred to clean petriplates and put them in a hot air oven of 80°C temperature. After a period of drying the plants which are transferred to mortar and made to fine powder by pestle.

1. Preparation of standard solutions of lead

SI NO	PLANTS USED	AMOUNT OF WATER USED IN (mL)	LEAD ACETATE ADDED IN (mg)	PERIODS OF GROWING
1.	<i>Salvinia molesta</i>	750 ml	1.5	20 days
2.	<i>Salvinia molesta</i>	750 ml	2.25	20 days
3.	<i>Salvinia molesta</i>	750 ml	3.75	20 days
4.	<i>Hydrilla verticillata</i>	750 ml	1.5	20 days
5.	<i>Hydrilla verticillata</i>	750 ml	2.25	20 days
6.	<i>Hydrilla verticillata</i>	750 ml	3.75	20 days

2. Preparation of standard graph

Calorimetry is a scientific technique that is used to determine the concentration of colored compounds in solutions by the application of Beer-Lambert law. It states that there is a linear relationship between the absorbance and the concentration of a sample. For this reason, Beer's law can only be applied when there is a linear relationship. Beer's law is written as,

$$A = E l c$$

Where,

- A is the measure of absorbance(no units)
- E is the molar extinction coefficient or molar absorptivity
- l is the path length
- C is the concentration

However, the eyesight of the analyst, inconsistency in the light sources and the fading of colour standards limit accurate and reproducible results. To avoid these sources of error, a colorimeter can be used to photoelectrically measure the amount of coloured light absorbed sample in reference to a colourless sample (blank).

White light is made up of many different colours or wave length of light. A coloured sample typically absorbs only one colour or one band of wave lengths from the white light. Colorimeters pass a coloured light beam through an optical filter ,which transmits only one particular colour or band of wavelength of light to the colorimeter _s photo detector where it is measured .

A series of standard solutions of a neutral aqueous solution containing 0.090 mg to 0.5 mg of lead in a 10 ml distilled water was mixed with Dithizone in each sample and 0.3 to 2.0 ml of 4×10^{-3} M HCl followed by the addition of 3 to 6 ml of 0.3 M CTAB.

3. Preparation of standard solution of lead

A stock solution of lead acetate was prepared with a concentration of 1mg/L. A series of dilutions were made from the stock solution viz. 1:1 to 1:10.

4. preparation of Dithizone solution

Molecular weight of dithizone is 256.32. 1 molar dithizone is prepared by dissolving 0.125 g in 20 ml 2-propanol.

5. Preparation of 0.3 M of CTAB solution

Molecular weight of CTAB is 364.45. To prepare 0.3 M solution 10.93 g of CTAB is dissolved in distilled water and made up to 100 ml in standard flask. The mixture is kept for 1 hour for the complete dissolution.

4. preparation of 4 mM Hydrochloric acid solution

4 Mm HCl was prepared by diluting 1 M HCl stock solution.(1 ml of 1 M HCl and 249 ml of distilled water.

5. preparation of sample solution

A number of solution sets were prepared containing varying concentration of lead and dithizone . The concentration of lead was varied from 0.09to 0.5 mg. A 100 fold molar excess of dithizone solution (1.95×10^{-4}),1 ml HCl(4×10^{-3}) and CTAB(0.3) added in each samples. A blank solution is prepared by adding 5ml distilled water ,dithizone,4 ml CTAB, 1ml HCl .one cuvetteis filled with blank solution and another cuvette is filled with first sample solution. The

colorimeter set up into 490nm. Blank solution is kept in the cuvette holder and set the OD into zero. After that put the first sample into the cuvette holder and note the reading. This way all the samples are measured in colorimeter and record all the OD values.

6. Estimation of concentration

Concentration of the sample is taken in the X-axis and OD values are taken in the Y-axis. Spot the OD value against corresponding concentration. After spot the OD in the graph, connect the adjacent spot by a straight line. The quantity of the dried samples were estimated by extrapolating on the standard graph corresponding to the OD value.

Result and discussion

With increase in the concentration of the heavy metal a decrease in the fresh weights of *Salvinia* and *Hydrilla* was noticed. The control plants of *Salvinia* and *Hydrilla* showed healthy growth and significant biomass i.e., 24.33g, 22.02g respectively.

Table -1- The comparison of fresh weight in plants under study

Concentration of lead acetate used	Salvinia		Hydrilla	
	Fresh weight	Dry weight	Fresh weight	Dry weight
control	24.33 g	9.86g	22.20g	8.75g
1.50 mg	22.25g	8.98g	18.65g	5.90g
2.25 mg	20.32g	7.66g	14.43g	4.32g
3.75 mg	21.67g	5.97g	15.65g	3.88g

These two species showed a similar trend in reduction of biomass and decrease of dry weight in response to lead heavy metal selected in the investigation. After 20 days of treatment two plant species showed a substantial amount of accumulation of heavy metal in their tissues. Dried samples were powdered and the ash was heated and the amount of metal accumulation was analyzed using colorimetry. At 3.75mg concentration of lead shows maximum accumulation of lead shows maximum accumulation of lead was noticed in both species.

Table-2-Showing the estimated quantity of lead absorbed by plants

Concentration of lead acetate used	OD		Quantity of lead (mg/L)	
	Salvinia	Hydrilla	Salvinia	Hydrilla
1.5 mg	0.30	0.36	0.31	0.39
2.25mg	0.42	0.40	0.43	0.36
3.75 mg	0.49	0.42	0.51	0.43

Salvinia showed maximum accumulation of lead in the concentration of 0.51mg. Therefore, from the results, it can be concluded that Salvinia is efficient in accumulating highest amount of lead. Similarly, Hydrilla shows maximum accumulation of lead ie,0.43 at 3.75 mg concentration. They are natural hyper accumulators of heavy and toxic metals.

SUMMARY

Lead is accounted significant pollutant due to solubility in water, which results in wide distribution in aquatic ecosystems, is strongly toxic to organisms. The excessive amounts of lead in water cause many physiological and biochemical stress symptoms in plant such as growth reduction, disturbed mineral nutrition, water imbalance, growth productivity and root elongation. Phytoremediation is a natural and direct use of green plants to uptake pollutants through roots and translocation to the upper part of the plant. In remediation of contaminated soil and water a wide range of plants species are used. Plant species used for phytoremediation possess quick growth rate,extensive root system,high biomass yield,various habitats adaptation,high tolerance,ability to acuminate the pollutants in above ground parts. Each plant species have specific role in phytoremediation for the uptake of waste water which occur. Metal absorption by root in small scale is in submerged as well as free floating plants.

REFERENCES

- Ansam S.Abbas Al-rubaie and Abdul- Rahman A.Al-Kubausi(2015),Removal of lead from water by using aquatic plants(45-51)
- Bertrant pournut (2014),Lead uptake ,toxicity and detoxification in plants (113-136)
- D. Barltrop and F. Meek1975), Absorption of different lead compounds,(805-809).
- Dhir B and Kumar R (2010), Absorption of heavy metals by Salvinia biomass and agricultural residue(427-432).
- Divya Singh et al (2012), Phytoremediation of lead from waste water using aquatic plants(1-11).

A Comparitive Study of effect of chemically and green Synthesised ZnO NPs on health for sustainable future

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Abstract

The present work demonstrates a simple, stable, sustainable, cost effective and eco-friendly strategy for the green synthesis of zinc oxide nanoparticles from zinc nitrate ($\text{Zn}(\text{NO}_3)_2$) solution using *Cinnamomum tamala* aqueous extract, as the NPs forming agent. The identification, detailed structural analysis of ZnO NPs were investigated using different characterization techniques like X-ray diffraction (XRD), UV-Visible spectroscopy and Fourier transform infrared (FTIR) spectroscopy. ZnO nanoparticles are of great interest due to inexpensive to synthesize, safe, and easy method of synthesis. Free radicals pose serious threat to tissues and vital organs, especially membrane lipids, proteins and nucleic acids of cells. The antioxidant effect of ZnO nanoparticles was stronger than other commercially synthesized standards. The free radical formation is controlled by antioxidant agents including enzymatic and non-enzymatic compounds. Free radicals are responsible for the cellular damage including diabetes. Overproduction of reactive oxygen/ nitrogen species (ROS/RNS) and other related radicals lead to oxidative stress which has been implicated in aging and a number of diseases. Diabetes mellitus is a metabolic disorder characterized by hyperglycemia and insufficiency of secretion or action of endogenous insulin. ZnO NPs lead to reduction of blood glucose, increased insulin level and expression. The scavenging power of enzymatic and non-enzymatic antioxidants is useful for the control of various chronic diseases like diabetes. ZnO NPs elucidated as anti diabetic agents.

INTRODUCTION

Nanoparticles have unique properties such as small sizes and a large surface to volume ratio, making them ideal for a wide range of applications, particularly in biomedicine. The use of nanoparticles in biomedical applications has increasingly emerged and gained great attentionⁱ. Natural products of plant origin have been used in traditional medicine for the treatment . Free radicals pose serious threat to tissues and vital organs, especially membrane lipids, proteins and nucleic acids of cells. Overproduction of reactive oxygen/ nitrogen species (ROS/RNS) and other related radicals lead to oxidative stress which has been implicated in aging and a number of diseases. One of the examples of such a disease is Diabetes mellitus Which is a metabolic disorder characterized by hyperglycemia and insufficiency of secretion or action of endogenous insulin.ⁱⁱ

Zinc supplementation has been reported to exhibit beneficial effects in enhanced glycemic control in diabetic animals and humans. Numerous studies have shown that ZnO-NPs reduce blood glucose levels in diabetic animals. Orally-administered ZnO-NPs (1–10mg/kg/day) for 56 consecutive days decreased blood glucose levels in diabetic rats in a concentration-and time-dependent manner. People suffering from diabetes are not able to produce or properly use insulin in the body and therefore chronic hyperglycemia occurs. Hyperglycemia is also found to promote lipid peroxidation of low density lipoprotein (LDL) by a superoxide-dependent pathway resulting in the generation of free radicals. Autooxidation of glucose involves spontaneous reduction of molecular oxygen to superoxide and hydroxyl radicals, which are highly reactive and interact with all biomolecules. ZnO NPs lead to reduction of blood glucose, increased insulin level and expression, increased GK activity and expression and improved expression level of IRA, GLUT-2 in diabetic rats. Rinku D Umrani & Kishore M Paknikar (2013) reported that Oral administration of zinc oxide nanoparticles resulted in significant antidiabetic effects – that is, improved glucose tolerance, higher serum insulin (70%), reduced blood glucose (29%), reduced non-esterified fatty acids (40%) and reduced triglycerides (48%). Nanoparticles were systemically absorbed resulting in elevated zinc levels in the liver, adipose tissue and pancreas. Increased insulin secretion and superoxide dismutase activity were also seen in rat insulinoma (RIN-5F) cells. They further concluded that Zinc oxide nanoparticles are a promising antidiabetic agent.ⁱⁱⁱ Further studies may help in developing suitable treatment method for diseases like Diabetes. In the present study zinc oxide nanoparticle was synthesised by green and chemical method then find which method of synthesis show maximum antioxidant activity.

^{iv}.Green approach to the synthesis of NPs came into role recently to restrain the ecosystem with naturally available biodegradable matter for its production . For the synthesis of metal/metal oxide nanoparticles, plant biodiversity has been broadly explored due to the availability of effective phytochemicals in various plant extracts, especially in leaves such as ketones, aldehydes, flavones, amides, terpenoids, carboxylic acids, phenols, and ascorbic acids, which are responsible for the reduction of metal salts into metal or metal oxide nanoparticles

Zinc oxide nanoparticles (ZnO NPs)

ZnO is described as a functional, strategic, promising and versatile inorganic material with a broad range of applications. The electrostatic characteristics of ZnO nanoparticles are another useful feature for biomedical applications. Zinc oxide nanoparticles typically have neutral hydroxyl groups attached to their surface, which plays a key role in their surface charge behaviour. In aqueous medium and at high pH, the chemisorbed protons (H^+) move out from the particle surface leaving a negatively charged surface with partially bonded oxygen atoms (ZnO^-). ^vAt lower pH, protons from the environment are likely transferred to the particle surface, leading to a positive charge from surface $ZnOH^{2+}$ groups. The exact physical and chemical properties of zinc oxide nanoparticles depend on the way in which they are synthesised. It is a wide bandgap semiconductor with an energy gap of 3.37 eV at room temperature. In the last two decades, ZnO NPs have become one of the most emerging metal oxide nanoparticles for biological applications due to their excellent biocompatibility and low toxicity. The advantages of nanostructured ZnO particles over other metal nanoparticles are due to their lower cost, UV blocking properties, high catalytic activity, large surface area, white appearance and their remarkable applications in the field of medicine, catalysis and agriculture.

Antioxidant property:

A free radical is any atom or molecule, capable of independent existence, that possesses one or more unpaired electrons. It is highly reactive. It causes damage to various tissue by generation of new reactive oxygen species by chain reaction. In circumstance, the body provides endogenous substance (free radical scavengers) to combine with the free radical. If these scavengers aren't available or If over production of free radicals, the radicals donate to or steal an electron from another molecule, leading to chain reaction that triggers

formation of more free radicals. The chain reaction results in damage to the cell membrane and DNA^{vi}. The antioxidants acting in the defense systems act at different levels such as preventive, radical scavenging and repair. Antioxidant" is a general term for any compound that can counteract unstable molecules called free radicals that damage DNA, cell membranes, and other parts of cells. Because free radicals lack a full complement of electrons, they steal electrons from other molecules and damage those molecules in the process. Antioxidants neutralize free radicals by giving up some of their own electrons. In making this sacrifice, they act as a natural "off" switch for the free radicals. This helps break a chain reaction that can affect other molecules in the cell and other cells in the body^{vii}. An antioxidant is a molecule capable of slowing or preventing the oxidation of other molecules. The most common reactive oxygen species (ROS) include superoxide (O_2^-) anion, hydrogen peroxide (H_2O_2), peroxy (ROO^-) radicals, and reactive hydroxyl (OH^-) radicals. It is possible to reduce the risk of chronic diseases and prevent disease progression by either enhancing the body's natural antioxidant defenses or by supplementing with proven dietary antioxidants.

DPPH (2,2-diphenyl picryl hydrazyl) assay is one of the simple and one of the widely used methods. DPPH is a stable free radical at room temperature and accepts an electron or hydrogen radical to become a stable diamagnetic molecule. The decrease in absorbance of DPPH radical caused by antioxidants, because of the reaction between antioxidant molecules and radical progress, results in the scavenging of the radical by hydrogen donation. It is a nitrogen centered free radical therefore, any substance that scavenges remarkable amounts of DPPH could reduce the quantities of other reactive nitrogen species in living cells. The DPPH activity of the ZnO nanoparticles was found to increase in a dose dependent manner.

In this study ZnO nanoparticles are synthesised through green method and chemical method and the antioxidant properties of nanoparticles synthesised through both of the methods are compared through DPPH assay.

METHOD

Preparation of leaf extract:

Fresh CT leaves were collected, cleaned well and shade dried for a month. The completely dried leaves were grinded to fine powder using mixer grinder. 10g of fine powder was weighed and transferred to 500 ml stoppered bottle. 250ml of distilled water was added and kept the mixture for heating at 80°C in a magnetic stirrer for 1 hour. The temperature was maintained constantly and the solution was filtered using cotton cloth. The filtrate solution was used as a reducing agent for the synthesis of ZnO NPs and it was kept in the refrigerator for further use.



Figure 7 : Cinnamomum Tamala plant extract

2.4 Green Synthesis of Zinc Oxide Nanoparticles (ZnO NPs):

Zinc oxide nanoparticles were synthesized using CT extract by a simple procedure. CT extract (5ml) was added to 25 ml of zinc nitrate (0.1M) and stirred at 60°C for 3 hours. The product obtained was dried and then calcined at 500°C for 2 hours. Calcined sample was pulverized and stored until further use

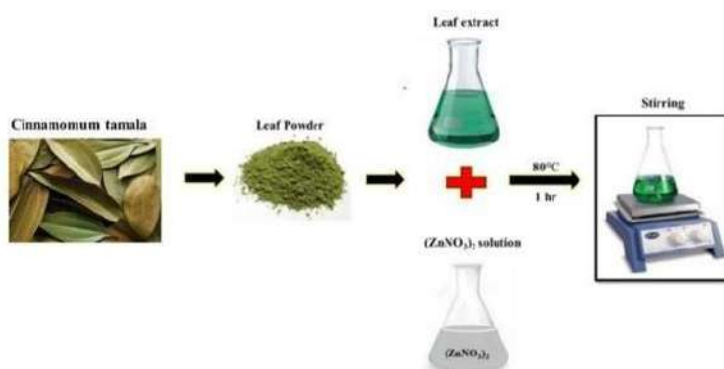


Figure 9: Flow chart process for the synthesis of ZnO NPs

Chemical Synthesis of ZnO nano particles:

Zinc oxide nano particles were synthesized chemically by using, Precipitation method. Here KOH is used as reducing agent . KOH solution is slowly added in to zinc nitrate under stirring white precipitate is formed . Centrifuged at 5000rpm for 20 min , washing with distilled water and absolute alcohol , calcinated at 500 °c at 2 hr , zno nanoparticle is formed .^{viii}

Antioxidant activity study

Free radical scavenging activity on 2, 2-diphenyl-2-picrylhydrazyl (DPPH)

The scavenging activity of the zinc oxide nanoparticles was measured by using DPPH assay. The various concentration of ZNO nps is mixed with 5 ml of DPPH solution (0.001M) is prepared in ethanol .The reaction mixture is shaken and allowed to incubate at room temperature in the dark . DPPH containig no sample is used as blank and the ascorbic acid was taken as standard . The absorbance of the mixtur was measured at 517nm and the free radical scavenging activity calculated was using equation

$$\% \text{ DPPH scavenging} = (A_{\text{Blank}} - A_{\text{Sample}} / A_{\text{Blank}}) \times 100$$

Where A blank is the absorbance of the control reaction (containing all reagents except the test compound) and A sample is the absorbance of the test compound

Mechanism of Formation of ZnO NPs Via Biosynthesis

The environment is rich in plant resources which contain many phytochemicals present in roots, leaves, flower, etc. The functional groups such as hydroxyl, carbonyl, carboxylic acid, etc. contained in these phytochemicals, which can act as good chemical reductants as well as facilitates the formation of nanoparticles. The present work is dealing with biosynthesizing ZnO NPs using green template, CT leaf extract. The extract is a rich source of polyphenols, flavonoids and alkaloids. When a metal solution i.e. zinc nitrate solution is introduced into a well synthesized homogenous leaf extract solution, leaf extract will try to form the matrix in which Zinc in +2 oxidation state gets absorbed. The stability of Zn²⁺ on matrix is due to the chelating effect or a type of interaction between functional groups and Zn

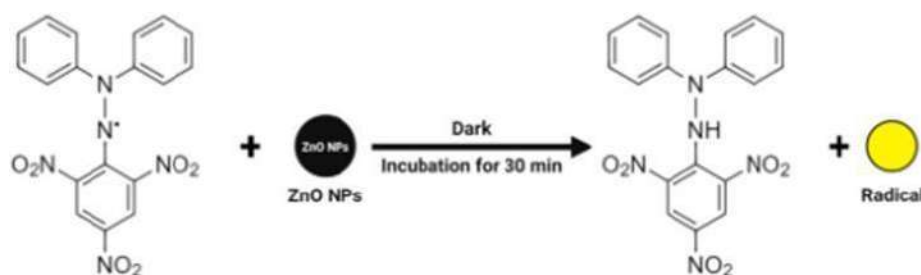
$2+$ which may be due to the transfer of lone pair of electrons (available on functional groups) to the empty orbital of zinc. ^{ix}So, the quarantined cations $M n^+$ or hydroxylated cation $[M(OH)]^{m+}$ which can undergo nucleation or growth process is accelerated by functional groups present in the leaf extract. The dried mixture obtained was yellow in colour which may attributed to the presence of zinc hydroxide as well as other phytochemicals present in it. The sample was kept for calcination to remove the hydroxides as well as other impurities which give rise to the formation of required oxide and finally resulting in zno nanoparticles. The formation of nanoparticles was confirmed by various analytical techniques. XRD displayed the exact pattern of hexagonal wurtzite structure of ZnO, UV-Visible discussed the characteristic absorption peak , below visible region and FTIR examined the unique absorption peak of ZnO in the finger print region.^x Moreover, XRD, UV-visible and FTIR collectively confirmed that no additional peaks corresponding to other chemical compounds (phytochemicals) or impurities were present in the resultant nanoparticles.

Mechanism of formation of zinc oxide nanoparticles via chemical synthesis:

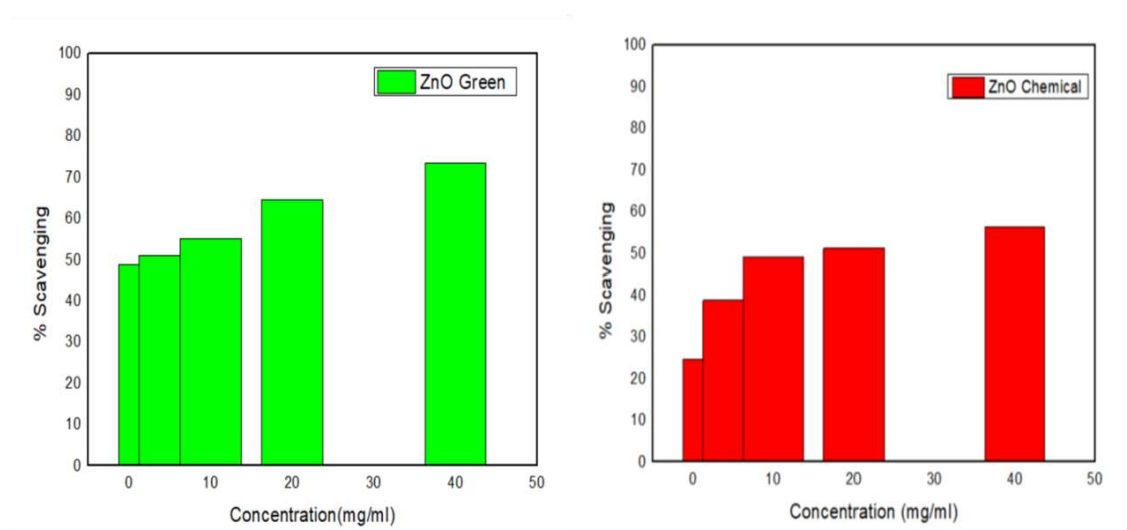
When the prepared zinc nitrate solution was treated with KOH solution which is a reducing agent then after continuous string white precipitate is formed . This precipitate on drying and calcining gives white powder of zinc oxide nanoparticles. The nanoparticles thus synthesised are characterised using FTIR, XRD and UV-Visible spectroscopy.

Antioxidant Activity

Antioxidant activity of synthesized ZnO nanoparticles on DPPH



Scavenging potential of chemically synthesized ZnO Nps



Antioxidant activity of synthesized zinc oxide nanoparticles.

Conclusion:

A simple, stable and eco-friendly method of biosynthesizing ZnO NPs was successfully developed using *Cinnamomum tamala* leaf extract. ZnO nanoparticles were also synthesized by precipitation method. The study focuses on the comparison of antioxidant capacity and reducing power of chemical synthesised nanoparticles and green synthesised ZnO nanoparticles. The formation of zinc oxide was confirmed using various characterisation techniques such as UV-Visible spectroscopy, fourier transform infrared spectroscopy(FTIR) and X-ray diffraction. The antioxidant and reducing power of thus synthesized nanoparticles were evaluated. The results shows that green synthesised nanoparticles possess better oxidant property or radical scavenging activity compared to chemically synthesised nanoparticle.

Scavenging property of nanoparticles can be used for various application especially in medical field. The production of free radicals under the normal physiological condition is adjusted by various antioxidants, production of excess reactive oxygen species lead to oxidative stress. It leads to most common chronic diseases such as Diabetes. ZnO NPs lead to reduction of blood glucose, increased insulin level and expression. The free radical scavenging activity of zinc oxide nanoparticles can be utilized in treatment of such disease. That is, ZnO NPs elucidated as anti diabetic agents. It provide a better method of preparing toxic free zinc oxide nanoparticles especially for biological applications. Hence, this method can be employed in large-scale production and further explored in the treatment of diabetics

Reference

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- ⁱ San Tang, K. (2019). The current and future perspectives of zinc oxide nanoparticles in the treatment of diabetes mellitus. *Life sciences*, 239, 117011.
- ⁱⁱ Kumar, S., & Pandey, A. K. (2015). Free radicals: health implications and their mitigation by herbals. *British Journal of Medicine and Medical Research*, 7(6), 438-457.
- ⁱⁱⁱ Sachan, A., Singh, S., Shankar, P., Nath, R., Sachan, A. K., & Dixit, R. K. (2015). *WORLD JOURNAL OF PHARMACY AND PHARMACEUTICAL SCIENCES*.
- ^{iv} Mukherjee, S., Sushma, V., Patra, S., Barui, A. K., Bhadra, M. P., Sreedhar, B., & Patra, C. R. (2012). Green chemistry approach for the synthesis and stabilization of biocompatible gold nanoparticles and their potential applications in cancer therapy. *Nanotechnology*, 23(45), 455103.
- ^v 13. Jiang, J., Pi, J., & Cai, J. (2018). The advancing of zinc oxide nanoparticles for biomedical applications. *Bioinorganic chemistry and applications, 2018. Bioinorganic Chemistry and Applications*
- ^{vi} Carlsen, M. H., Halvorsen, B. L., Holte, K., Bøhn, S. K., Dragland, S., Sampson, L., ... & Blomhoff, R. (2010). The total antioxidant content of more than 3100 foods, beverages, spices, herbs and supplements used worldwide. *Nutrition journal*, 9(1), 1-11.
- ^{vii} Rodionov, R. N. (2003). Urate as an endogenous antioxidant. *Free Radicals in Biology and Medicine*, 77(222), 1-11.
- ^{viii} Ghorbani, H. R., Mehr, F. P., Pazoki, H., & Rahmani, B. M. (2015). Synthesis of ZnO nanoparticles by precipitation method. *Orient. J. Chem*, 31(2), 1219-1221.
- ^{ix} 19. Boury, B., & Plumejeau, S. (2015). Metal oxides and polysaccharides: an efficient hybrid association for materials chemistry. *Green Chemistry*, 17(1), 72-88.

^x 18. KS, S., Vellora Thekkae Padil, V., Senan, C., Pilankatta, R., George, B., Waclawek, S., & Černík, M. (2018). Green Synthesis of High Temperature Stable Anatase Titanium Dioxide Nanoparticles Using Gum Kondagogu: Characterization and Solar Driven Photocatalytic Degradation of Organic Dye. *Nanomaterials*, 8(12), 1002.

EMBEDDING VALUE EDUCATION ATTRIBUTES IN SCIENCE AND TECHNOLOGY: AN EFFECTIVE ROADMAP FOR STRENGTHENING AFFECTIVE DOMAIN

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ABSTRACT

This paper examines the importance of embedding value education attributes in science and technology education to strengthen the affective domain of learners. The paper provides a comprehensive overview of the theoretical foundations of value education, affective domain, and science and technology education. It discusses the need for integrating value education in science and technology education, considering the current educational landscape and the rapid advancement in science and technology. The paper presents a practical roadmap for embedding value education attributes in science and technology education, which involves developing appropriate learning materials, instructional strategies, and assessment tools. The effectiveness of the roadmap is demonstrated through a case study of its implementation in a science and technology course. The method used for the study was survey method including 30 B. Ed / M. Ed students. The paper concludes that embedding value education attributes in science and technology education can help learners develop important moral and ethical values, enhance their critical thinking, and foster their social and emotional well-being.

INTRODUCTION

Science and technology play an important role in value education by providing students with opportunities to develop critical thinking, problem-solving, and decision-making skills, as well as an understanding of the ethical and social implications of scientific and technological advancements.

One way that science and technology can contribute to value education is through the study of scientific inquiry and the scientific method. Students can learn how to ask questions,

formulate hypotheses, design experiments, and analyse data, which can help them develop a systematic and evidence-based approach to problem-solving.

In addition, science and technology education can help students develop an appreciation for the natural world and an understanding of environmental issues. Students can learn about the impact of human activities on the environment, as well as strategies for conservation and sustainability.

Technology education can also promote values such as collaboration, creativity, and innovation. Students can learn how to use technology tools to communicate, collaborate, and create, which can prepare them for future careers in science, technology, engineering, and mathematics (STEM) fields.

However, it is important to note that science and technology education must also address ethical and social issues, such as privacy, cybersecurity, and social responsibility. Students need to understand the potential impact of scientific and technological advancements on society and learn how to make responsible and ethical decisions.

Overall, science and technology can play an important role in value education by providing students with opportunities to develop critical thinking, problem-solving, and decision-making skills, as well as an understanding of the ethical and social implications of scientific and technological advancements.

In recent years, there has been a growing recognition of the importance of value education in fostering learners' moral and ethical values, critical thinking, and social and emotional well-being. At the same time, science and technology education has become increasingly important in preparing learners for the demands of the modern world. However, there is often a disconnect between these two areas of education. Embedding value education attributes in science and technology education can help to bridge this gap and provide learners with a holistic education that encompasses both technical skills and important values. This paper aims to provide a roadmap for integrating value education attributes in science and technology education to strengthen the affective domain of learners. The paper will first provide an overview of the theoretical foundations of value education, affective domain, and science and technology education. It will then discuss the need for integrating value education in science and technology education and present a practical roadmap for doing so. Finally, the paper will provide a case study to demonstrate the effectiveness of the roadmap. The integration

of value education in science and technology education can provide learners with the necessary skills and values to become responsible citizens who can contribute to the betterment of society.

OBJECTIVES

Value education through science and technology aims to impart ethical, moral, and social values along with scientific knowledge to individuals. Some of the objectives of value education through science and technology include:

1. **Developing an ethical and moral mindset:** The primary objective of value education is to instil a sense of ethics and morality in individuals. Science and technology provide a platform for exploring these values by examining the consequences of actions and understanding the impact of technology on society.
2. **Encouraging critical thinking:** The study of science and technology involves critical thinking and analysis, which can help individuals develop a questioning mindset. This can be applied to ethical issues and help individuals make informed decisions.
3. **Promoting social responsibility:** Value education through science and technology can promote social responsibility by highlighting the social, economic, and environmental impact of scientific and technological developments. This can encourage individuals to consider the broader implications of their actions.
4. **Fostering respect for diversity:** Science and technology education can foster respect for diversity by highlighting the contributions of individuals from different cultures and backgrounds. This can help individuals appreciate the value of diversity and promote social harmony.
5. **Encouraging innovation:** The study of science and technology can encourage individuals to think creatively and develop innovative solutions to problems. This can help individuals become agents of change and contribute positively to society.

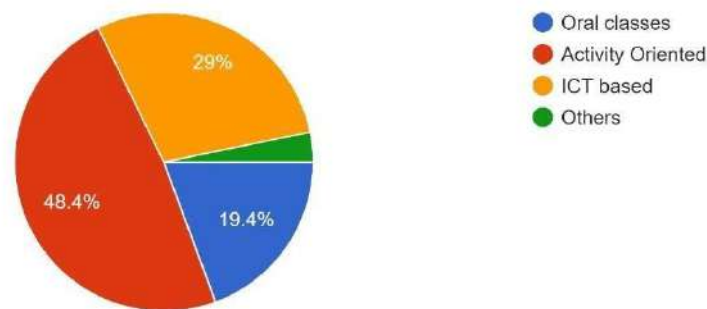
Overall, the objective of value education through science and technology is to develop well-rounded individuals who are not only knowledgeable about science and technology but also possess strong ethical, moral, and social values.

DATA ANALYSIS

We conducted a survey on the people to ensure validity of the problem. The 30 participants involved in the survey were B. Ed / M. Ed students. Implementation of the values in classrooms of different people are graphed below.

If yes, how did you implement it in the classroom?

31 responses



CHALLENGES FACED IN TODAY'S EDUCATION TO IMPLEMENT VALUE EDUCATION

There are several challenges that educators face in implementing value education in today's education system. Here are some of the common problems faced in implementing value education:

1. Lack of time and resources: With the pressure to complete the academic curriculum, teachers often struggle to find time to include value education in their lessons. Additionally, schools may not have the resources to provide training and materials for value education.
2. Cultural and linguistic diversity: Today's classrooms are often culturally and linguistically diverse, which can make it difficult to teach values that are relevant and meaningful to all students. Teachers need to be mindful of these differences and adapt their approach to meet the needs of their students.
3. Resistance to change: Some educators and parents may not see the value of teaching values in schools and may resist efforts to implement value education. This can create a challenge for schools and teachers who want to integrate value education into their curriculum.
4. Lack of standardized approach: Value education is often left to the discretion of individual teachers, resulting in a lack of standardized approach across schools and classrooms. This can create confusion and inconsistency in teaching values to students.

5. Lack of assessment and evaluation: There is often a lack of assessment and evaluation of the effectiveness of value education programs, which makes it difficult to determine their impact on students.

In order to overcome these challenges, it is important to create a supportive environment for value education. This can be done by providing resources and training for teachers, involving parents and the community in the process, and creating a standardized approach to teaching values that is relevant and culturally sensitive. Additionally, regular assessment and evaluation of value education programs can help to determine their effectiveness and make necessary adjustments.

SUGGESTIONS

Value education is a crucial aspect of a well-rounded education that aims to develop ethical and moral values in students. With the increasing use of technology in education, it is possible to implement value education through technology in innovative and effective ways. Here are some ways to implement value education through technology:

- **Gamification:** Gamification is the process of incorporating game-like elements into education to make it more engaging and interactive. By creating games that focus on ethical and moral values, students can learn and practice these values in a fun and engaging way.
- **E-learning modules:** E-learning modules can be created that cover various aspects of value education. These modules can include videos, quizzes, and interactive activities that help students learn and apply these values.
- **Social media:** Social media platforms can be used to share stories, quotes, and inspirational messages related to ethical and moral values. This can help create awareness and promote discussions on these values.
- **Online communities:** Online communities can be created where students can discuss and share their thoughts and experiences related to ethical and moral values. These communities can be moderated by teachers or other professionals to ensure that the discussions remain constructive and productive.
- **Augmented reality:** AR is another best tool for implementing value education in this technology world.

Implementation of augmented reality in value education

Augmented reality (AR) can be a powerful tool to implement value education. AR involves overlaying digital content on top of the real-world environment using a smartphone, tablet, or other devices. Here are some ways to implement AR in value education:

- **Interactive learning experiences:** AR can be used to create interactive learning experiences that engage students in a fun and immersive way. For example, AR can be used to create virtual simulations of ethical dilemmas where students can practice decision-making skills in a safe and controlled environment.
- **3D models:** AR can be used to create 3D models of objects or scenarios related to ethical and moral values. For example, AR can be used to create a 3D model of a historical monument or a natural wonder, which students can explore in detail.
- **Storytelling:** AR can be used to create interactive stories that teach important moral lessons. For example, AR can be used to create a story where students follow a character who faces ethical dilemmas and makes moral choices.
- **Cultural experiences:** AR can be used to provide students with immersive cultural experiences that teach them about the values and beliefs of different cultures. For example, AR can be used to create a virtual tour of a cultural landmark or a traditional festival.

To implement AR in value education, teachers will need to have access to AR technology and appropriate software. Additionally, teachers will need to receive training on how to use AR technology effectively in the classroom. Overall, AR can be a powerful tool for implementing value education as it provides students with immersive and engaging learning experiences that help them develop important moral and ethical values.

The effectiveness of implementing value education through technology depends on how well it is executed. It is important to ensure that the technology is accessible to all students and that the content is age-appropriate and culturally relevant. Additionally, it is important to monitor the effectiveness of the implementation through feedback from students and teachers. Overall, if implemented effectively, value education through technology can be a powerful tool for shaping the ethical and moral values of future generations.

CONCLUSION

Embedding value education attributes in science and technology education is a promising approach to strengthen the affective domain of learners. The theoretical foundations of value education, affective domain, and science and technology education provide a solid basis for the development of an effective roadmap for integrating value education in science and technology education. The roadmap involves developing appropriate learning materials, instructional strategies, and assessment tools. The case study presented in this paper demonstrates the effectiveness of the roadmap in enhancing learners' moral and ethical values, critical thinking, and social and emotional well-being. The integration of value education in science and technology education can also help learners to become responsible citizens who are able to use their knowledge and skills to address societal issues and promote the common good. Therefore, it is important for educators to recognize the value of value education and take steps to embed value education attributes in science and technology education for the benefit of learners and society as a whole.

Reference

1. *Arita Marini and et al, 2021, The effect of character values integration in teaching process on student behaviour in social studies class, Turkish journal of computer and mathematics education*
2. *Tuba Kunduroglu and et al, 2010, the effectiveness of values education program integrated with the 4th grade science and technology instructional program, Elsevier*
3. *Rizali Hadi, 2015, the integration of character values in the teaching of economics: A case selected high schools in Banjarmasin, International education studies*

MODERN TECHNIQUES FOR THE IDENTIFICATION OF PLANT SECONDARY METABOLITES WITH MEDICINAL PROPERTIES

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ABSTRACT

Plant secondary metabolites are chemical compounds produced by plants that are not essential for their growth and development but play important roles in their defence against herbivores, pathogens, and environmental stressors. Many of these secondary metabolites have been found to possess medicinal properties and are used in the development of drugs and other therapeutic agents. Throughout the beginning of time, people have employed plants for their therapeutic properties all across the world. The phytochemical components of plants, particularly the secondary metabolites, which are remarkable sources of value-added bioactive chemicals, provide the basis for their pharmacological activities. Secondary metabolites are created by plants in response to various types of stress to carry out diverse physiological functions. They have complicated chemical compositions. They are utilised in the food and beverage, cosmetics, pharmaceutical, and dietary supplement industries. This study tries to identify utilization of modern techniques for the identification & detection of plant secondary metabolites with medicinal properties.

Key words: Secondary metabolites, medicinal value, SEM, Chromatography, Modern techniques

OBJECTIVES

- To identify and isolate secondary metabolites from plants with potential medicinal properties using advanced techniques such as metabolomics, genomics, transcriptomics, proteomics, metabolic engineering, synthetic biology, SEM, and chromatography.
- To evaluate the therapeutic potential of identified secondary metabolites and develop new therapeutic agents for the treatment of various diseases.
- To promote the sustainable use of plant resources and protect plant biodiversity while utilizing modern techniques for the identification of secondary metabolites with medicinal properties.

INTRODUCTION

Plants have always been important components of both modern and traditional treatments. For their essential health and wellness, around 80% of the world's population depends on plant-derived ingredients. They are abundant in phytochemicals, which can miraculously cure illnesses and are employed in a variety of industries, including pharmaceuticals, cosmetics, nutraceuticals, etc. They are attracting increased interest from the increasing population because to their accessibility, affordability, eco-friendliness, and efficacy that is equivalent to expensive synthetic pharmacological agents. So, the initial focus of study on medicinal plants up to this point has been on pharmacognosy, phytochemistry, and horticulture. Finding methods to increase production of these goods without affecting their natural population is necessary because to the rising demand for them. Plant secondary metabolites are bioactive compounds produced by plants that play a crucial role in their survival and adaptation to environmental stressors. These metabolites, including alkaloids, terpenoids, flavonoids, and phenolics, have been found to possess medicinal properties and are used in the development of drugs and other therapeutic agents. In recent years, modern techniques have been developed to identify these compounds, which have greatly advanced our understanding of their biosynthesis and function.

Some examples for secondary metabolite and functions.

Taxol: Taxol is a secondary metabolite extracted from the bark of the Pacific yew tree. It is used as a chemotherapy drug to treat various types of cancer, including breast, ovarian, and lung cancer.

Artemisinin: Artemisinin is a secondary metabolite extracted from the sweet wormwood plant. It is used as an antimalarial drug to treat malaria, a life-threatening disease caused by the Plasmodium parasite.

Curcumin: Curcumin is a secondary metabolite found in the turmeric plant. It has anti-inflammatory and antioxidant properties and is used to treat a variety of conditions, including arthritis, digestive disorders, and cancer.

Resveratrol: Resveratrol is a secondary metabolite found in grapes and other plants. It has anti-inflammatory and antioxidant properties and is used to treat a variety of conditions, including cardiovascular disease, cancer, and diabetes.

Cannabinoids: Cannabinoids are a group of secondary metabolites found in the cannabis plant. They have analgesic, anti-inflammatory, and psychoactive properties and are used to treat a variety of conditions, including chronic pain, epilepsy, and anxiety disorders.

Quinine: Quinine is a secondary metabolite found in the bark of the cinchona tree. It is used as an antimalarial drug to treat malaria and has been used for centuries by indigenous South American peoples to treat fevers and other ailments.

METHODS

The identification of plant secondary metabolites with medicinal properties has been a challenging task due to the complex nature of plant secondary metabolites and the limited knowledge of their biosynthesis pathways. However, with the advent of modern techniques, significant progress has been made in this field. Firstly, plants are collected and processed to obtain extracts. The extracts are then subjected to various analytical techniques, including metabolomics, genomics, transcriptomics, proteomics, and metabolic engineering. Modern techniques for the identification of plant secondary metabolites with medicinal properties include:

Metabolomics involves the comprehensive analysis of all the small molecules produced by an organism. In the case of plants, this technique is used to identify and quantify secondary metabolites. By comparing the metabolite profiles of different plants or different plant tissues, researchers can identify secondary metabolites that are unique to specific species or organs.

Genomics involves sequencing the entire genome of a plant to identify genes that are involved in the biosynthesis of secondary metabolites. By analysing the genomic data, researchers can identify candidate genes that are potentially involved in the biosynthesis of specific secondary metabolites. They can then use targeted gene editing techniques, such as CRISPR-Cas9, to manipulate the expression of these genes and test their function.

Transcriptomics involves the analysis of the complete set of transcripts produced by a plant. This technique can be used to identify genes that are differentially expressed in response to different stimuli, including stressors, and that are involved in the biosynthesis of secondary metabolites. By analyzing the transcriptome of plants grown under different conditions or exposed to different stressors, researchers can identify candidate genes for further study.

Proteomics involves the analysis of the complete set of proteins produced by a plant. This technique can be used to identify proteins that are involved in the biosynthesis of secondary metabolites. By analyzing the proteome of plants grown under different conditions or exposed to different stressors, researchers can identify candidate proteins for further study.

Metabolic engineering involves the manipulation of the metabolic pathways in plants to enhance the production of desired secondary metabolites. This can be achieved by overexpressing genes involved in the biosynthesis of the desired compounds or by suppressing genes that compete for the same precursors. This technique has been used to increase the production of important secondary metabolites such as artemisinin, a potent antimalarial compound found in *Artemisia annua*. Overall, these modern techniques for the identification of plant secondary metabolites with medicinal properties have greatly advanced our understanding of the biosynthesis and function of these compounds and have opened up new avenues for the development of drugs and other therapeutic agents.

SEM is a powerful imaging technique that allows for the visualization of the surface structure of plant materials. By using a beam of electrons to scan the surface of the sample, SEM can produce high-resolution images that provide detailed information about the morphology and structure of the sample. In the case of plant secondary metabolites, SEM can be used to identify specific structures such as trichomes, which are specialized structures that

produce and store secondary metabolites. By analyzing the morphology of these structures, researchers can gain insight into the type and quantity of secondary metabolites produced by the plant.

Chromatography is a separation technique that can be used to isolate and identify specific compounds in a mixture. There are several types of chromatography, including high-performance liquid chromatography (HPLC) and gas chromatography (GC). In HPLC, a sample is dissolved in a liquid and injected onto a column packed with a stationary phase. The different components of the sample are then separated based on their interactions with the stationary phase and eluted from the column at different times. In GC, the sample is vaporized and injected into a column packed with a stationary phase. The components of the sample are then separated based on their interactions with the stationary phase and eluted from the column at different times. Both HPLC and GC can be used to separate and identify specific secondary metabolites in plants. By comparing the retention times of unknown compounds to those of known standards, researchers can identify specific secondary metabolites present in the sample. Additionally, mass spectrometry (MS) can be coupled with chromatography to provide additional information about the chemical structure of the compounds. By analyzing the mass-to-charge ratio of the ions produced by the compounds, researchers can identify the molecular weight and chemical formula of the compounds, which can help to further elucidate their structure and function.

CONCLUSION

In conclusion, the identification of plant secondary metabolites with medicinal properties is a crucial area of research that has the potential to lead to the discovery of new therapeutic agents. Modern techniques such as metabolomics, genomics, transcriptomics, proteomics, metabolic engineering, synthetic biology, SEM, and chromatography have greatly advanced our ability to identify and analyze secondary metabolites in plants. Metabolomics allows for the comprehensive analysis of all small molecules produced by a plant, while genomics, transcriptomics, and proteomics provide information about the genes and proteins involved in the biosynthesis of these molecules. Metabolic engineering and synthetic biology allow for the manipulation and optimization of metabolic pathways in plants to increase the production of desired secondary metabolites or to create novel compounds. SEM and chromatography provide detailed information about the structure and chemical composition of

plant materials and can be used to isolate and identify specific secondary metabolites in a mixture. These techniques can also be combined with other methods such as mass spectrometry to provide additional information about the chemical structure of the compounds. Overall, the application of modern techniques in the identification of plant secondary metabolites with medicinal properties holds promise for the development of new drugs and other therapeutic agents.

In summary, the identification of plant secondary metabolites with medicinal properties is a complex and challenging task. However, the application of modern techniques such as metabolomics, genomics, transcriptomics, proteomics, metabolic engineering, synthetic biology, SEM, and chromatography has greatly advanced our ability to identify and analyse secondary metabolites in plants. These techniques hold promise for the discovery and development of new therapeutic agents, but their use must be balanced with concerns for plant biodiversity and sustainability.

REFERENCE

- Ali, K.; Ali, A.; Khan, M.N.; Rahman, S.; Faizi, S.; Ali, M.S.; Khalifa, S.A.M.; El-Seedi, H.R.; Musharraf, S.G. Rapid Identification of Common Secondary Metabolites of Medicinal Herbs Using High-Performance Liquid Chromatography with Evaporative Light Scattering Detector in Extracts. *Metabolites* 2021, 11, 489. <https://doi.org/10.3390/metabo11080489>
- Barku, V. Y. (2019). Wound healing: contributions from plant secondary metabolite antioxidants. *Wound Heal Curr Persp*.
- Chandran, H., Meena, M., Barupal, T., & Sharma, K. (2020). Plant tissue culture as a perpetual source for production of industrially important bioactive compounds. *Biotechnology reports* (Amsterdam, Netherlands), 26, e00450. <https://doi.org/10.1016/j.btre.2020.e00450>
- Das, Kuntal & Gezici, Sevgi. (2018). Secondary plant metabolites, their separation and identification, and role in human disease prevention. *Annals of Phytomedicine: An International Journal*. 7. 13-24. 10.21276/ap.2018.7.2.3.
- Dewick, P.M. (2009). *Medicinal Natural Products: A Biosynthetic Approach* (3rd ed.). Wiley.
- Fang, J.L., Liu, X., Wang, W., Zhang, Y., Zhang, C., & Zhang, W. (2014). Metabolomics and its application in the field of medicinal plants. *Natural Product Research and Development*, 26(6), 1057-1064.
- Fukushima, E.O., Seki, H., Ohyama, K., Ono, E., Umemoto, N., & Mizutani, M. (2014). Metabolomic analysis of diverse rice genotypes and identification of conserved metabolic pathways. *Journal of Experimental Botany*, 65(1), 183-193.
- Hussein, R., & A. El-Anssary, A. (2019). Plants Secondary Metabolites: The Key Drivers of the Pharmacological Actions of Medicinal Plants. *Herbal Medicine*. doi: 10.5772/intechopen.76139

ANTI-PROLIFERATIVE PROPERTIES OF FINGERMILLET (*Eleusine coracana*) FOR HEALTH

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ABSTRACT

Science includes the systematic study through observation and experiment, and technology is the application of scientific knowledge. Technology helps in detecting diseases as well as finding drugs in healthcare field. Plants are a great source of medicines. The present study was conducted for the evaluation of antiproliferative properties of *Eleusine coracana* seed extract. Antiproliferative assay was determined by cell viability test using yeast cells (*Saccharomyces cerevisiae*). GCMS analysis of polar and non-polar seed extracts of *Eleusine coracana* were analyzed for detecting bioactive compounds.

INTRODUCTION

Science includes the systematic study through observation and experiment, and technology is the application of scientific knowledge. Science and technology make life easier and more comfortable for man. It enables us to save time and money. Science and technology open up new perspectives of understanding. In addition, technology helps medical providers in detecting diseases and finding drugs. Science provides knowledge that can be applied to enhance the field of healthcare in the world. Science and healthcare are closely interconnected and there is need to come up with measures that enhance the benefits of science in same. The advantages of health information technology is vast. Healthcare advancements will not be possible without proper research done by medical scientists. With the use of technology, effective procedures are available that can help diagnose, prevent, and cure all kinds of diseases. Technology changed every aspect of our lives. In the past two hundred years, advancements in the medical field have helped and saved many lives from all around the world. Now, doctors and patients can easily talk

to each other through video conferences or other methods helps in the diagnosis and treatments. It breaks down the molecular mechanism of any disease and contributes to the development of drugs and pharmaceuticals. In addition to curative healthcare, Basic Medical Sciences sow the seeds of preventive healthcare.

Eleusine coracana (finger millet) is a plant that belongs to the family Poaceae. It is widely grown in Africa and Asia. It is a popular millet in India. These plants are a good source of antioxidants (Gull, Prasad, & Kumar, 2015). Flavonoids and condensed tannins are the main components in finger millet which give colour to the finger millet grain (Priyanwada, Ruvini, Barana, & Janak, 2020). The phenolics and vitamins are concentrated in the outer layers of the grain (Devi, Sathyabama, Vijayabharathi, Malleshi, & Priyadarisini, 2014). Many studies have been conducted to evaluate the various claims that it can improve health and treat various diseases. The use of medicinal plants in India contributes a major part to basic health treatments. Thousands of plants are found to have medicinal properties. Thus research on plants of medicinal properties was increased. Nowadays the synthetic drugs have been taken the position of medicinal plants. But synthetic drugs can develop resistance against particular diseases. Plants have antioxidant properties due to the presence of various bioactive compounds which includes phenolics, flavonoids, alkaloids, terpenes, and saponins (Gupta & Patel, 2020). Knowledge of phytochemical constituents in a plant is important to understand the mechanism of bioactivity of plant extracts. Anti-oxidant compounds such as phenolic acids, polyphenols, and flavonoids scavenge free radicals and inhibit oxidative stress. Certain bioactive compounds like phenolic compounds give antioxidant property to finger millet (*Eleusine coracana*). Finger millets are an important source of phytic acid, tannins, and flavonoids, peptides, and insoluble fibres (Udeh, Jideani, & Duodu, 2018). Antioxidants effectively inhibit the DNA damage and uncontrolled division of cells (Gupta & Patel, 2020). Antioxidants can disrupt the formation of free radicals and reduce oxidative stress, which ultimately prevents cancer (Khor, Lim, Moses, & Samad, 2018).

Objectives

- Antiproliferative activity of *Eleusine coracana* seed extract using yeast (*saccharomyces cerevisiae*)
- GCMS Analysis of *Eleusine coracana* seed extract

MATERIALS AND METHODS

Preparation of seed extract

The finger millet (*Eleusine coracana*) seeds were collected from local market in Kerala. It was cleaned, shade dried and powdered. This powder of *Eleusine coracana* (25g) were used for soxhlet extraction with 250ml distilled water (85°C) for 24-48 hours. The extracts were concentrated by evaporating the extract in rotary evaporator. The dried extract was kept in air tight containers in cool temperature.

GCMS Analysis

In GCMS analysis of chloroform extract, Ethyl acetate extract, and Hexane extract of *Eleusine coracana* was done to detect significant bioactive compounds.

Antiproliferative assay using Yeast (*Saccharomyces cerevisiae*)

Dried yeast was activated and incubated in YPD Broth for 24 hours at 37°C (Gélinas, 2019). Plant extracts were dissolved in 100% DMSO and made 1mg/ml, 2mg/ml, 3mg/ml solutions. 0.5 ml of yeast inoculum and 2.5 ml of YPD broth was treated with 1 ml of each concentrations. The mixture was incubated for 24 hours at 37°C. Each concentrations of extracts were mixed with 0.1 % methylene blue and number of dead cells (Stained blue cells) and live cells (unstained transparent cells) were counted using haemocytometer under low power microscope.

$$\text{Viable cells / mL} = \text{average number of viable cell in one square} \times \text{dilution factor} \times 10^4$$

$$\text{Percentage of cell viability} = \text{Total viable cells} / \text{Total cells} \times 100$$

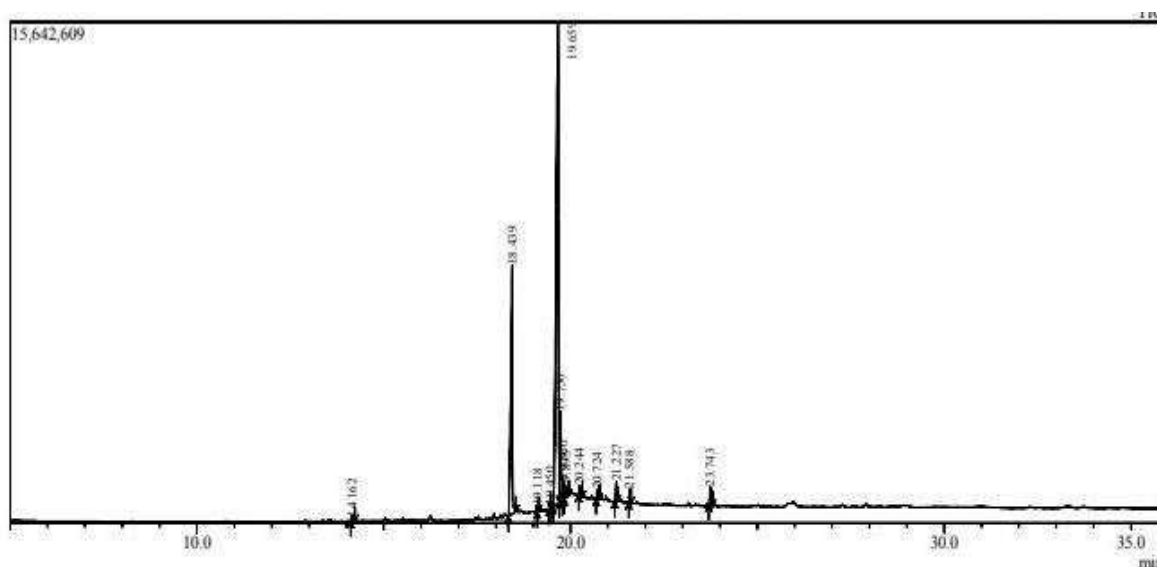
Ingredients	Grams/litre
Peptone	20
Yeast extract	10
Dextrose	20
Agar	15

TABLE 1. Composition of YPD Agar

RESULT AND DISCUSSION

GCMS Analysis

In GCMS analysis of chloroform extract of *Eleusine coracana* the compounds like Lanosterol, Cis-vaccenic acid, N-hexadecanoic acid, 2, 4- Di-tert-butylphenol, 2, 5-cyclohexadiene-1, 4dion were found. The ethyl acetate extract of *Eleusine coracana* showed compounds like 2-propenoic acid, tridecyl ester, n-Hexadecanoic acid, Oleic Acid, Tetradecanoic acid, Dodecanoic acid, is 2-ethylhexyl phthalate.



Peak#	R.Time	Area	Area%	Height	Height%	A/H	Name
1	14.162	424863	0.42	153265	0.52	2.77	Dodecanoic acid
2	18.439	24313736	24.26	7767892	26.51	3.13	n-Hexadecanoic acid
3	19.118	342102	0.34	203903	0.70	1.68	1-Eicosanol
4	19.450	162826	0.16	141500	0.48	1.15	Eicosane
5	19.659	60913111	60.79	15028665	51.28	4.05	Oleic Acid
6	19.730	6063877	6.05	2819248	9.62	2.15	Octadecanoic acid
7	19.800	1355500	1.35	654110	2.23	2.07	Hexadecanamide
8	19.895	1897727	1.89	254573	0.87	7.45	10(E),12(Z)-Conjugated linoleic acid
9	20.244	495537	0.49	310932	1.06	1.59	Glycidyl palmitate
10	20.724	785384	0.78	287286	0.98	2.73	9-Octadecenamide, (Z)-
11	21.227	1353404	1.35	635892	2.17	2.13	Glycidyl palmitoleate
12	21.588	728263	0.73	454021	1.55	1.60	Bis(2-ethylhexyl) phthalate
13	23.743	1372174	1.37	593082	2.02	2.31	Squalene
		100208504	100.00	29304369	100.00		

Fig.1 GCMS chromatogram of Hexane extract

Lanosterol present in the chloroform extract of *Eleusine coracana* maintain cholesterol homeostasis and also critical for drug-resistant leukaemia cancer cells (Lasunción, Sánchez, Duque, & Busto, 2012) . Lanosterol inhibit the cell cycle progression (Lasunción, Sánchez, Duque, & Busto, 2012) . The cholesterol metabolism is essential for cancer cell proliferation. Increase in lanosterol synthesis is not accompanied by an increase in cholesterol flux (Lasunción, Sánchez, Duque, & Busto, 2012) . Increased lanosterol flux poses a metabolic weakness of resistant cells that potentially could be therapeutically exploited (Staubert, et al., 2016) . Cis- vaccenic acid was found to reduce the growth of HT-29 human colon cancer cells by 23% (Awad, Hermann, Finsk, & Horvath, 1995).

N-hexadecanoic acid is a fatty acids which inhibit DNA topoisomerase-I and prevents the proliferation of human fibroblast cells (Ravi & Krishnan, 2017). N-hexadecanoic acid showed significant cytotoxicity against human colorectal carcinoma cells (HCT-116) (Ravi & Krishnan, 2017). 2, 4- Di-tert-butylphenol was found to inhibit the proliferation of AGS gastric cancer cells (Song, Lim, & Cho, 2018). 2, 5-cyclohexadiene-1,4dion showed cytotoxicity against almost human tumour cells (Petronzi, Festa, Peduto, Castellano, & Marinello, 2013).

Decanoic acids was found to reduce the cancer cell viability by 70% to 90% compared to controls (Narayanan, Baskaran, Amalaradjou, & Venkitanarayanan, 2015) . Oleic acid plays a role in antitumoral effects reported in clinical studies (Carrillo, Cavia, & Alonso-Torre, 2012) . Oleic acid could suppress the over-expression of HER2, an oncogene which plays a key role in the etiology (Carrillo, Cavia, & Alonso-Torre, 2012) . Studies reported that inhibition in cell proliferation by oleic acid in different tumor cell lines (Carrillo, Cavia, & Alonso-Torre, 2012). Squalene reported to have an inhibitory effect on cancer growth and a high anti-tumor activity (Gunes, 2013). It is used in therapy of variety of cancers. Squalene's anti-cancer properties are interesting and promising (Gunes, 2013). Migration of cancer cells was suppressed by eicosane the acetone extract (Mishra, Verma, Rai, Awasthee, & Arya, 2019) . n-tetradecanoic acid, n- dodecanoic acid, and n-octadecanoic acid have differentiation and cytotoxic and apoptotic effectson breast cancer cells (mrrlado, 2019). This suggests that the anti-cancer properties of *Eleusine coracana* could be attributed to the bioactive compounds present in the extract of this plant

Concentration (mg/ml)	viable cells	total cells	viable cells/ml	% cell viability
1	10	12	70×10^4	83.3
2	11	14	63×10^4	78.5
3	7	12	49×10^4	58.3

Table 2. Percentage cell viability of yeast cells in antiproliferative assay

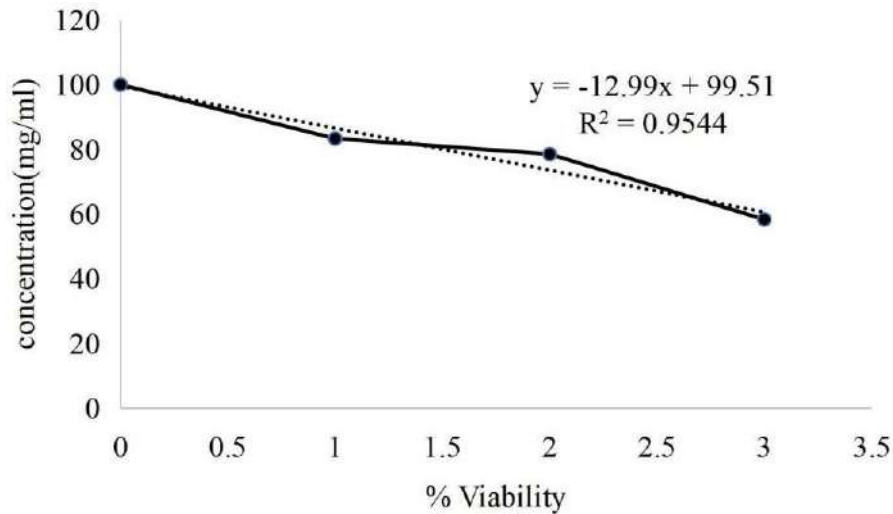


Fig.2 graphical representation of percentage cell viability of yeast

CONCLUSION

Present study on antiproliferative activity of *Eleusine coracana* suggests that it has potential antimitotic properties. These activity showed the presence of major bioactive compounds and biochemical constituents in this plant due to which it might be used as potential source of drug. Overall, the studies described here in illustrate that *Eleusine coracana* extracts have huge potential to be developed into an anticancer drug.

REFERECES

- Udeh, H. o., Jideani, A., & Duodu, K. G. (2018). Malting Period Effect on the Phenolic Composition and Antioxidant Activity of Finger Millet (*Eleusine coracana* L. Gaertn) Flour. *molecules*.
- Asare, G. A., Addo, P., Bugyei, K., Gyan, B., Samuel, A., Otu-Nyarko, L. S., . . . Adje, D. N. (2011). Acute toxicity studies of aqueous leaf extract of *Phyllanthus niruri*. *interdisciplinary toxicology*, 4(4), 206-210.
- Awad, A., Hermann, T., Finsk, C. S., & Horvath, P. J. (1995). n7 fatty acids inhibit growth and decrease inositol phosphatase release in HT-29 cells compared to n9 fatty acids. *Cancer letters*, 91(1), 55-61.
- Carrillo, C., Cavia, M., & Alonso-Torre, S. (2012). Antitumor effect of oleic acid; mechanisms of action. A review. *Nutricion hospitalaria*, 26(7), 1860-1865.
- Deepthi, K., & menon, M. (2015). Altered enzyme activity in greengram seeds treated with antimetabolic herbal drugs. *International journal for current research*, 7(6), 17217-17223.
- Devi, P. B., Sathyabama, s., Vijayabharathi, R., Malleshi, N. G., & Priyadarisini, V. B. (2014). Health benefits of finger millet (*Eleusine coracana* L.) polyphenols and dietary fiber: a review. *foodscience technology*, 51(6), 1021-1040.
- Doshi, G. M., & Kanade, P. P. (2017). Evaluation of bioactivity of *Cucurbita pepo* L., *Cucumis melo* L. *Cucumis sativus* L. seed extracts. *Indian Journal of experimental biology*, 57, 269-273.
- Sarita, & Chauhan, E. S. (2017). Antioxidant properties of germinated millets (*Eleusine coracana* & *Pennisetum glaucum*): A Comparative study. *International Journal of Food Science and Nutrition*, 2(2), 75-78.
- Singh, N., Sekhar, A., Meenu, G., & Abraham, J. (2015). Evaluation of antimicrobial and anticancer properties of finger millet (*Eleusine coracana*) and pearl millet (*Pennisetum glaucum*) extract. *The Pharma innovation*, 3(11), 82-86.

ROLE OF TECHNOLOGY IN MITIGATION OF EXAMINATION MALPRACTICES

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ABSTRACT

Education, being a process of teaching and learning and it is evaluated through examination at the end of learning period. Examination not only serve as feedback for the trainer to know the level of knowledge acquisition but also serves as a measure of knowledge retention by the trainee. Any malpractice or irregularity distorts the objective of examination and gives a false outcome to the learning process. The study entitled –ROLE OF TECHNOLOGY IN MITIGATION OF EXAMINATION MALPRACTICES –shows the causes and forms of examination malpractices among the students of GHSS Irikkur. The study is based on both primary and secondary data. The primary data are collected from 10 respondents of the student teachers practicing at GHSS Irikkur during their internship period, on the basis of their invigilation duty of Second Terminal Examination, through Google form and structured questionnaire. The secondary data has been also collected from articles and websites. The analysis made it clear that malpractices in the exam hall is the important issue and the study revealed that the major form of malpractices is the introduction of unauthorized materials into the exam hall due to the reason of laziness. And so that there is an increase in the need for technology to mitigate the menace of examination malpractices include scanners and e-search software, facial recognition technology, biometric system and Closed-Circuit Television (CCTV). And the study also recommends that government and other stakeholders in the education system should pay more attention to the menace of examination

malpractices and also provide the adequate facilities needed for the use of technology for the mitigation of examination malpractices.

Keywords: Examination malpractices, Mitigation, Technology

INTRODUCTION

The oxford advanced learners dictionary (2000) defined examination as spoken or practical test at school or college especially an important one that you need to do in order to get a qualification. A test may be administered orally, on a paper, on a computer or in confined area that requires a test taker to physically perform a set of skills.

Examination malpractice is defined as any deliberate act of wrong doing, contrary to the rules of examinations designed to give a candidate an undue advantage. Examination malpractice also known as cheating is the illegal action that students take during their examinations to try to make good grades by cutting corners. Examination malpractice has done a lot of harm to students since many of them have neglected their books with the hope of Performing the magic they are used to in every examination. (Oko, Sylvanus U Shine and Adie, Roseline Ishanga,2016)

Many of these irregularities or misconducts surround examination and it came to an alarming rate in the last three decades. The society does not want to know how an individual achieves success. The important thing is the success. In actual fact examination malpractice is a variant of the wrongs and corruption in the society. All sorts of misconducts take place in and around examination venues to take undue advantage of the process and achieve –success. To make matter worse it is not only students that are involved, Business centres inside or around schools, parents, teachers, school heads, and examination officers all collude with students to perpetrate this misconduct.

(<https://thenigerialawyer.com/examination-malpractice-and-powers-of-examination-Body-to-discipline-students/>)

From all the definitions, it is clear that examination malpractice tends to confer undue advantage or undeserved grade to the perpetrators of the act. Again, it may be committed by not only the candidates but also by other bodies charged with the responsibilities of examination management. Undoubtedly, examination malpractice has been a social problem for decades, but the rate and manner it is perpetrated nowadays calls for serious concern. The rate of this crime has become so widespread that there is virtually no examination anywhere at all levels and outside the formal

school system that there is no one form of illegal practice or another. Examination malpractices are common everywhere and every examination season witnesses the emergence of new and ingenious ways of cheating. (Onyibe O C, Uma U Uma and Ibina Emmanuel,2015)

OBJECTIVE

- To assess the common forms of examination malpractices in the study area
- To find out the reasons of examination malpractice among HSS students in the examination hall

METHODOLOGY

The study tries to find out the forms and causes of examination malpractices among HSS students and the role of technology in mitigation of examination malpractices. The study is based on both primary and secondary data. The primary data is collected through Google form method by using structured questionnaire. The study was concentrated on GHSS Irikkur and 10 student teachers in Higher Secondary section were selected for the survey. The secondary data has been also collected from various articles and websites.

ANALYSIS OF DATA

Classification on the role of invigilator or assisted the invigilator

The invigilator supervises the examinations and to ensure that guidelines and regulations for the integrity and security of the examination papers and procedures are followed during examination. The below table shows whether the sample respondents possess the role of invigilator or assisted the invigilator.

SL NO	Role of invigilator or assisted the invigilator	No. of respondents	Percent
1	Yes	10	100%
2	No	0	0%
	Grand total	10	100%

Source: Primary data

In the above table shows the Classification on the basis of whether the student teachers act the Role of invigilator or assisted the invigilator. Out of the 10 samples, all the student teachers that is 100%, take the role of invigilator or assisted the invigilator in the exam hall.

Classification as to whether irregularities were found in the examination hall

The table shows whether student teachers found irregularities in exam hall or not.

SL NO	Whether malpractice found in the exam hall	No. of respondents	Percent
1	Yes	10	100%
2	No	0	0%
	Grand total	10	100%

Source: Primary data

In the above table, all the respondents that are 100% have identified irregularities or malpractices in the exam hall.

Forms of malpractices

Examination malpractice may be of various forms like Coping from another candidate's work with or without permission, passing of information between candidates, Introduction of unauthorized materials into the examination hall, Use of coded sign language etc. and the below table shows the various forms of malpractice identified within the exam hall by the respondents in the study area.

SL NO.	Forms of malpractice	Number of respondents	percent
1	Coping from another candidate's work with or without permission	5	23.81%
2	Passing of information between candidates	6	28.57%
3	Introduction of unauthorized materials into the examination hall	7	33.33%
4	Use of coded sign language	3	14.29%
5	Other	0	0%
	Grand total	21	100%

Source: Primary data

Out of the 10 samples, the above table shows that 21 respondents have identified various forms of malpractices in the exam hall. That is, it will shows that one respondent have identified more than one form of malpractices in the exam hall. In that majority of the respondents have identified

introduction of unauthorized materials into the examination hall that is 33.33%. Around 28.57% have identified passing of information between candidates and 23.81% of the respondents have identified coping from another candidates work with or without permission from the exam hall. The remaining portion of 14.29% of the respondents have identified use of coded sign language as a form of malpractices in the exam hall. Mainly the above-mentioned form of malpractices has identified by the respondents in the exam hall and no one have identified other forms of malpractices in the study area.

Reasons of malpractice

Students engaged in exam malpractice due to various reasons like Laziness, Personal influence, learning difficulty, Fear of failure, achieve good marks etc. and the below table shows the various reasons of malpractice in the study area.

SL NO.	Reasons of malpractice	Number of respondents	percent
1	Laziness	6	40%
2	Personal influence	1	6.67%
3	Learning difficulty	2	13.33%
4	Fear of failure	4	26.67%
5	Achieve good marks	2	13.33%
6	Others	0	0%
	Grand total	15	100%

Source: Primary data

The above table shows that out of 15 respondents, 40% of the respondents revealed that laziness is the main reason of students engaged in exam malpractices. Around 26.67% of the respondents shows that fear of failure is the reason of malpractice in the exam hall. And 13.33% of the respondents belong to the reasons of learning difficulty and achieve good marks. The remaining portion of 6.67%, revealed that personal influence is the reason for exam malpractice

SUMMARY AND CONCLUSIONS

Education is the main important thing for the development of a society and also the development of a country. Examinations contained in the educational system helps every teacher to understand the mental capacity of the students and to rectify their shortcomings. In turn it helps the students

to perform and think as the way it should be done. But the painful thing is that there is an increase in examination malpractice by students from different parts of the world. There is always a reason for any action that a person takes: be it legal or illegal action. Students do not engage themselves in examination malpractices just because they want to do it; rather there are things that lead them to such illegal actions.

The present study was made among B.Ed. Student teachers in their internship period from GHSS Irikkur on the basis of second terminal examination. From the analysis above, it is apparent that the major causes of examination malpractices among the students are laziness and the main form of examination malpractices is for the introduction of unauthorized materials into the examination hall. In a nutshell, engaging in examination malpractice constitutes academic dishonesty. And in that the role of technology have high role for the mitigation or fight the menace of examination malpractice. Technology offers various solutions for the mitigation of examination malpractices and some of these technologies include scanners and e-search software, facial recognition technology, biometric system and Closed-Circuit Television (CCTV). Examination malpractices viewed as a major challenge not only to examination bodies but to school administrators, the entire education system, the government and the society at large. So, the study also recommends that government and other stakeholders in the education system should pay more attention to the menace of examination malpractices and also provide the adequate facilities needed for the use of technology for the mitigation of examination malpractices

MAJOR FINDINGS

- ❖ Out of the 10 samples, all the student teachers that is 100%, take the role of invigilator or assisted the invigilator in the exam hall.
- ❖ All the respondents that is 100% have identified irregularities or malpractices in the exam hall.
- ❖ Majority of the respondents have identified introduction of unauthorized materials into the examination hall that is 33.33%. And the other forms of exam malpractices identified by the respondents in the study area are Coping from another candidate's work with or without permission, passing of information between candidates, Use of coded sign language.
- ❖ Students engaged in exam malpractice due to various reasons like Laziness, Personal influence, learning difficulty, Fear of failure and achieve good marks. And 40% of the respondents revealed that laziness is the main reason of students engaged in exam malpractices.

SUGGESTIONS

- ❖ Teachers and parents must work hand in hand to fight the menace of examination malpractice
- ❖ Students have developed sophisticated and new forms of cheating during examination, so the introduction of scanners and e-search software to help curb the new methods that students have adopted to cheat.
- ❖ Ban on the use of smart watches in the examination halls should be enforced to check the new wave of e-cheating.
- ❖ Government should allocate more funds to education to ensure the adequate facilities needed for the use of technology.
- ❖ Give more importance to the problem of power supply and given attention to enhance the use of technology in examination.
- ❖ Sound educational policy is needed for de-emphasis on the supremacy of certificates over skills and professional competence.
- ❖ Technology should be integrated into the learning process and it will help the students to improve the understanding of concepts and also helps to improve their confidence in writing exams.
- ❖ The invigilators should be very vigilant in the supervision of examination and should be fair to all.
- ❖ Counsel the students to refrain from involving themselves in actions that are contrary to the rules and regulations of exams.
- ❖ Sitting arrangements should be spaced enough, so that it would be extremely difficult for students to see the writings of colleagues sitting beside them or in front of them.
- ❖ Closed Circuit Television (CCTV) cameras should be installed in large examination halls, and also encourage invigilators to do thorough checks on students before allowing them into the examination halls.

REFERENCE

- ❖ Ampofo Agyei Justice, *Causes and Effects of Examination Malpractices Among Junior High School Students in New Edubiase*, International Journal of Management and Entrepreneurship Research, Vol.2, Issue 7, 30 December 2020, Pp. 492-511.

- ❖ Ifeoma P Okafor, *Causes and Consequences of Examination Malpractice Among Senior Secondary School Students in Eti-Osa L.G.A of Lagos State, Nigeria*, Canadian Journal of Family and Youth, 2021, Pp.84-98.
- ❖ John Dadzie Thompson, Gilbert Ansoglenang and Suuk Laar, *Why Do Students Engage in Examination Malpractice? The University for Development Studies Experience*, Journal of Social Science Studies, Vol.7, 23 August 2019.
- ❖ O C Onyibe, Uma U Uma and Ibina Emmanuel, *Examination Malpractice in Nigeria: Causes and Effects on National Development*, Journal of Education and Practice, Vol.6, 2015.
- ❖ [https:// thenigerialawyer.com/examination-malpractice-and-powers-of-examination-body-to-discipline-students/](https://thenigerialawyer.com/examination-malpractice-and-powers-of-examination-body-to-discipline-students/)

EFFECT OF TECHNOLOGY IN BUILDING ATTENTIVE MATHEMATICS CLASS ROOM

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ABSTRACT

This study is to investigate the effects of implementing technology into a high school Mathematics classroom. Mathematics is considered as the queen of all sciences. One learning strategy that can be implemented throughout the curriculum that can help students succeed in Mathematics is the use of technology in the pedagogy of the classroom. In this study we used the method of observation, teacher- learner interaction, and the questionnaire .This study was mainly focused on a group of 31 students in high school level. At the end, we found that technology based learning help the students to increase their interest level towards mathematics. Also it helps to create a less-anxious mathematics environment for students, help motivate students, and help students get a deeper understanding of the mathematical content. It was concluded that the technologies used in high school level mathematics teaching have a small positive effect on students' mathematics achievement.

INTRODUCTION

According to Carl Friedrich Gauss, -Mathematics is the queen of sciences. Technology in education refers to the study and ethical practice of facilitating learning and improving performance by creating, using and managing appropriate technological processes and resources.

Use of technology serves as a motivation for teachers due to the positive outcomes achieved. Technology leads to teaching that is more effective and this leads to better performance for the students. Teachers are therefore motivated in their work due to these good results.

Technology provides additional opportunities for learners to see and interact with mathematical concepts. We can bring videos, animations, interesting movies and other media into the learning process to help our students develop skills and understandings. And it can help to motivate and

excite our students about their can explore and make discoveries with games, puzzles and digital tools.

Here is an attempt to find out the effect of technology in building attentive mathematics classroom in high school level. This study was conducted on a group of 31 students in high school level. The tools used in this study were observation, teacher- learner interaction, and the questionnaire.

REVIEW OF LITERATURE

Findings from a number of studies have shown that the strategic use of technological tools can support both the learning of mathematical procedures and skills as well as the development of advanced mathematical proficiencies, such as problem solving, reasoning, and justifying (e.g., Gadanidis & Geiger, 2010; Kastberg & Leatham, 2005; Nelson, Christopher, & Mims, 2009; Pierce & Stacey, 2010; Roschelle, et al., 2009, 2010; Suh & Moyer, 2007).

In a balanced mathematics program, the strategic use of technology strengthens mathematics teaching and learning (Dick & Hollebrands, 2011). Simply having access to technology is not sufficient. The teacher and the curriculum play critical roles in mediating the use of technological tools (King-Sears, 2009; Roschelle, et al., 2010; Suh, 2010). Teachers and curriculum developers must be knowledgeable decision makers, skilled in determining when and how technology can enhance students' learning appropriately and effectively (ISTE, 2008). All schools and mathematics programs should provide students and teachers with access to instructional technology—including classroom hardware, handheld and lab-based devices with mathematical software and applications, and Web-based resources—together with adequate training to ensure its effective use.

It is widely agreed that flexibly changing between different forms of representations, like graphical, algebraic, and numerical representation, is crucial for comprehension of mathematical concepts (Duval, 2006). Technology can be used to support easy access to different forms of representations and to provide simultaneous access to multiple, linked representations in order to develop understanding of the subject at hand (e.g., Hegedus & Roschelle, 2013).

Technology can be used to assist students in exploring, discovering, and developing mathematical concepts on their own, for example, by investigating regularity and variation (e.g.,

Hoyles et al., 2013). This can be achieved, for example, by generating examples and exploring patterns, providing students with the opportunity to learn mathematics as a constructive activity.

OBJECTIVES OF STUDY

- To find the interest level of students towards mathematics
- To increase students' interest level towards mathematics
- To build attentive mathematics classroom

METHODOLOGY

a) Collection of data

The sample of study includes 31 students in high school level.

b) Tools used for study

1. Observation

The technique of keen observation is used to understand the interest level of students towards the subject mathematics and also to understand the active participation of students in learning activities.

2. Teacher- learner Interaction

The technique of personal and classroom interaction with students is used to understand fear and interest towards the subject mathematics.

3. Questionnaire

Two tests were conducted using questionnaire consisting of 10 questions. First test was used to know students basic knowledge in mathematics and the second one is used to know the improvements in their learning.

Questionnaire

- 1) Solve 34×26
- 2) Solve $257 - 39$
- 3) Solve $365 \div 5$
- 4) Find $\frac{3}{4} + \frac{2}{6}$
- 5) Calculate , $-5 + 3$

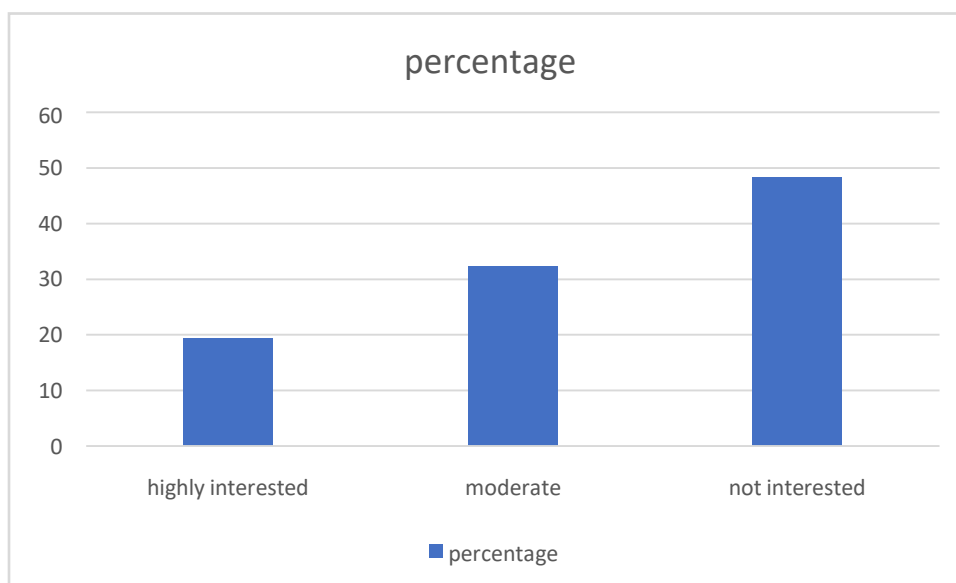
- 6) Solve 3.5×6
- 7) Find the area of circle with radius 4cm
- 8) Area of a square is 16 cm^2 . Then find the sides of the square.
- 9) Draw a circle with radius 2.5cm
- 10) Draw a triangle with sides 4cm , 5cm and 6 cm .

DATA ANALYSIS

Interest level of students towards mathematics

The table given below shows the interest level of students towards the subject mathematics. About 19.35% of students are highly interested in mathematics. Also the table shows that about 32.26 % of students are moderate feeling and 48.39 % students are not interested in mathematics.

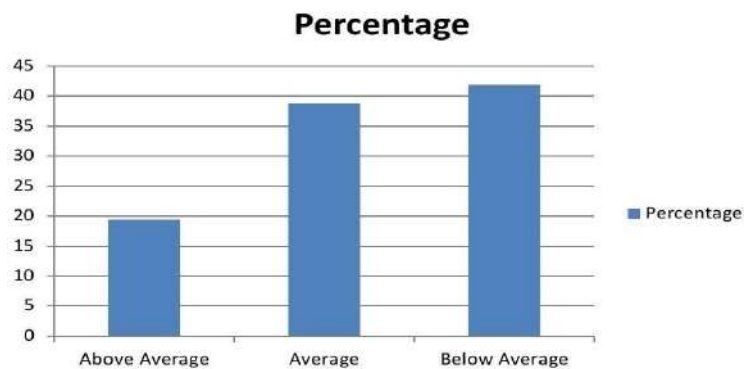
Interest level of students	Number of students	Percentage
Highly interested	6	19.35
Moderate	10	32.26
Not interested	15	48.39
Total	31	100



Findings from Test 1

A test was conducted among 31 students in high school level. It showed that majority of the students had difficulties in doing simple mathematics problems. The table below shows the level of students in doing basic mathematics problems. It shows that about 19.35% students belong to above average category, 38.8 % students. Belongs to average category and 41.85% belongs to below average category.

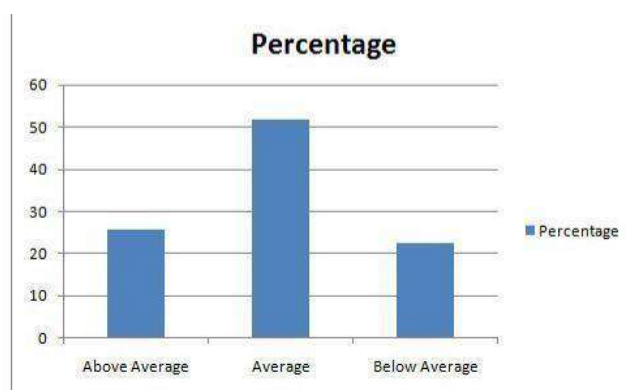
Range of Students	Number of Students	Percentage
AboveAverage	6	19.35
Average	12	38.8
Below Average	13	41.85
Total	31	100



Findings from Test 2

Some technological tools like PPT, Videos, Geogebra, Open board, Cartoons...etc. were used in the class. After that, we conducted a test with 10 questions; an improvement in their performance was noticed. The table given below shows that percentage of above average students changed into 25.8%, average students changed into 51.61% and below average students changed into 22.59%.

Range of Students	Number of Students	Percentage
Above Average	8	25.8
Average	16	51.61
Below Average	7	22.59
Total	31	100



CONCLUSIONS

The mathematics classroom has gone far beyond the image of a teacher, a chalkboard and a bunch of bored students. Today's mathematics classroom engages students through learning challenges and through the use of many different kinds of technology. Teachers use technology to plan lessons, teach lessons and keep track of student progress.

The study was named -Effect of technology in building attentive mathematics classroom. The study was conducted on a group of 31 students in high school level.

About 19.35% of students are highly interested in the subject Mathematics. About 32.26 % of students are moderate feeling and 48.39 % students are not interested in the subject Mathematics. The first test used to check the basic mathematics knowledge level of the students. In the test, about 19.35% students belong to above average category and 38.8% belongs to average category. Also 41.85 % belongs to below average category. Second test was done after using some technological tools like PPT, Videos, Geogebra, Open board, Cartoons,... etc in teaching process. Second test showed a result of improvement in students' performance. The percentage of above

average students changed to 25.8% and average students changed into 51.61 % and the percentage of below average students' decreased to 22.59%.

From this study we understood that effective use of technology increases the interest of the students towards the subject Mathematics. Also it helps to remove students' fear towards the subject. This research indicates that by use of technology, students are able to learn mathematics more deeply. Effective teachers optimize the potential of technology to develop students' understanding, stimulate their interest, and increase their proficiency in mathematics. When teachers use technology strategically; they can provide greater access to mathematics for all students.

REFERENCE

1. Dick, T. P., & Hollebrands, K. F. (2011). *Focus in high school mathematics: Technology to support reasoning and sense making*. Reston, VA: NCTM.
2. Hoyles, C., Noss, R., Vahey, P., & Roschelle, J. (2013). Cornerstone mathematics: Designing digital technology for teacher adaptation and scaling. *ZDM-Mathematics Education*, 45(7), 1057–1070.
3. <https://link.springer.com/article/10.1007/s10649-021-10072-x>
4. <https://www.texthelp.com/resources/blog/what-are-the-benefits-of-using-technology-formath/#:~:text=Technology%20provides%20additional%20opportunities%20for,%20based%20graphing%20calculator%2C%20Desmos.>
5. <https://link.springer.com/article/10.1007/s13347-019-00348-9>
6. <https://ivypanda.com/essays/the-impact-of-technology-on-the-learning-and-teaching-of-mathematics/>

ENHANCEMENT OF THERMOELECTRIC PROPERTIES

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ABSTRACT

Renewable energy sources are major solution for current energy crisis in this world. Thermoelectric materials that are able to convert thermal energy directly into electricity. Thermoelectric generators depend on temperature gradient to cause an electromotive force, that propels charge carriers to one end of material and generates a potential difference. The reverse process occurs in thermoelectric refrigerators ie. refrigerators use a power source to drive charge carriers such that it creates a temperature gradient. The efficiency of thermoelectric material has an essential role in thermoelectric device performance. The parameters that lead to efficiency can be analysed in various methods. Both experimental and theoretical researches are required to detect the properties of thermoelectric materials and the tuning methods to improve efficiency. The intention of this work is to study thermoelectric properties of Graphite and strategies to enhance its efficiency.

INTRODUCTION

Thermoelectric effect

Thermoelectric effect is the direct conversion of temperature differences to electric voltage and vice versa via a thermocouple. Thermoelectric effect is explained by three effects: the Seebeck effect, Peltier effect and Thomson effect.

Figure of Merit

The thermoelectric figure of merit ZT , is a dimensionless number that describe the energy conversion efficiency of a material.

$$ZT = \frac{\sigma a^2 T}{k}$$

counterparts by quantization and interface effects. These two combined effects should induce an enhanced Seebeck effect and a reduced thermal transfer.

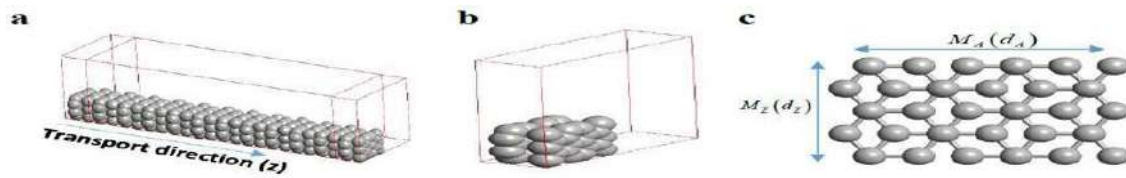


Figure 2.3 (a) Sketch of a nano device made of a graphite nanofiber with transport along the z direction corresponding to the c-axis of graphite.(b) Typical unit cell of a graphite nanofiber. (c) Atomistic view of the cross section of a graphite nanofiber. (Each unit cell contains two sub-layers and the diameter of the fiber is characterized by the number of slices in each sub-layer along the armchair and zigzag edges, M_A and M_Z , respectively.)

In a theoretical study of GNF [12], by using ab initio calculations for electrons and a semi-empirical Force Constant (FC) model for, in combination with Green's function formalism of transport, demonstrated that very high thermoelectric performance can be achieved with ZT reaching 3.55 in perfect GNFs 0.5 nm in diameter and even up to 5.07 when introducing ^{14}C isotope doping. Lower phonon conductance results in enhancement of figure of merit. Doping causes reduction in phonon transmission. This leads to drop in phonon thermal conductance. Hence causes to enhance zT.

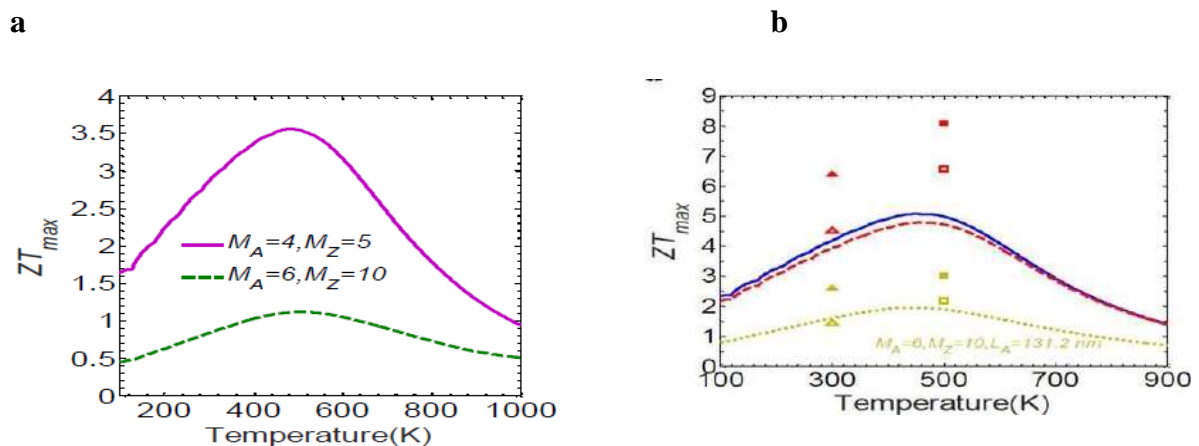


Figure 2.4 Maximum value ZTmax as a function of temperature (a): for pure graphite and (b): for two different device lengths with 50% of C^{14} isotope doping.

Thermoelectric performance of Graphite can be improved by making intercalation compounds. Graphite consists of hexagonal carbon planes stacked along c-axis by weak van der Waals

force. Therefore, many chemical species, can intercalate into the gallery of the graphite interlayer to form graphite intercalation compounds.

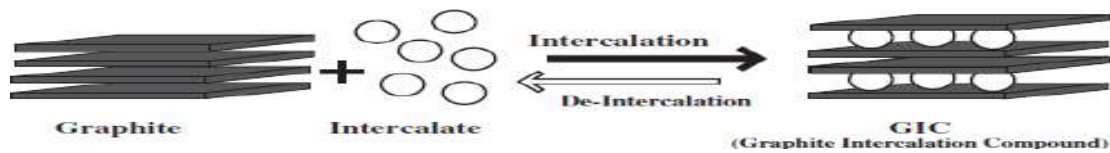


Figure 2.5 : Illustration of intercalation reaction

Charge transfer occurs between the intercalated species and adjacent graphite layers. Hence in-plane electrical conductivity of GICs become greater than that of the host graphite. The Seebeck coefficient of pristine graphite is nearly zero, because the number of electrons and the number of holes is almost equal. But GICs have greater number of electrons (or holes), their Seebeck coefficients also become greater. The thermal conductivities of GICs around room temperature are lower than those of the host graphite.

Experimental study on GICs made by Grafoil sheets and PGS (Pyrolytic graphite sheets) [13] have proved the improvement of thermoelectric performance. The electrical conductivities were measured by the four-terminal method in air. The thermal conductivity and Seebeck coefficient were measured under vacuum using basically the same system. The thermoelectric performance of a material was evaluated using the figure of merit and power factor.

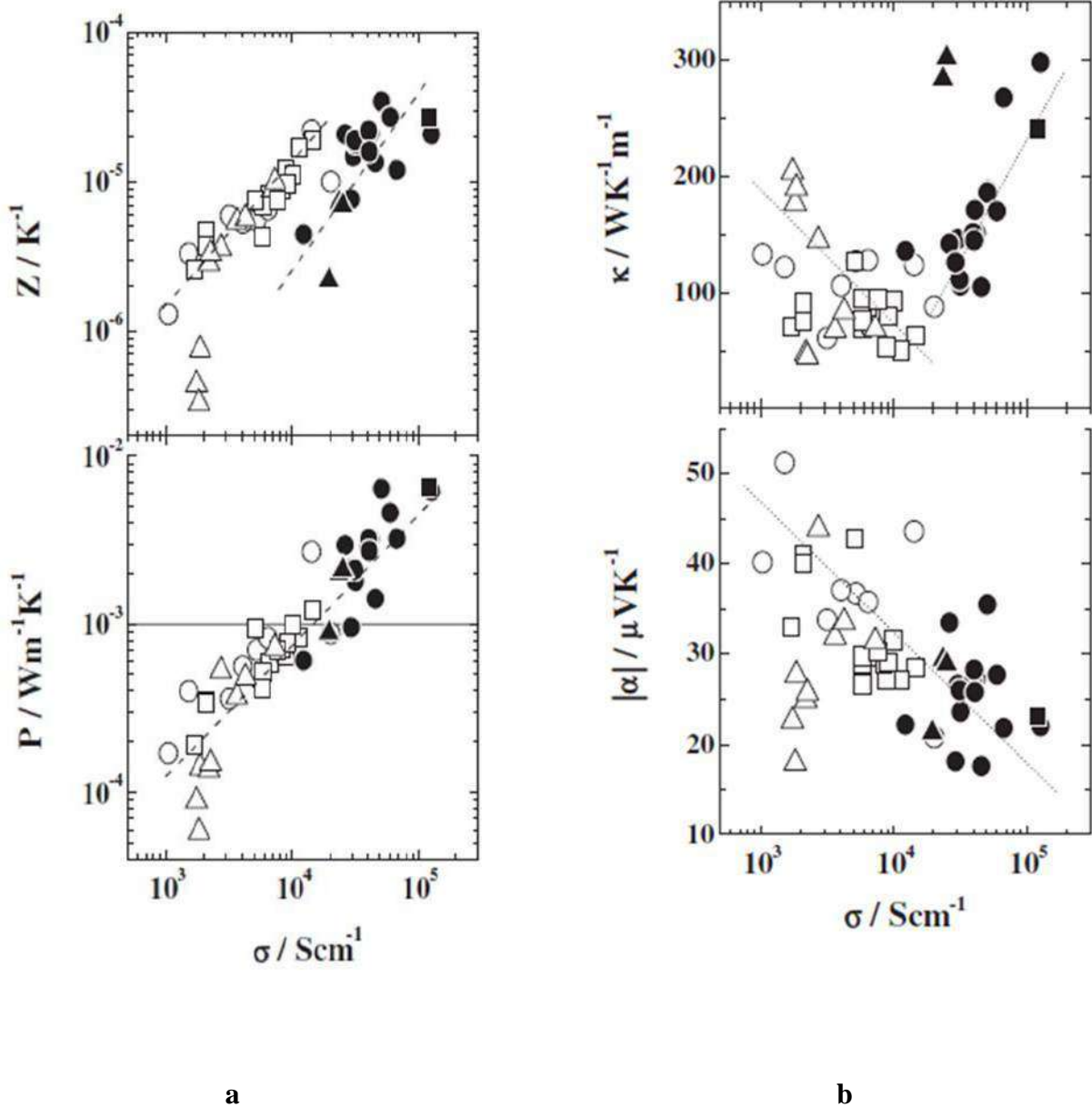


Figure 2.6: (a) Dependence of figure of merit (Z) and power factor (P) with electrical conductivity (σ). (b) Dependence of thermal conductivity (k) and absolute Seebeck coefficient ($|\alpha|$) with electrical conductivity (σ). ●: Alkali metal (AM)- GICs, ■: AM-ethylene-GICs, ▲: FeCl₃- and CuCl₂-GICs prepared from PGS, ○: AM-GICs, □: AM-molecules-GICs, Δ: FeCl₃- and CuCl₂-GICs prepared from Grafoil.

In the case of GICs prepared from PGS, the thermal conductivities increase with the electrical conductivity; this is similar to the behaviour of simple metals. But, in the case of GICs prepared from Grafoil, the thermal conductivity appears to decrease with the electrical conductivity. The absolute Seebeck coefficient decreases with the electrical conductivity; this behaviour is also similar to that of metals. The figures of merit increase with the electrical conductivity and

there are two lines for each graphite host. Though the power factor also increases with the electrical conductivity, all the values lie on one line. This shows that the power factor of the GICs depend only on their electrical conductivity. Thus, the thermoelectric performance of GICs is strongly affected by their electrical conductivity.

Another method to improve thermoelectric property of GIC was based on estimation of electrical carrier densities (n_e and n_h) and mobilities (μ_e and μ_h) from the electrical conductivity, Hall coefficient, and magnetoresistance.

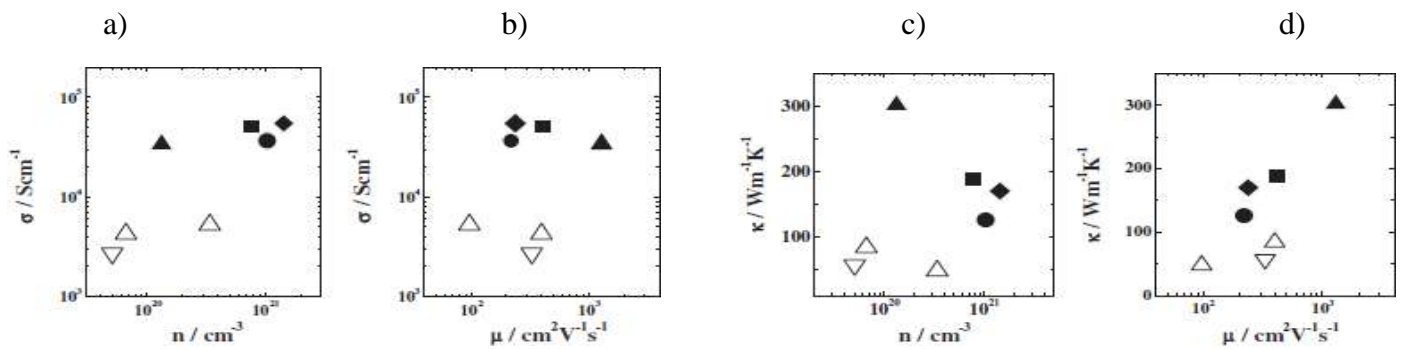


Figure 2.7: a) Dependence of electrical conductivity (σ) with carrier density (n), b) dependence of electrical conductivity (σ) with carrier mobility (μ), c) dependence of thermal conductivity (κ) with carrier density (n), d) dependence of thermal conductivity (κ) with carrier mobility (μ).
 ●: Alkali metal (AM)-GICs, ■: AM-ethylene-GICs, ▲: FeCl₃- and CuCl₂-GICs prepared from PGS, ○: AM-GICs, □: AM-molecules-GICs, Δ: FeCl₃- and CuCl₂-GICs prepared from Grafoil.

The increase in carrier density causes an increase in the electrical conductivity and the decrease in carrier mobility causes a decrease in the thermal conductivity. A method of increasing the carrier density of GICs is to increase the density of the intercalated species in the interlayer of graphite.

The increase in carrier density causes an increase in the electrical conductivity and the decrease in carrier mobility causes a decrease in the thermal conductivity

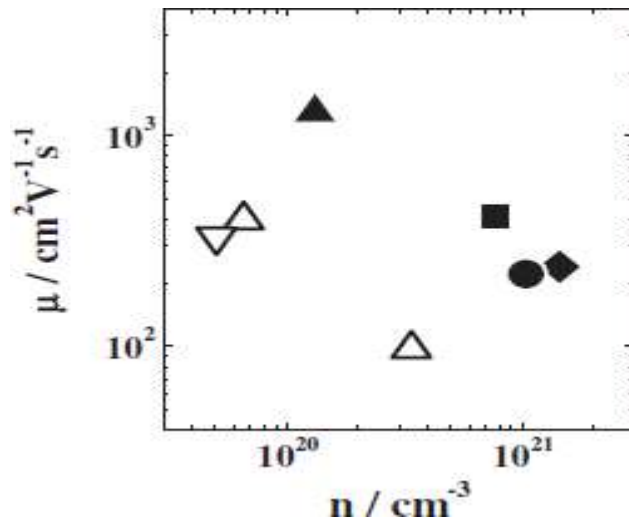
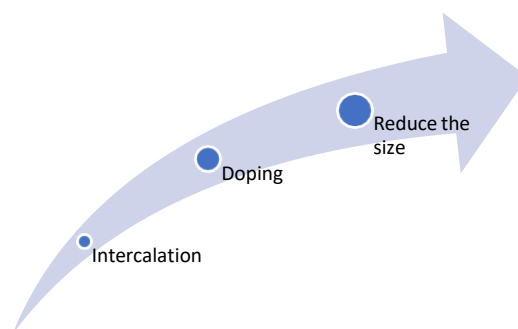
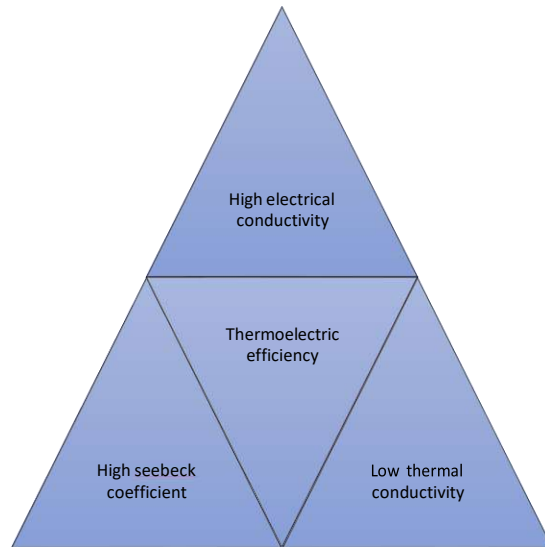


Figure 2.8: Dependence of carrier mobility (μ) with carrier density (n). ●: Alkali metal (AM)-GICs, ■: AM-ethylene-GICs, ▲: FeCl₃- and CuCl₂-GICs prepared from PGS, ○: AM-GICs, □: AM-molecules-GICs, Δ: FeCl₃- and CuCl₂-GICs prepared from Grafoil

In the GICs prepared from Grafoil, the change of thermal conductivities with the carrier density is quite small. On the other hand, the thermal conductivities increase with the carrier mobility in the GICs prepared from PGS. This is because the high thermal conductivity of PGS arises from its large carrier mobility. It is also important to select a suitable host graphite material. It is found that PGS is more suitable for improving the thermoelectric performance of GICs compared with Grafoil. This is attributed to its large carrier mobility which originates from the large graphite crystallite size and high orientation of graphite layers. In conclusion, the thermoelectric performance of GICs is suggested to be improved by an increase in the carrier density, that is, by an increase in the intercalate concentration.





CONCLUSION

Graphite is an important thermoelectric materials, but they have average thermoelectric efficiency. In this work, the methods to enhance efficiency of these materials have studied. The increase in carrier density causes an increase in the electrical conductivity and the decrease in carrier mobility causes a decrease in the thermal conductivity. This can be achieved by intercalation. Also reducing size is an effective method for enhancing thermoelectric efficiency. Doping can reduce phonon transmission by which we can reduce phonon thermal conductance. Also increase in temperature will increase efficiency. These are some effective strategies to enhance thermoelectric efficiency.

Bibliography

[1]. Twombly ,C.(2015) . *A study of thermoelectric properties of graphene materials* [Master's thesis, Colorado School of Mines, Colorado]. Available from ProQuest Dissertations &Theses database (ProQuest Number: 1606864)

- [2]. Heinz, P. D. FIRST PRINCIPLES STUDY OF THERMOELECTRIC PROPERTIES. (Texas State University-San Marcos, 2010).
- [3]. Wang, X. & Wang, Z. *Nanoscale Thermoelectrics. Thermoelectrics Handbook* (2014). doi:doi:10.1201/9781420038903.ch48\r10.1201/9781420038903.ch48
- [4]. Snyder, G. J. & Toberer, E. S. Complex thermoelectric materials. *Nat. Mater.* **7**, 105–14 (2008).
- [5]. Hochbaum, A. I. *et al.* Enhanced thermoelectric performance of rough silicon nanowires. *Nature* **451**, 163–7(2008).
- [6]. Venkatasubramanian, R., Siivola, E., Colpitts, T. & τ'Quinn, B. Thin-film thermoelectric devices with high room-temperature figures of merit. *Nature* **413**, 597–602 (2001).
- [7]. Guo, D., Hu, C., Xi, Y. & Zhang, K. Strain Effects To Optimize Thermoelectric Properties of Doped {Bi₂O₂Se} via {Tran–Blaha} Modified {Becke–Johnson} Density Functional Theory. *J. Phys. Chem. C* **117**, 21597–21602 (2013).
- [8]. Zhang, Q. *et al.* Heavy doping and band engineering by potassium to improve the thermoelectric figure of merit in p-type PbTe, PbSe, and PbTe 1- ySe y. *J. Am. Chem. Soc.* **134**, 10031–10038 (2012).
- [9]. Pan, Y. *et al.* Significant thermal conductivity reduction of silicon nanowire forests through discrete surface doping of germanium. *Appl. Phys. Lett.* **106**, 093102 (2015).
- [10]. Gunst, T., Markussen, T., Jauho, A. P. & Brandbyge, M. Thermoelectric properties of finite graphene antidot lattices. *Phys. Rev. B - Condens. Matter Mater. Phys.* **84**, 1–11 (2011).
- [11]. Lim, J., Hippalgaonkar, K., Andrews, S. C. & Majumdar, A. Quantifying Surface Roughness Effects on Phonon Transport in Silicon Nanowires. *Nano Lett.* **12**, 2475–2482 (2012).
- [12]. Van-Truong Tran¹, Jérôme Saint-Martin, Philippe Dollfus and Sebastian Volz, *Nanoscale*, 2018, 10, 3784-3791.
- [13]. Rika Matsumoto, Yutaro Hoshina and Noboru Akuzawa , *Materials Transactions*, 2009, 50(7) , 1607-1611
- [14]. Ma, W.; Liu, Y.; Yan, S.; Miao, T.; Shi, S.; Yang, M.; Zhang, X.; Gao, C. *Nano Res.* **2016**, 9 (11), 3536–3546.

- [15]. Chambers, A.; Park, C.; Baker, R. T. K.; Rodriguez, N. M. *J. Phys. Chem. B* **1998**, *102* (22), 4253–4256.
- [16]. Lueking, A. D.; Yang, R. T.; Rodriguez, N. M.; Baker, R. T. K. *Langmuir* **2004**, *20* (3), 714–721.
- [17]. Hicks, L. D.; Dresselhaus, M. S. *Phys. Rev. B* **1993**, *47* (19), 12727–12731.
- [18]. Hicks, L. D.; Dresselhaus, M. S. *Phys. Rev. B* **1993**, *47* (24), 16631–16634.
- [19]. A. H. Reshak, Saleem Ayaz Khan and S. Auluckc , *J. Mater. Chem. C*, 2014, *2*, 2346
- [20]. L. M. Goncalves, C. Couto, P. Alpuim, A. G. Rolo, F. Völklein and J. H. Correia, *Thin Solid Films*, 2010, *518*, 2816.
- [21]. BURAI Software : <https://nisihara.wixsite.com/burai/resources>
- [22]. -DENSITY FUNCTIONAL THEORY A Practical Introduction|| , D.S Sholl and J.A Steckel (Wiley 2009)
- [23]. S. Latil and L. Henrard, *Phys. Rev. Lett.* *97*, 036803 (2006).
- [24]. H. Min, B. Sahu, S. K. Banerjee, and A. H. MacDonald, *Phys. Rev. B* *75*, 155115 (2007).
- [25]. A.Z. AlZahrani and G.P. Srivastava, *Braz.J.Phys.* 2009, *39*(4) , 694-698
- [26]. Daniel R. Cooper, Benjamin D'Anjou, Nageswara Ghattamaneni, Benjamin Harack, Michael Hilke, Alexandre Horth, Norberto Majlis, Mathieu Massicotte, Leron Vandsburger, Eric Whiteway, Victor Yu, "Experimental Review of Graphene", *International Scholarly Research Notices*, vol. 2012, Article ID 501686, 56 pages, 2012. <https://doi.org/10.5402/2012/501686>
- [27]. N García, P Esquinazi, J Barzola-Quiquia and S Dusari, 2012 *New J. Phys.* **14** 053015

Technology and Science as the Foundation Stones of Peace.

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Abstract

Science and technology have crucial role to play in promoting peace, conflict resolution and progress. Peace is more than just the absence of conflict; it also entails the encouragement of several initiatives to foster development, awareness, and contentment inside and among nations as well as in the local community and among families. Public health, utilization and conservation of natural resources, food security, sanitation, climate change, disarmament and disaster preparedness are all different areas within the realm of science which will have efficacy in the establishment of peace in the world. By using this technology, a stable state of peace can be established and maintained on a global scale in a way that is both affordable and supported by science.

Keywords

Science, Technology, Peace promotion, Conflicts, Conflict resolution.

Introduction

In the last few centuries of human history, science and technology have made incredible advancements. The depth of man's scientific knowledge and the range of his tools have swiftly increased. Pharmaceuticals, appliances, transportation, communications, and medical diagnosis and treatments are a few instances of the ongoing revolution that significantly impacts people's daily life. The improvements in personal well-being, comfort, and health stand out the most. Notwithstanding these remarkable achievements, the future is increasingly in danger due to a decline in the standard of living and the growth of social injustices. The goal is to pinpoint the key causes of or contributors to the dangerous conditions that threaten us and preserve world peace. Peace is not a passive but an active term that involves encouraging a variety of actions that foster an atmosphere conducive to maintaining peace and preventing conflicts that might do so.

Factors that Disturb Peace

- **Racism and Casteism:**

During history, there have been countless wars and conflicts that have been caused by the idea that one is superior because of certain aspects of one's birth rather than because of accomplishments or merit. Another notable example would be World War II, which was begun by Hitler under the presumption that the Aryan race, to which the Germans belonged, was superior to all other races.

- **Monopoly over knowledge:**

As a result of having a monopoly on knowledge, knowledge imperialism has been one of the main methods of exploitation in the modern era. In the end, those who are exploited revolt against such treatment.

- **Technological disparities:**

Guerrilla warfare was brought about by the stark technological divide between the United States and Vietnam in terms of military equipment. The perceived technological differences between the two sides contributed to the cold war between the West and the East before the Soviet Union's collapse a few years ago.

- **Poor conditions for living and the existence of disparities, exploitation and discrimination within a society:**

In today's culture, there is always unhappiness in the population when fundamental needs like food, shelter, health, education, employment, transportation, social justice, and communication are not provided. Similar to how enormous differences in wealth, status, and power between people that are determined by things other than personal achievement and merit result in annoyance and/or a sense of injustice, which then causes conflicts.

- **Corruption and crime going unchecked and unpunished:**

Such circumstances often lead to widespread, genuine anger among the populace, which has all the makings of an unchecked escalation into a major conflict.

- **Environmental considerations:**

Those who prioritise protecting the environment and people who prioritise growth and/or defence have increasingly clashed during the past 20 years. As was the case, for instance, with the German Green-Peace movement and the struggle in our nation to stop the Narmada project, such clashes frequently result in the breakdown of peace.

Role of science and technology help to resolve or prevent conflicts

- **Racism and Casteism:**

By providing genetic evidence, science has already made a significant contribution to the suppression of racism, casteism, and other forms of discrimination. For instance, the strongest argument against apartheid has been the observation that all traits are random in sufficiently large outbred populations. This implies that no race on Earth now has an intellectual or other advantage over any other race. For caste, the same would apply.

- **Knowledge:**

All monopolies of knowledge are opposed by science and scientists. The fact that all credible scientists publish their findings in peer-reviewed journals that are, in theory, available to everyone worldwide is an example of the scientific community's opposition to this monopoly.

- **Technological disparities**

It can be removed only by technological development based on a sound, country-specific technology-policy that will take into account the strengths of the country in regard to men, material and resources.

- **Basic needs:**

At each given period, science and technology assist in providing solutions to issues involving fundamental human needs. Many of these issues still remain in our country, not because there are no scientific solutions, but rather because the government, bureaucracy, and other people in positions of authority lack the necessary socio-political-economic will. Examples include the development of new small-scale technologies (like biotechnology) that are applicable to our communities and create additional employment for individuals working in the agricultural sector, such as a biogas plant, and distant learning via television. Science provides guidance on post-disaster assessment, response, and recovery, assisting with Post Disaster Needs Assessment exercises and implementing initiatives right away after a disaster.

- **Lack of scientific temper**

The seeming opposition between conventional knowledge and science is one of the main causes of inner turmoil that one may encounter in today's culture. For roughly 4000 years of recorded

history, or up to 1500 A.D., we think that India was far ahead of most of the other then-civilized world in terms of biological understanding. But following this time, European biological knowledge advanced rapidly while ours remained unchanged. The benefit of our history, culture, and tradition—such as the fact that dissection was not prohibited—was thus lost. An key factor in both economic growth and social development is investment in science, technology, and innovation (STI). The term "science governance" describes the institutions and legal frameworks that make sure that scientific knowledge is protected.

- **Environmental considerations:**

Polluted air, waterways, and oceans, deforested areas, erosion, desertification, and radioactive and chemical wastes are all issues that are either common knowledge or experience today.

Even the more obscure dangers, like the ozone layer's thinning and the build-up of greenhouse gases, have been brought to our attention. This summer's unusually high temperatures in Europe and the melting of polar glaciers are both effects of global warming.

Science has developed tools for preventing and controlling it. Understanding present world change, assisting in Earth's sustainability, and enabling nations to manage their mineral resources all depend on an understanding of the Earth's past and the earth sciences. With a focus on projects and geoscientists from developing nations, the International Geosciences Programme (IGCP) encourages international cooperation in the geosciences. It supports initiatives that have a clear societal focus on sustainable development, such as those that reduce the impact of natural disasters, advance medical geology, and harvest mineral and groundwater resources. Since its founding in 1972, more than 340 international cooperation projects on the Earth's geology have been carried out in over 150 nations, advancing our understanding of geological resources and processes and establishing geoscientific networks. distance perception and space the use of technology to track environmental change is very helpful. The UNESCO Climate Change Initiative unites UNESCO's efforts with those of other UN organisations with the goal of assisting Member States in mitigating and adapting to climate change, promoting sustainable development in the context of climate change, determining the likelihood of natural disasters brought on by climate change, and monitoring its effects on World Heritage sites and biosphere reserves. Man And Biosphere (MAB) focuses on certain ecosystems in biosphere reserves, such as wetlands, marine, island, and mountainous ecosystems as well as drylands, arid lands, tropical forests, urban systems, and coastal, island, and arid lands ecosystems.

Conclusion

The main aspects of how science and technology affect peace have been the subject of the current study. The contextual framework includes not only nations but also societies, families, and people as a whole. Sustainable development cannot advance much without science. We will be better equipped to develop solutions to the increasingly pressing economic, social, and environmental problems that humanity is currently confronting as a result of our pursuit of knowledge and understanding through science. This is true for both developed and emerging nations in a globe that is becoming more connected. In response to the need to create greener communities, science supports economic growth and employment, helps us manage the environment, and gives us the information we need to promote equal social advancement. . Science, to build peace and to respond to international development goals can visualise a dream that can be eventually true.

References

(Mishra, Science and technology as the pillars of peace- A study, 2016)

(Murayama, 2014)

(Jeffrey D. Sachs, 2016)

Science education with technology :effective of ICT integration for sustainable future

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ABSTRACT

Science is viewed as study of things and events in the universe occurring in pattern that can be comprehensible through careful and systematic study. Science education is only possible if we understand nature of science and how it works for the sustainable development. Science is an effective process that we use to help us understand the Nature through proper observations and experimentation with effective use of ICT integration . Integration of Information, Communication, and Technology (ICT) will assist teachers to the global requirement to replace traditional teaching methods with a technology-based teaching and learning tools and facilities. In India, ICT is considered as one of the main elements in transforming the country to the future development. Wide varieties of options are available for experimentation in this modern world of education apart from traditional methods. In this online era, it is very important to rethink about the traditional methods of teaching and adopting effective strategies of the experimentation process for a sustainable future when compared with ICT integration. This study aims to analyze teachers' perceptions on effectiveness of ICT integration to support teaching and learning process in classroom. A survey questionnaire was distributed randomly to the total of 44 teachers and 55 students from certain public and private schools in kannur district, kerala . The results indicate that ICT integration has a great effectiveness for both teachers and the students. Findings indicate that teachers' well-equipped preparation with ICT tools and facilities is one of the main factors in success of technology-based teaching and learning. . It was also found that professional development training programs for teachers also played a key role in enhancing students' quality learning.

INTRODUCTION

In this 21st century, the term –technology is an important issue in many fields including education. This is because technology has become the knowledge transfer highway in most countries. Technology integration nowadays has gone through innovations and transformed our societies that has totally changed the way people think, work and live (Grabe, 2007). As part of this, schools and other educational institutions which are supposed to prepare students to live in –a knowledge society need to consider ICT integration in their curriculum (Ghavifekr, Afshari & Amla Salleh, 2012).

The use of computer-based communication that is integrated into the regular educational process in the classroom is referred to as information, communication, and technology (ICT) integration in education. Teachers are viewed as the essential players in implementing ICT in their regular classroom settings and training pupils for the contemporary digital environment. This is a result of ICT's ability to provide an active and dynamic teaching-learning environment (Arnseth & Hatlevik, 2012). The goal of ICT integration is to enhance and raise the quality, accessibility, and cost-efficiency of how education is delivered to students, but it also refers to the advantages of networking learning communities to meet the problems of present globalisation (Albirini, 2006, p.6). Process of adoption of ICT is not a single step, but it is ongoing and continuous steps that fully support teaching and learning and information resources (Young, 2003).

1.1 Review of literature

Several studies has been conducted in the area of ICT integration for sustainable future. Following are the important studies in our area of research.

ICT can be applied in a variety of ways to support teacher and student learning in a variety of topic areas.

Finger & Trinidad, (2002) in their article describes a technology-based approach to teaching and learning provides a variety of engaging methods, such as educational movies, stimulation, data storage, database use, mind-mapping, guided discovery, brainstorming, music, and the World Wide Web (www), that will enhance and deepen the learning experience.

Jorge, Young, and Jamieson-Procter(2003) in their work describes that students will gain from ICT integration when they are not constrained by the curriculum and resources that are available to them. Instead, they can engage in hands-on activities in a technology-based course that are intended to assist them increase their grasp of the subject. Additionally, it aids teachers in creating engaging lesson plans that are efficient, innovative, and fascinating. Previous researches proved that use of ICT in teaching will enhance the learning process and maximizes the students' abilities in active learning. Technology-based instruction and learning have the potential to revolutionise education, but they necessitate careful planning and policy development. Policymakers and researchers need to have the same understanding of the future strategy.

Dudeney (2010) pointed out that national ICT strategies can fulfil a number of essential purposes. They offer a justification, a set of objectives, and a picture of how educational institutions would function if ICT is incorporated into the process of teaching and learning, and they are advantageous to pupils, teachers, parents, and the general populace of a certain nation. In order to provide ICT to schools across the country, infrastructure and facilities are required.

Hennessy, Ruthven, & Brindley, (2005) pointed that having enough computer laboratories and ICT equipment is essential for effective ICT use. By doing this, subject teachers will be readily available Technological resources as needed.

Chapelle,(2011). In their article describes one of the major issues that schools, particularly in rural regions, are currently confronting is a lack of proper ICT equipment and internet connection. The report's further findings demonstrated that parents support schools with IT infrastructure initiative or community power.

Jamieson-Proctor (2013) pointed that Most schools have experienced a rise in technical issues, which have frustrated students and instructors and disrupted the teaching and learning process. If there is no technical support available, no repair on it, teachers are not able to use the computer for temporarily. The effect is that teachers will be discouraged from using computers because of fear of equipment failure since they are not given any assistance on the issue. Schools had employed a range of techniques to offer instructors additional professional development beyond the teaching of fundamental skills.

The importance and benefits of ICT **Warwick and Kershner (2008)**, should be teachers must be aware of in order to conduct an effective lesson utilising ICT. In order to learn about integrating ICT in the teaching and learning process, teachers should be sent to training sessions. Yet, many educational institutions employed peer tutoring programmes. A teacher with greater ICT expertise would support and mentor a teacher with less ICT expertise as they prepared for teaching and learning. As was previously said, a variety of elements make it possible to employ ICT for teaching and learning in classroom settings.

Agbatogun, (2012) start with policy and then and skills of teacher to integrate it into pedagogical process. Besides, technical support and continuous professional development in ICT should be conducted from time to time. In short, all parties must cooperate in order to bring the nation to become a country advance in technology.

1.2 Objectives

This study's primary goal is to

1. To evaluate how well ICT integration works.
- 2 This study specifically intends to determine the efficiency of ICT integration from teaching and learning perspectives
3. To investigate the effective use of ICT in learning environments.

1.3 Teachers' Perceptions of Technology-Based Instruction

The late 20th century saw the fast growth of learning technologies, which led to changes in the educational system. This is because technology can offer a proactive, convenient, and all-encompassing teaching and learning environment. In order to improve the use of cutting-edge technologies in the teaching and learning processes across the globe, the ministry of education now offers numerous facilities and training programmes. To give instructors the tools they need to strengthen the educational system, a large fund has been allocated. Despite their best efforts, teachers in the majority of countries still fail to fully utilise the technologies.

Moreover, Chien, Wu, and Hsu's (2014) study revealed that kids in schools have high expectations for the use of ICT in the classroom because the current generation was born and raised with technology and could be described as the phenomena of the digital native. The higher the expectation of students for ICT integration in the classroom, the younger they are. Also, it demonstrated how heavily personal factors—which are defined as self-perceptions—

affect ICT integration. This study also demonstrates how teachers and students accept ICT both within and outside of the classroom, with both groups being more inclined to use it there. They discovered that the instructors' attitudes, ability, and confidence are the biggest hindrances to ICT integration.

According to the findings of a prior study (Cox & Marshall, 2007), teachers can develop ICT skills in the classroom by using only a traditional-centered approach. The educators are very self-assured and even though it doesn't indicate the types of ICT used, classroom ICT proficiency. This is due to their conviction that ICT is a tool that may aid in the learning process, particularly when it comes to connecting with real-world activities. This issue forced a change in the way that knowledge is created and constructed for students, integrating ICT into the educational process. The study demonstrates that the balance between training and pedagogically focused approaches in ICT professional development may be reflected in the relationship between competency and confidence. The administration of the school could ensure there are sufficient supports for the teachers to integrate ICT in the classroom.

1.4 Importance of ICT integration in school pedagogy

Several nations now acknowledge the value of ICT education and training to equip citizens with the knowledge and skills needed to access information and engage in commerce using these technologies (Kozma, 2008). According to a number of studies, using ICT in education has the potential to improve the methods used in teaching and learning. Kubiak (2013) discovered that efficient use of technology can inspire students, make lessons more engaging and dynamic, and revitalise teacher passion.

UNESCO (2002) noted that ICT has, in a very short period of time, emerged as one of the fundamental pillars of contemporary society and advised member states to adopt ICT-based pedagogy to guarantee that all developed and developing nations have access to the best educational resources required to equip children with the skills they need to participate fully in contemporary

Teachers must incorporate ICT into their everyday lesson plans by swapping out their outdated teaching techniques for more contemporary ones in order to keep up with the present digital era. There are distinctions between the simple usage of ICT and its inclusion in pedagogy. Krauss and Nkula (2014), ICT integration refers to the use of technology to promote teaching-learning, where students use ICTs to acquire new knowledge

and skills, as opposed to just installing computers in the classroom or using technology to support traditional teaching techniques. ICTs are therefore central to teaching and learning when they are used with integration.

Assisting nations in creating educational software and materials by using new technologies like ICT, UNESCO (2002) also urged member states to maintain an ideal balance between ICT and older educational technologies. They have integrated multimedia, e-learning, and distance learning into their educational system. However, successful ICT integration in pedagogy is a challenging undertaking that requires the efficient operation of a number of internal and external components. Although the availability of ICT tools in classrooms has increased, research from cultures other than our own found that instructors may not be utilising these resources as intended (Aldunate and Nussbaum, 2013).

1.5 Teachers' role in ICT integration

The most significant influence on educational innovations is thought to be teachers, and new technologies necessitate substantial changes in the teacher's position as well as in the structure and activities of the classroom (Fishman and Davis, 2006). Balanskat et al. (2006) noted that although instructors recognise the value of ICT in the classroom, they frequently encounter barriers to integrating these tools into their pedagogy. The use of ICTs in the classroom is largely dependent on teachers' attitudes and pedagogical beliefs, according to Chigona (2015b), Palak and Walls (2009), and Sang et al. (2010). Teachers do not share a common set of assumptions about how kids learn, and their choice of how to employ ICTs in the classroom is influenced by their views on education.

1.6 Integration of ICT in Indian Context

ICT integration in the classroom is becoming more crucial since it supports students' improvement of their collaboration learning and developing cross-disciplinary competencies that promote social skills, problem-solving abilities, independence, accountability, and the capacity for reflection and initiative. These are all fundamental principles that in an environment that is both dynamic and educating, students must succeed (Ghavifekr et al., 2014). Similar to this, the government of India started integrating Technology into the teaching and learning process. This is because having a workforce that is technologically literate and capable of critical thought is crucial for the country's participation in the global economy (Hamidi, Meshkat, Rezaee, & Jafari, 2011). As a result, several schools received upgrades such as computer labs, internet access, and smart whiteboards.

The main goal of ICT implementation in education proclaimed the vision and missions of the government to promote ICT in education for the following intentions:

- 1) To surround schools with dynamic and innovative learning environments for students to become more motivated and creative;
- 2) To enable students to gain wider range of knowledge and be able to access to internet for developing a global outlook;
- 3) To nurture students with capabilities of processing information more effectively and efficiently; and
- 4) To develop students with attitudes and capability of life-long learning.

1.7 The Conceptual Framework

Two theories—the Diffusion of Innovations by Rogers (2003) and the Technology Acceptance Model—were used for the objective of this study in light of ICT integration to improve a quality teaching and learning experience in schools (TAM). Davis (2003) has been used as the conceptual framework for this study and modified for the research context (Figure 1). According to Rogers' theory, an innovation spreads among the individuals within a social system through time and through certain channels. In order to integrate technology, the process will begin with "knowledge" of the first channel, which represents the features of the decision-making unit by the ICT users. And it concludes with "confirmation" from the users to accept and incorporate the technology and integrate it accordingly.

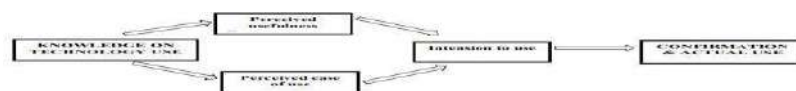


Fig 1: . Conceptual framework of study (Davis, 2003; Rogers, 2003)

1.8 Method of data collection

Research Design

In this research, quantitative methodology was used to collect and analyze the data obtained from all the respondents. The researchers developed the questionnaire and finalized it before being distributed to the targeted group of respondents. Few sections on the questionnaire were designed specifically to address research objectives in regard with the effectiveness of ICT integration for students in learning and effective elements of ICT integration in public school in kannur district . Therefore, the questionnaire was distributed to obtain the data from the respondents.

Population and Sampling

The overall total of respondents for this research was 44 teachers and 55 students from public and private schools in kannur district . The questionnaire was randomly distributed to the respondents with teaching background regardless of gender, race, teaching experience as well as highest teaching experience. There are no preferences set by the researcher as long as the respondents come with teaching background especially in public , private school in kannur . Since the targeted respondents for this research are meant for individuals with teaching background, the researcher tried to get especially teachers from public and private schools in Kannur district to be part of this research.

Materials:

The material used for this particular study was a questionnaire regarding the topic containing certain questions. The material is created by the help of Google forms.

Procedure:

This particular topic is seemed to be more relevant in this technological world. The use of computer-based communication that is integrated into the regular educational process in the classroom is referred to as information, communication, and technology (ICT) integration in education. And this prompted me to choose this topic -Teaching and learning science education with technology :effective of ICT integration for sustainable futurel. To collect the data I prepared an online Google form which was circulated through whatsapp.

Data interpretation and analysis

2.1 Teachers' Perception on Technology-based Teaching and Learning

Table 1 : Teacher's perception of ICT integration in teaching

SI. No	Items	Strongly agree
1	I feel confident learning new computer skills.	10 (22.7%)
2	I find it easier to teach by using ICT	15 (34.1%)
3	I am aware of the great opportunities that ICT offers for effective teaching.	14 (31.8%)
4	I think that ICT supported teaching makes learning more effective.	16 (36.4%)
5	The use of ICT helps teachers to improve teaching with more updated materials.	10 (22.72%)
6	I think the use of ICT improves the quality of teaching	12 (27.27%)
7	Students' makes no effort for their lesson if ICT is used in teaching	12 (27.27%)
8	The use of ICT enables the students' to be more active and engaging in the lesson.	10 (22.7%)
9	Students pay attention when ICT is used	2 (4.5%)

From the data provided in Table 1 about teacher's perception of ICT in teaching, it shows that most teachers are aware of the goodness and usefulness of ICT in teaching. Most teachers realized that the use of ICT helps teachers to improve teaching with more updated materials. It is undeniable that teaching resources and materials provided online are more updated and teachers can refer to it in order to design more interesting and engaging lesson for students.

2.2 Effectiveness of Technology-based Teaching and Learning for Students

Table 2: Effectiveness of Technology-based Teaching and Learning for Students

SI No	item	Strongly agree	Agree	Strongly disagree	Disagree
1	The use of ICT helps students to find related knowledge and information for learning.	15 (27.27%)	30 (54.54%)	5 (9.09%)	5 (9.09%)
2	ICT allows students' to be more creative and imaginative.	25 (45.45%)	15 (27.27%)	5 (9.09%)	10 (18.18%)
3	The use of ICT encourages students to communicate more with their classmates.	13 (23.63%)	32 (58.18%)	4 (7.27%)	6 (10.9%)
4	I think the use of ICT helps to improve students' ability specifically in reading, writing.	10 (18.18%)	35 (63.63%)	6 (10.9%)	4 (7.27%)
5	The use of ICT enables students' to express their ideas and thoughts better.	15 (27.27%)	26 (47.27%)	4 (7.27%)	9 (16.36%)

6	I think the use of ICT helps to improve students' ability specifically in reading, writing.	24 (43.63%)	23 (41.81%)	2 (3.63%)	6 (10.9%)
7	The use of ICT promotes active and engaging lesson for students' best learning experience.	11 (20%)	37 (67.27%)	2 (3.63%)	5 (9.09%)
8	The students' are more behaved and under control with the use of ICT.	18 (32.72%)	27 (49.09%)	8 (14.54%)	10 ((18.18%)

The result shows that the effectiveness of ICT for students in learning are it encourages students to communicate more with their classmates aswell as it increase the students confidence to participate actively in the class. It is effective in a sense that students are occupied with adequate knowledge that enables them to be more confident in sharing and exchanging their opinion with their classmates. Lastly, it shows that students are more behaved and under control with the use of ICT in learning

CONCLUSION

The findings of this study demonstrate that technology-based instruction and learning are more successful than traditional classroom settings. This is due to the fact that using ICT tools and equipment will create an active learning environment that is more engaging and productive

for teachers and students alike. The outcomes are consistent by integrating ICT into education will improve students' learning. Also, this study demonstrated that using ICT to construct engaging and entertaining lessons helps students learn more efficiently. Participants concurred that incorporating ICT can help pupils learn as a result .

To ensure that teachers and students can utilise ICT to its full potential, the first phase of deployment must be successful. Consequently, adequate implementation and support from the school's senior management serve as the foundation for technology-based teaching and learning preparations. ICT integration in schools will be a great success and have advantages for both instructors and pupils if the implementation process is carried out correctly from the very beginning stage and the ongoing maintenance are effectively given. Teachers must be given time to learn about and explore ICT in teaching and learning since it is more practical than theoretical, and they must go through the "trial-and-error" phase before they can utilise it effectively.

This study also demonstrated that In order to improve the quality of the nation's educational system, ICT integration in the classroom requires careful attention. This will result in a better future workforce and raise the national education system's international standing.

REFERENCES

Abd Rahim, B. & Shamsiah, M. (2008). Teaching Using Information Communication Technology: Do trainee teachers have the confidence? *International Journal of Education and Development using ICT*, 4(1), 1-8.

Agbatogun, A. O. (2012). Investigating Nigerian primary school teachers' preparedness to adopt personal response system in ESL classroom. *International Electronic Journal of Elementary Education*, 4(2), 377-394.

Albirini, A. (2006). Teachers' attitudes toward information and communication technologies: The case of Syrian EFL teachers. *Computers & Education*, 47(4), 373-398.

Arnseth, H.C., & Hatlevik, O.E. (2010). Challenges in aligning pedagogical practices and pupils' competencies with the Information Society's demands: The case of Norway. In S. Mukerji & P. Triphati (Eds.), *Cases on technological adaptability and transnational learning: Issues and challenges*. Hershey: IGI global.

Capan, S.A. (2012). Teacher Attitudes towards Computer Use in EFL Classrooms. *Frontiers of Language and Teaching*, 3, 248-254.

Cassim, K. M., & Obono, S. E. (2011). On the factors affecting the adoption of ICT for

the teaching of word problems. In Proceedings of the World Congress on Engineering and Computer Science (Vol. 1, pp. 19-21).

Chan, F. M. (2002). ICT in Malaysian schools: policy and strategies. Paper presented at a workshop on the promotion of ICT in education to narrow the digital divide, 15-22 October. Tokyo Japan.

Chapelle, C. (2011). Computer applications in second language acquisition: Foundations for teaching, testing and research. Cambridge: Cambridge University Press.

Chien, S.P., Wu, H.K., & Hsu, Y.S. (2014). An investigation of teachers' beliefs and their use of technology-based assessments. *Computers in Human Behavior*, 31, 198-210.

Cox, M. J., & Marshall, G. (2007). Effects of ICT: Do we know what we should know? *Education and Information Technologies*, 12(2), 59-70.

Davis, F. D. (2003). Acceptance of Information Technology. *MIS Quarterly*, 13(3), 319-339.

Cuban, L. (2001). *Oversold and Underused: Computers in the Classroom*. Cambridge, MA: Harvard University Press.

Dudeney, G. (2010). *The Internet and the language classroom (Vol.X)*. Cambridge:

Cambridge University Press. Finger, G., & Trinidad, S. (2002). ICTs for learning: An overview of systemic initiatives in the Australian states and territories. *Australian Educational Computing*, 17(2), 3-14.

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