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## Role of Technology for Equality, Diversity and Inclusivity

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Dr. Navdeep Kaur<sup>1\*</sup>, Mrs. Maninderpal Kaur<sup>2</sup>

<sup>1\*</sup>Assistant Professor, Department of Education, GNDU, Amritsar, India.

<sup>2</sup>JRF Scholar, Department of Education, GNDU, Amritsar, India.

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**Abstract:** *In this 21st century, technology has brought revolutionary change in global realm, specifically in information society, which influenced all the different fields of human society. To compete in world economy, nations cannot think of their development without the integration of technology (such as information and communication technology) in their educational systems (United Nations, 2005). Information and communication technology (ICT) is proved very useful to attain educational objectives in inclusive setting, where all children are taught in common classroom regardless of their socio-economic, cultural, religious, regional, caste and creed backgrounds. The task of providing qualitative and accessible education to differently abled children has become a shared responsibility for all stakeholders (Ahmad,2015;Praisner,2003); which demands a change in attitude, the presence and accessibility of infrastructure facilities, different methods and strategies of teaching and learning, varied tools and techniques for assessment and evaluation, and the solution of issue of acceptance and accommodation of all learners at all levels in education system(Ahmad,2014;2015b;Stainback & Stainback,1984). Assistive devices and assistive equipments of Information and communication technology facilitate children with varied impairments in inclusive setting. Researches proved that information and communication technology has played a crucial role to bring equality among all learners in the inclusive classrooms, however the efficiency in educational process can be achieved only through the involvement of stakeholders of education and with the efforts of different countries ( in terms of finance disbursement and provision of infrastructure facilities).*

**Keywords:** *Inclusive Education, Information and Communication Technology, Assistive Technology, Children with Varied Impairments.*



## **1. INTRODUCTION**

Education is the key to success and it plays a crucial role in the growth, development and empowerment of individuals (Stainback & Stainback, 1984). When philosophy of inclusion is applied in educational institutions, regardless of the varied socio-economic backgrounds and the variations in 'abilities' and 'disabilities' (Praisner, 2003), no doubt importance of education in human life increases and becomes stronger (Ahmad, 2014). In present times, it is necessitated that students should be given qualitative education, especially the special ones. To fulfill this purpose, new educational institutions have been established, new studies have being conducted and adapted. Inclusive education is an important part of these studies, which means 'to include all the learners in mainstream of education irrespective of their physical or mental disability, color, caste, creed, religion, region, gender and so on.' According to UNESCO, 'inclusive education means that all schools should provide qualitative education to all learners regardless of their different abilities. All students should be dealt with respect and each has equal opportunity to learn together'' (UNESCO, 2007).

The task of providing qualitative and accessible education to children with disabilities has become shared responsibility for all stakeholders (Ahmad,2015;Praisner,2003); which demands change in attitude, presence and accessibility of infrastructure facilities, different methods and strategies of teaching and learning and the solution of issue of acceptance and accommodation of all learners in education system (Ahmad,2014;2015b). By recognizing the learning needs of all pupils, with special emphasis on those targeted to marginalization and exclusion, inclusive education as an approach provides opportunities to learn together through access to common curriculum, better support services and availability of flexible education system. Inclusive education is not only concerned with mainstreaming of learners with special needs, but it is also trying to remove the obstacles in the way of achieving effective, continuous and qualitative education for all (Ramchand & Dummugudem, 2014; Ahmad, 2015a). It provides a 'least restrictive environment'(LRE) and educational benefit to disabled children to nurture their capacities (Gal et al; 2010).

### **➤ Historical Background of Inclusive Education**

As the Salamanca Report of UNESCO was released in 1994, many developing countries changed their educational policies for accommodating disabled and diverse children in mainstream of education. Many developed countries like USA, Canada and Australia have made significant progress in the field of inclusive education and were promoting 'inclusive education' through their policies and effective laws (Ferguson, 2008; Gronlund et al.; 2010; Kearney & Kane, 2006; Norwich, 2008); contrastly; poor nations were providing education to disabled children in segregated schools. Historically, inclusive education is a kind of setting in which disabled children received education in common classroom, but these children were shifted to resource rooms when required (Mastropieri & Scruggs, 2004, p.7).

During that time, some of the educational institutions had adopted 'Integrated Educational



Model' as an alternative to inclusive education approach. In integrated system, it was not mandatory to attend school on regular basis. However, more emphasis was given to fit students in the system, rather than to bring institutional changes. Children with mild disabilities had the opportunity to get integrated education, but severely disabled children do not go to school (Kearney & Kane, 2006).

### ➤ **Integration of Technology for Inclusive Classrooms**

Since the beginning of 20th Century, technology is playing vital role for bringing reforms in various sectors of life globally; whereas it influenced the information society dramatically. When a device helps us in performing physical or mental task, we are adopted technology. Technology affects our life drastically from the way we live, think, work and to contact with each other. To compete in the World economy, nations cannot think of their development without the integration of Information and Communication Technology (ICT) in their educational systems. The term ICT is concerned with technological innovation and inclusion of information and communication which is required for the progress of information societies and results in improvements in social interactions, economic and business strategies, political involvement, education, health-care, leisure and entertainment (United Nations, 2005).

Among researchers, there has been a debate over the question whether ICT should be integrated in the education or not. On one side, some researchers agreed that ICT will bring pedagogical benefits to the system (Cuban, 1986; McRobbie & Thomas, 1998; oppenheimer, 1997; Peat & Franklin, 2003; Postman, 1990, 1993, 1995; cited in Vestich1997). Alternatively advocates like Edison (cited in Saettler, 1990, p 98), Negroponte (1995), the co-founder of the Massachusetts Institute of Technology Media Lab, and Papert (1996) technology will alter educational field and it will enhance learner's performance dramatically. While some of the researchers adopt a balanced viewpoint, who firmly believe that if ICT should be adequately integrated in the education, it would increase the development of student's decision-making and problem-solving capacity, data processing abilities and communication potentialities (Whitworth, High & Berson, 2003). Various countries realized that they need a workforce, which has computer-literacy skills to compete in this throat-cut competitive era. Countries which do not consider and work according to demands of new content and recent pedagogies in education and training will have to face hardships in World economy (Delannoy, 2000).

Information and communication technology (ICT) is very crucial in creating a motivating and adaptable teaching-learning environment for children with special needs in an inclusive classroom. It has capacity to fulfill varied learners needs and potential to access general educational curriculum. ICT helps individuals with disabilities by the use of varied assistive technologies (Turner-Smith & Devlin, 2005). For Example, visual learners can understand the concepts with the help of Braille system and projection screens linked to computers. With integration of effective technology such as ICT, these children can easily adapt general education curriculum and can perform their educational tasks easily and independently (Roberts et al., 2008; Van, 2007).



“The real miracle of technology may be the capacity it insurmountable barriers faced by persons with disabilities” (Simon, 1992).

➤ **Assistive technologies for Persons with Disabilities**

Assistive Technologies (AT) is a wider concept comprises virtually something which can be used to fulfill the needs of disabled persons (Reed & Bowser,2005) starts from crutches or special grips pens to auditory aids and magnifying lens or glasses to high-tech devices such as Braille system and computers with special software to assist dyslectics to read study materials (WHO, 2009). Assistive technologies eliminate all those obstacles that come in the way of completion of educational and habilitative needs of persons with disabilities. Assistive technology promotes education for all in the same classroom including children with physical, mental and developmental disabilities (Smith et al., 2005).

“Any device, item or piece of equipment which is used to increase, maintain or improve functional capabilities of disabled persons is called assistive technology. It comprises specific hardware and software devices, which are specifically designed for individuals with disabilities (Ramakrishna T. 2009: Petty R.E., 2012). Assistive technologies in the form of adaptive devices, also includes walkers, wheelchairs and some of the hardware and software materials which helps disabled persons to access computers and information technologies.

➤ **Assistive Technology for Student with Visual Impairment**

It is an impairment in which two types of children are involved- children with low vision and those with total loss of sight- blindness. These learners require assistive devices to complete their regular functioning, improvement in maximum learning and for adjustment in the environment. The OBR (Optical Braille Recognition) software helps these individuals in reading Braille documents, scanning in the translation of textual material. These children can take the 'hard copy' output with the use of Braille printers. Scanners with optical character recognition reads printed material, which can then be stored on computers. Speech output systems are used to read text on screen and the text-to-speech software such as JAWS (Job Access with Speech) helps to adjust the volume, pitch and speed of reading and in the selection of a man and woman voice according to the choice of disabled persons. During the reading, a screen reader with navigation equipments helps the users to move from headline to headline or category to category.

Students with visual impairments can also learn with the help of auditory materials like talking books and audio cassettes of recorded lessons. The descriptive video service provides a narrative verbal description of the visual elements that are displayed on the screen, assists the visually impaired children to hear descriptions of visual materials, which will give a chance to these students for better learning, knowledge building and for socialization ( Petty, 2012).

➤ **Assistive Technology for Students with Hearing or Speech Impairments**

These children have deficiency in their auditory ability and this deficiency can be varied ranges



from mild to severe disabilities. Word processing and educational software are credible in developing writing skills among these children. These children can make use of computer with other alternatives to audio output instead of using a standard keyboard and mouse. Advanced speech synthesizers help those children who are disabled to communicate verbally, with the provision of substitute voices. These students can become the part of class discussions by adapting computers- gives them the provision of intelligible speaking voices. With the introduction of required speech and language patterns in the education, students with hearing or speech impairments can comprehend written or on-screen documentation with ease, by utilizing alternate supportive aids such as recorded tapes, photo albums, charts, concrete objects and visual cues. 'Text Telephones' provisions that the telephonic conversation should be typed and read instead of spoken or heard; and 'the computerized speech recognition' software converts a verbal message into a written document that allows children with hearing impairment to read it with ease.

➤ **Assistive Technology for Students with Mobility Impairments**

These kind of disabled children have physical defect which inhibits exercise of muscles and bones. These children have crippled legs or arms, loss of body organ due to accident, hereditary causes or disease. Individuals with orthopedically impairments needs larger keyboards, on-screen keyboards and speech-recognition programs to do learning efficiently. A standard keyboard in a computer with a 'mouth or head-stick' is a device in which these children can press the keys with the use of pointing device. In speech recognition systems, pupils can manage the computers by speaking words or letters, in which a specific system is installed to comprehend these voices. On- screen keyboards increase access to user guides for persons with disabilities, which needs a page-turner in books.

These students need a wheel-chair, computer desks that can be easily adjusted to their height, to pull up to computer for doing work. Left-handed and right-handed computers are also provided to those individuals, who can operate the computer with one hand only. However, due to architectural obstacles such as non-availability of ramps, elevators, automatic doors and telecommunication devices, hinders the involvement of disabled students. So, the physical environment of educational institutions could be changed and there should be presence of all required infrastructure facilities like ramps, lifts to increase accessibility to all workspaces, sinks with adjustable heights and so on, for the inclusion of children with mobility impairments in education and social field (Campbell, 1989).

➤ **Assistive Devices for children with Learning Disabilities**

It is a kind of neurological dysfunctioning in which an individual has a problem in understanding, grasping or storing information in an organized and systematic way. These disabilities include dyslexia, dysgraphia, dyscalculia, attention deficit hyperactivity disorder (ADHD). Educational software provides multi-sensory experiences to these children, which can be useful for the development of varied skills in them and could motivate them intensively. The standard word processor could help students with dysgraphia- an inability to write clearly,





in completing their written tasks and tutorial lessons. In some educational institutions, quiet work-spaces have been constructed for those children, who get irritated and easily distracted by the outer-side noise due to their hyper-sensitivity. Reading problems can overcome with the use of adaptive devices like large print materials and use of alternative colors on computer screen. 'Electronic Math Sheets' assists in solving math problems on screen, in which digits appear are read aloud with the use of speech synthesizer, for making math easier to those children who cannot solve mathematical problems with paper-pencil (Liao et al., n.d.). The Paper-based Pen technology assists students in recording their study –material, afterwards this recorded and written information is learned by the students with their own flexibility of time and space. This technology is helpful to those who have deficiencies in listening, writing, reading and memorizing the learning material.

➤ **Essential Requirements for Assistive Devices**

**Effectiveness, Affordability, Reliability and Portability** is the four major criteria which should be considered properly before buying or using any assistive devices for disabled persons.

- Firstly, the device should be effective as it can improve the functioning ability of the individual.
- Secondly, disabled persons can buy or maintain these devices without any financial hardship.
- Thirdly, the device can increase the levels of accuracy for a certain amount of time.
- Lastly, assistive devices can be easily moved, carried or operated in different locations by disabled persons.

➤ **Reasons Responsible For Integrating Technology In Education:**

Integration of technology in education does not mean the replacement of teachers but it is proved efficient to attain educational objectives. Besides this, it raises the quality in education and provides a workforce which can be fit in technology-driven marketplace''. (Haddad & Jurich, 2002, p.47). Following reasons are responsible for integrating technology in education:

**An Efficient Learning Environment for All Learners**

Technology has provided a motivating learning environment, where students can construct their own knowledge with the facilitation provided by the teacher. Nowadays, experts are also advocating for implementing constructivist model of learning in comparison to traditional instructivist model (Clark & Sun, 1996; Williams, 2000).

**An Effective Tool to Supplement Teachers Instruction in Classroom**

When teachers use technology in the form of aids, equipments and teaching -learning materials, it creates students interest and it motivates them to complete their learning tasks in various subjects with efficiently and accurately.

**Assists Administrators and Teachers in Their Administrative Tasks**



Apart from classroom teaching, a teacher has to perform certain administrative duties like to keep record of student's attendance, preparation of student's cumulative records, lesson planning, and preparation of tutorials, handouts and many more. Administrators are also keeping record of their employees and do computation of institution's performances annually and some other tasks with the help of technology.

### **Enhanced Access and Strengthens Inclusive Education in the Schools**

Technology helps in increasing access to education of students with disabilities in the inclusive setting, where all the students are served equally regardless of their strengths and weaknesses and social, economic, cultural background, racial backgrounds.

### **A Means of Sharing Ideas, Knowledge and Experiences**

Technology, with the introduction of networks and internet, has made it easier to communicate anyone around the world, without any restrictions in terms of time and place. It has also provided a platform to students, teachers, administrators and other stakeholders in the education, to share knowledge and expertise with each other and also increase the opportunities to work collaboratively to attain educational objectives (O'Gorman, E., 2005).

### **Computer Literate Workforce- Need of the Hour**

Among all nations competition has reached at its peak, which requires a workforce, who has specific computer knowledge and skills. With the inclusion of technology in education, such skilled workers can be produced who will have the ability of tackling competition of tomorrow.

### **➤ Obstacles in The Way of Inclusion of Technology in Educational Institutions**

Access to technology is totally concerned with the economic status of a country (Haddad & Jurich, 2002). A number of developing countries, like Africa, do not have resources, which are essential to integrate technology in the educational field.

### **Absence of Vision of an Education for the 21st Century**

Some countries are not concerned to bring changes in their educational set-ups, which are essential to survive in the global market economy of 21st century (Williams, 2000).

### **Financial Reality**

Certain nations do not have financial resources, which they are required to spend on technology integration in schools. They do not consider educational reforms on priority basis and spend most of their money for military purposes.

### **Infrastructure**

Many countries do not have required physical infrastructure facilities for eg. libraries, laboratories, classroom furniture, water facilities and electricity.

## **2. CONCLUSION**



Accessibility to education is a celebration of diversity and an important aspect of enhancing student's participation in the teaching- learning environment. Access to learning material, mainstreaming of disabled children, assistive devices and support services can provide opportunities to disabled students to learn at par with the normal children in the same classroom, breaking down all the hurdles, which obstructed them from having equal access to quality education. Researches assure the positive outcomes of inclusion in education, which has brought effectiveness in educational practice, delivered positive educational outcomes for children with disabilities in inclusive settings (Katz & Mirenda, 2002). Regular schools with an inclusive set-up have found to be most effective in abolishing discriminatory behaviors, building an inclusive society and are achieving education for all (UNESCO, 1994). But it is a prerequisite for every nation to build itself financially strong, so that adequate assistive technologies, infrastructure facilities and support services can be provided to children with disabilities, for the attainment of better results in the inclusive set- up of education.

### **3. REFERENCES**

1. Ahmad, F.A. (2015 b). Exploring the invisible: Issues in identification and assessment of students with learning disabilities in India. *Transcience: A Journal of Global Studies*, 6(1), 91-107.
2. Ahmad, K.F. (2014). "Assistive Provisions for the Education of Students with Learning Disabilities in Delhi Schools." *International Journal of Fundamental and Applied Research*, 2(9), 9-16.
3. Ahmad, K.F. (2015a). "Challenging Exclusion; Issues and Concerns in Inclusive Education in India." *Researchpedia*, 2(1), 15-32.
4. Campbell, P.H. (1989). Students with physical disabilities. *Integration strategies for students with handicaps*, 53-76.
5. Case-Smith, J. (2001). *Occupational Therapy for Children*. St. Louis, Missouri: Mosby Inc.
6. Christensen, P.R. (1997). Educational technology and educational reform: Lessons for South Africa. In proceedings of The Future World International Conference- Educating for the 21<sup>st</sup> Century, Cape Town, 2-4 December 1997.
7. Clark, J., & Sun, J. (1996). Technology implementation in Warren Country Kentucky public schools: An evaluation of instructional and administrative systems. Accessed August 10, 2000 from <http://www.warren.k12.ky.us/tech%20study.htm>
8. Cuban, L. (1986). *Teachers and machines: The Classroom Use of Technology Since 1920*. New York: Teachers College Press.
9. Delannoy, F. (2000). Teacher training or lifelong professional development? Worldwide trends and challenges. *TecKnowLogia*, 2(6), 10-13. Knowledge Enterprise. Accessed August 9, 2004 from [www.techknowlogia.org/](http://www.techknowlogia.org/)
10. Ferguson, D.L. (2008). International trends in inclusive education: The continuing challenge to teach each one and everyone. *European Journal of special needs education*, 23(2), 109-120.
11. Gronlund, A., Lim, N., & Larsson, H. (2010). Effective use of assistive technologies for





- inclusive education in developing countries: Issues and challenges from two case studies. *International Journal of Education and Development using ICT*, 6(4), 5-26.
12. Gal, E., Schreur, N., & Engel-Yeger, B. (2010). Inclusion of Children with Disabilities: Teacher's Attitudes and Requirements for Environmental Accommodations. *International journal of special education*, 25(2), 89-99.
  13. Haddad, W.D., & Jurich, S. (2002). ICT for education: prerequisites and constraints. *Technologies for Education: Potentials, Parameters and Prospects*. UNESCO, Paris, 42-57.
  14. Katz, J., & Mirenda, P. (2002). Including students with developmental disabilities in general education classrooms: Educational benefits. *International journal of special education*, 17(2), 14-24.
  15. Kearney, A., & Kane, R. (2006). Inclusive education, policy in New Zealand: reality or ruse? *International Journal of Inclusive Education*, 10(02-03), 201-219.
  16. Liao, C., Guimbretiere, F., & Loeckenhoff, C.E. (2006, October). Pen-top feedback for paper-based interfaces. In *Proceedings of the 19<sup>th</sup> annual ACM symposium on User interface software and technology* (pp.201-210).
  17. Mishra, G. & Kiran, U.V. (2015). Role of ICT In Achieving Complete Gender Equality In India. *International Journal of Technical Research and Applications*, 3(3), 184-189.
  18. Mastropieri, M.A., & Scruggs, T.E. (2004). *The Inclusive Classroom: Strategies for Effective Instruction*. NY: Pearson.
  19. McRobbie, C.J. & Thomas, G.P. (1998). The use of microcomputer-based learning in senior chemistry: Does technological innovation always result in improved student learning. In *annual conference of the Australian Association for Educational Research*, Adelaide.
  20. Norwich, B. (2008). Dilemmas of difference, inclusion and disability: international perspectives on placement. *European Journal of Special Needs Education*, 23(4), 287-304.
  21. Ogato, G.S. (2013). The Quest for Gender Responsive Information Communication Technologies (ICTs) Policy In Least Developed Countries: Policy and Strategy Implications for Promoting Gender Equality and Women's Empowerment In Ethiopia. *International Journal of Information Technology and Business Management*, 15(1).
  22. O'Gorman, E. (2005). Setting Standards for Teacher Education in Special Educational Needs in Ireland. 30<sup>th</sup> Annual Conference ATEE. Amsterdam. 22-26, October 2005, 377-381. Accessed September 25, 2009, from [http://www.atee2005.nl/download/papers/06\\_bb.pdf](http://www.atee2005.nl/download/papers/06_bb.pdf)
  23. Oppenheimer, T. (1997). The computer delusion. *The Atlantic Monthly*, 280(1), 45-62. Accessed June 30, 2003 from <http://www.theatlantic.com/issues/97jul/computer.htm>
  24. Praisner, C.L. (2003). Attitudes of elementary school principals toward the inclusion of students with disabilities. *Exceptional children*, 69(2), 135-145.
  25. Petty, R.E. (2012). *Technology Access in the Workplace and Higher Education for persons with Visual Impairments: An Examination of Barriers and Discussion of Solutions*. Independent Living Research Utilization at TIRR. Houston, Texas.



26. Peat, M. & Franklin, S. (2003). Has student learning been improved by the use of online and offline formative assessment opportunities? *Australian Journal of Educational Technology*, 19(1).
27. Postman, N. (1990). *Informing Ourselves to Death*. Speech given at a meeting of the German Informatics Society (Gesellschaft für Informatik). Stuttgart, Germany. Accessed October 9, 2003 from [http://world.std.com/\\_jimf/informing.html](http://world.std.com/_jimf/informing.html).
28. Postman, N. (1993). *Technopoly: The Surrender of Culture to Technology*. New York: Knopf.
29. Postman, N. (1995). *The End of Education: Redefining the Value of School*. New York: Knopf.
30. Ramchand, B.Dummugudem (2014). "Inclusion Education as Solution to Barriers of CWSN and Answer for their Success." *International Journal of Humanities and Social Science Invention*, 3(8), 97-107.
31. Roberts, J.M., Keane, E., & Clark, T.R. (2008). Making inclusion work: Autism Spectrum Australia's satellite class project. *Teaching Exceptional Children*, 41(2), 22-27.
32. Reed, P. & Bowser, G. (2005). "Assistive technologies and the IEP" in Edyburn, D., Higgins, K.
33. Ramakrishna, T. (2009). *Serving Students with Disabilities in Distance Education*, New Delhi: IGNOU (Stride) Handbook.
34. Simon, M. (1992). *Effective Practices for Inclusive Programs: A Technical Assistance Planning Guide*.
35. Stainback, W., & Stainback, S. (1984). "A rationale for the merger of special and regular education". *Exceptional Children*, 51(2), 102-111.
36. Sahu, K.T. & Pradhan, R.S. *Role of Assistive Technology for Inclusive Education in India*.
37. Saettler, L.P. (1990). *The Evolution of American Education Technology*. Englewood, CO: Libraries Unlimited.
38. Turner-Smith, A. & Devlin, A. (2005). E-learning for assistive technology professionals- A review of the TELEMATE project. *Medical Engineering & Physics*, 27, 561-570.
39. United Nations. (2005). *Gender Equality and Empowerment of Women Through ICT*. New York: Division for the Advancement of Women, Department of Economic and Social Affairs, United Nations.
40. UNESCO. (1994). *Salamanca Statement* Retrieved from United Nations Educational, Scientific, Cultural Organization. Website: <http://portal.unesco.org/education/en/ev.phpURL-ID=10379>.
41. Van Kraayenoord, C.E. (2007). School and classroom practices in inclusive education in Australia. *Childhood education*, 83(6), 390-394.
42. WHO. (2009). "Assistive devices/technologies". Retrieved from <http://www.who.int/disabilities/technology/en/>, retrieved
43. Whitworth S. A., High, G.S. & Berson, M. (2003). Computer technology in the social studies: An examination of the effectiveness literature. In *contemporary Issues in Technology and Teacher Education*, 2(4). Retrieved March 6, 2004, from



<http://www.citejournal.org/vol2/iss4/socialstudies/article1.cfm>.

44. Williams, M.D. (2000). Introduction: What is technology integration. Integration Technology into Teaching and Learning: Concepts and Application.