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Inclusionary Practices in Open and Distance Learning System: Exploring Challenges and Possibilities

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Abstract

This study aims to improve the current practices of existing open schools and was carried out in two phases. In the first phase, the researchers intended to explore the concerns and problem areas of the learners in open school and in the second phase, an intervention programme was provided to the learners. Hence, the first section presents the challenges and the other section shares the outcome of the intervention, which was provided to the learners based on the findings of the first section's research. For the research, the authors selected participants from the National Institute of Open Schooling. The challenges of the learners were explored with respect to the following dimensions:-registration process, accessibility to study centers, study material (available in three forms:- text, audio and audio-visual), examination and support services extended by the organization. About 50 learners with different disabilities were selected and a questionnaire was used to gather the data. The questionnaire was translated into three languages, i.e. English, Hindi and Indian Sign Language and was shared with the sample through different means: video format, personal interaction and hard copy (as per the convenience of the learner). The findings of the study revealed that most of the learners were facing challenges mainly in accessing the textual study material of open school and attending the examination. Further based on the survey findings, to increase the content accessibility, a modification of one of the chapters of X grade Science subject, topic 'Air' was done. 30 learners with disability were selected for the intervention program through purposive sampling and the effectiveness of the modified content was assessed. The post-test administered at the end of the intervention revealed that 80% of the learners agreed that the 'modified content' was easy to understand, memorize and recall. This research outlines a series of recommendations which include the need to be more focussed on the presentation of textual material shared with the learners, modification in the ways of taking the examination and a learner-centric support system at open schools. It is further suggested that the content must be prepared and presented on the universal design of learning and the learners must be allowed to take the examination through different modes i.e. verbal, non-verbal (sign language) and written, whichever the learner is comfortable at. Moreover, it is also suggested that special education and related services along with guidance and counselling cells at study centres must be taken into consideration for the psychological well-being of the learners with disability enrolled with the open school system.

Keywords: Learner with Disability, Education, Open Schooling, Content Modification, UDL principles and Challenges.

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Introduction

Arranging Education for all with equity and equality had been the biggest challenge in India. Despite the fact that the Right to Education Act of 2009, passed by the Indian parliament on August 4, 2009, mandates free and compulsory education for children aged 6 to 14 years old, 77 million of them were not enrolled in the regular system. This exclusion was frequently seen in marginalised groups such as people with disabilities (PwD), girls, and members of scheduled castes and scheduled tribes. As far as education in India is concerned, children with disability (CwDs) are observed as the most vulnerable group which requires special attention through special provisions. Census 2011 reveals that 46.2 lakhs is the population of children with disability that lies in the age group of 10-19 years. Out of this population, 27% never attended school, 12% attended school earlier. Also, 54% of children with multiple disabilities never attended any educational institution. Furthermore, researchers communicated that after they drop out of mainstream schools, most of the learners either leave education altogether or join the open school system. Hence, it becomes imperative to have a strong open education system in the country so that it welcomes and caters for the needs of children with disability in the best possible manner that enhances their academic aspirations.

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Open and Distance Learning, The Non-Traditional Schooling

With a vision to have India as a global knowledge superpower, the National Education Policy 2020 (NEP, 2020) acknowledged the role of the Open and Distance Learning (ODL) system in fostering the unique capabilities of each learner in India. ODL system plays a major role in implementing the Education policies as it widens the access to Education, be it at the school level or higher level. The intensifying call for quality education at all the levels obliges expansion of ODL through different means. The flexibility in learning, cost-effectiveness, learning satisfaction, access, migration

problem, multiple certifications etc. makes the ODL system, a need of an hour for dynamic learners of today's times. The potentialities of ODL system are hard to ignore as it contributes to expanding learning opportunities in different areas. Moreover, in current times, technological intervention has made the ODL system one of the most rapidly growing education systems nowadays. The extensive reach and access of ODL have made this parallel, alternate and complimentary education system widely accepted across the Globe. It is substantially catering for the diverse needs of the learners by providing a diverse curriculum, varied means and modes of delivering the instructions, different ways of assessment and flexibility in content presentation. This system re-envisions the role of education and promotes a barrier-free environment that focuses education and training that is free from all kinds of limitations. However, modernization and development bring lots of opportunities, challenges and unpredictable situations in life. And, as the needs and challenges of today's learners are dynamic in nature, the expectations and delivery system of today's Education system are also expected to be dynamic. Also, recently it has been observed that the pandemic brought a paradigm shift in the ways of engagement and participation of every learner around the globe. Hence, it becomes imperative to brainstorm, analyse and bring modifications in the existing education system, including the open schooling.

Let's first examine the advantages of open education in India. The open school system's philosophy is based on a number of variables and characteristics. When closely scrutinised, the following attributes are thought to play a substantial role in how well ODL functions (Figure 1):

- Learner placed at the center of the learning system (from teacher centric to learner centric education)
- Self-paced learning
- Teacher as a facilitator
- Alternate &Cost-Effective Education
- Opportunity to learn at any time and from 4 walls of classroom to anywhere
- From verbal & written to technology aided instruction
- From only academics to combination of academics and vocational education
- Diversity of courses &flexibility in combinations of courses
- Flexibility of time-frame, of choosing programme independent of age, attending/ not attending contact programme and to take on demand exam.
- Relaxed and mindful learners (no stress and no unhealthy competition) as there is always another chance given to the learners
- No marginalization & discrimination
- Opportunity of continuing & Lifelong education

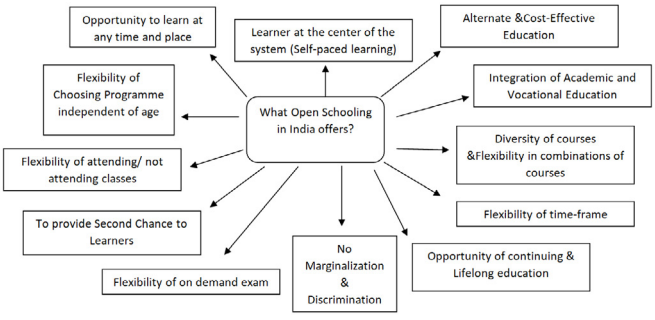

Figure 1: Open School in India

The Distance Learners and Challenges in Distance Learning

The reach and accessibility of learning in open and distance settings have risen with the development of technology, but this has also raised issues with credibility, quality, and equity. Equity: Why? Since there is a significant digital divide in India, the issue of equity is raised. A learner nowadays needs a customised, learner-friendly learning environment, and an expectation from ODL to provide the same, still seems unrealistic. A personal connection in the learning space, face-to-face communication with mentors, teachers, and peers, immediate feedback, and sound support system are still mostly lacking in Indian open schooling. The studies of distance learners are disrupted by a variety of socio-emotional pressures in addition to academic difficulties. This ultimately adds on to the high drop-out even in the ODL system. Basically, distance learners are the ones who are majorly coming from the marginalised communities, rural and remote areas, families with challenging circumstances, first generation learners etc. Consequently, they require more incentives as compared to the learners of formal education system. But such emotional and psychological concerns are disregarded in the open schooling in India. Therefore, most of the distance learners have low academic aspirations, high anxiety and show apathy towards the academics. Despite having technically sound curriculum and course design, the distance learners find it difficult to comprehend and relate the content with the real life.

Let's now examine the concerns of the first-generation learners enrolled with ODL. Without consistent help from family, teachers, institution, peer group and mentors, the content in simple language becomes incomprehensible. And with time, the severity of the academic problems worsens when there is a lack of a basic level of knowledge. In addition, with the expansion of ICT usage at ODL, where even the admission and registration are conducted online, the complete accessibility to the system is questioned due to poor socio-economic background and limited technological literacy of the learners. The development of the learner's soft skills, competency-building, and self-esteem are also believed to be important components of education, while open schooling places less of a focus on these areas. As a result, the learner falls behind towards the end when compared to the graduates of other school systems. Therefore, it is believed that although India's open school system is presently doing well, its ideology still needs to be revised.

Challenges of learners with disability in Open Schools in India

Arranging Education for all with equity and equality was the biggest challenge in India. Despite having Right to Education Act (2009), 77 million children were not enrolled with the regular system and such exclusion was commonly observed in marginalised categories like people with disabilities (PwDs), girls, people belonging to scheduled castes and scheduled tribes, etc. (UNESCO, 2019). Research proved that 97% of the PwDs do not have basic literacy skills (UNESCO, 2018). Hence, it was observed as a major concern and legislation and policies were placed as legal interventions making the process of bringing inclusion easier. Therefore, there have been consistent efforts from the Indian government and education system to make India a potential educational landscape with global standards.

Primarily, open and distance learning setups have intentions to cater for the needs of the learners belonging to marginalised, under-served or not served at all, by the current education system. People who are significantly impacted by the social, physical,

psychological, attitudinal, economic, and structural aspects of life are given a platform through open schools. Despite having promising contributions of open schools in India, there are certain challenges which learners do encounter during the course of study. In this paper, the challenges are categorised as academic, infrastructural, information sharing and administrative-related challenges (Figure 2). The academic challenges include options in courses offered, lack of complete knowledge of the future relevance of the courses, relevance of the open school curriculum, the content of study material and its presentation, assessment procedures etc. The infrastructural challenges of the learners include problems pertaining to reaching the study centres, the distance between home to the regional centre or head office, classrooms of contact programmes, washrooms of study centres etc. Moreover, the information-related challenges especially highlight the service culture and support mechanism of open schools. It focuses on the lack of directions and on the need of the sharing the information/ updates at the right time. The administrative-related challenges cover problems related to lack of technical assistance, problems in admission and registration process, too much dependency on internet cafes due to online services of open schools, lack of proper distribution of study material and delivery of mark-sheet/certificate, problems in assignment submissions, improper marketing and promotion of the institution, etc.

What is Universal Design of Learning?

The educational framework known as Universal Design for Learning (UDL) aims to provide inclusive and accessible learning environments that can accommodate the various needs and abilities of all students. To maximise learning possibilities for everyone, UDL aims to provide a variety of modes of representation, participation, and expression.

In the 1990s, the UDL framework as we know it today began to take shape. The Harvard Graduate School of Education's David Rose and Anne Meyer, among others, pioneered UDL by combining Universal Design concepts with educational practises. UDL gained popularity and was included into educational practises and policy in the early 2000s. UDL's significance in establishing fair educational opportunities was further acknowledged by the inclusion of a definition of UDL in the U.S. Higher Education Opportunity Act (2008). In order to meet the varied requirements of learners, their work placed an emphasis on offering a variety of representational, engaging, and expressive mediums.

In order to accommodate different learning styles and preferences, information and content are presented via *multiple means of representation*. Information may be communicated in this way by employing visual, aural, and tactile techniques. Giving pupils a variety of opportunities to interact with the subject matter and stay interested. Offering options, establishing objectives, and utilising students' interests and passions can all be part of this. Allowing pupils to exhibit their comprehension and expertise via a variety of evaluation and expression methods is known as multiple means of expression. This covers projects that require writing, speaking, producing art, and more. By adhering to these principles, educators hope to dismantle obstacles to learning and give every student an equal chance to succeed. In order to ensure that a wide range of learners can access and benefit from educational experiences without the need for separate or specialised modifications, UDL supports proactive design as opposed to retrospective adjustments.

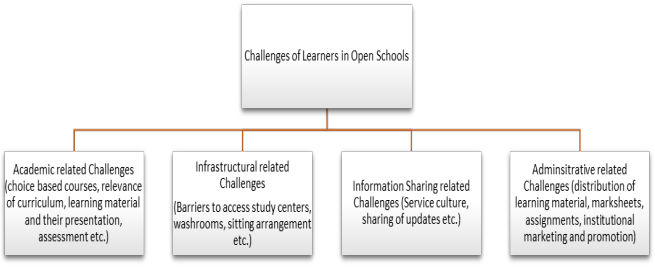

Figure 2: Major Challenges faced by the learners with disability in Open Schools in India

The development of the idea from the fields of architecture and product design to its implementation in education, with a focus on providing equitable learning opportunities for all students, regardless of their talents and backgrounds, is highlighted by the historical viewpoint on UDL. UDL's origins can be found in the fields of product design and architecture. The idea of universal design first appeared in architectural and urban design in the 1960s and 1970s, with the goal of making things and settings useable by everyone, regardless of age, ability, or disability. In the 1990s, the UDL framework as we know it today began to take shape. The Harvard Graduate School of Education's David Rose and Anne Meyer, among others, pioneered UDL by combining Universal Design concepts with educational practises. In order to meet the varied requirements of learners, their work placed an emphasis on offering a variety of representational, engaging, and expressive mediums.

UDL for Learners with Disability

Research reveals that children with disabilities benefit greatly from Universal Design for Learning (UDL), which offers a flexible and inclusive approach to education that accommodates their variety of learning needs and skills. By allowing for customization and flexibility in teaching strategies, resources, and evaluations, UDL makes it simpler to accommodate a range of disabilities. The learning process can be modified by teachers to accommodate student choices and needs. Also, UDL encourages a variety of engagement techniques, enabling kids with disabilities to interact with the information in ways that are appropriate for their skills and interests. Their interest and involvement in educational activities may increase as a result. By offering a variety of teaching styles and tools to accommodate the various learning needs of students, UDL supports differentiated instruction. Based on each student's skills, interests, and obstacles, educators might modify their strategy. Teachers can lessen potential learning obstacles for students with disabilities by implementing UDL principles. This all-inclusive strategy aids in creating a setting where each child may easily access the curriculum and actively participate in it. The inclusive and encouraging learning environment fostered by UDL can increase the self-efficacy and confidence of kids with impairments. Their general intellectual and social confidence increases when they can participate and succeed in class. Hence, it is rightly to adopt UDL in the teaching and learning process as it promotes an inclusive and empowering learning environment by guaranteeing that children with disabilities receive the assistance and opportunities they require to realise their full potential.

Review of Related Literature

The researchers have carried out an extensive review to develop a deep understanding on the distance education and challenges pertaining to it at national and international level. To form the base of this study, the most related and relevant studies are discussed below in this section.

Prinsloo and Uleanya in 2022 carried out a study and revealed that despite an institutional commitment to delivering equal learning opportunities, students with disabilities were often invisible in the process of designing, planning, and delivering instruction in South African Distance education system. Other study executed by Santamaria-Lopez, T.M., and Ruiz, V.G. in 2022 on the experiences of students in distance and virtual learning revealed the significance of simulating the physical classroom experience in the virtual setting, encouraging student friendship, developing engagement strategies, and taking into account socio-cultural factors that affect learning in distance education, particularly for learners with disabilities and/or from disadvantaged backgrounds. It was also mentioned by the authors that distance education is one of the better alternatives for children with disabilities and/or from vulnerable families. Richardson in 2009 analysed the academic progress of students from the United Kingdom's Open University who were enrolled in remote learning courses in 2009. It was found in the study that students with mental health issues demonstrated poorer course completion and lower pass rates than non-disabled students. Also, students with restricted mobility demonstrated poorer course completion and lower pass rates than non-disabled students. Moreover, it was also observed in the study that students with other disabilities demonstrated lower pass rates than non-disabled students. Further, students with dyslexia or other specific learning difficulties demonstrated lower pass rates. The researcher suggested in the research that the diverse groups of students with specific disabilities must be the focus of accommodations in education system, especially in distance education system. In the other study, at an Israeli distance learning university, Heiman (2006) found differences in the academic performances of students with and without learning disability (LD). According to the findings, LD students preferred to employ more step-by-step processing, including memorization and drilling, than Non-LD students. On further comparison, it was found that students with LD had greater need for self-regulation techniques, such as planning, monitoring, controlling their learning process, self-orientation, and ongoing assessment of their progress. Students with LD also asserted that they lacked self-control, citing challenges in the classroom. Findings of this study were in regard to how educational institutes that offer distance learning might better develop the skills of their LD and Non-LD students. The other study by Moisey in 2004 on the enrolment status of students with impairment of Athabasca University highlighted that students with disability experienced a little less success as compared to their counterparts. Also, the study casted some doubts on the improvement aspect of distance education system, whether distant learning may improve accessibility and success-enhancing support services for students with disabilities.

According to the literature review, students with impairments experience difficulties in a variety of areas and have a lower success rate than their counterparts in the distant education system. Since, National Institute of Open School also deals with education of children with disability and have a good enrolment of learners with disability, the researchers felt the need of carrying out a small scale research at NIOS with respect to exploring possibilities and challenges of learners with disability in open school system in India.

About the Research

This research aimed to improve the current practices of existing open schools in India and was carried out in two phases. In the first phase, the researchers intended to explore the concerns and problem areas of the learners in open school with a special focus on the learners with disability and in the second phase, an intervention programme was provided which was assessed at the end through statistical analysis.

Aim of the Study

"To study the challenges and find remedial measures in order to improve the Open School System for learners with disability in India"

Research Questions

Following research questions were framed for the study:

- What are the educational provisions made for learners with disability in open school system in India?
- What are the challenges of learners with disability in open schooling?
- How the curricular content is made available and to what extent do children with disabilities feel at ease with the curriculum?
- If the content for the open school learners are prepared on UDL principles, what would be the effectiveness of that content on the understanding level of the learners?

Objectives of the Study

- To explore the challenges of learners with disability studying in open schools.
- To develop sample content on UDL principles for learners with disability studying in open schools.
- To observe the effectiveness of the content developed on UDL principles on the understanding level of learners with disability.

Delimitations of the Study

The study had following delimitations:-

- The study is delimited to open school learners only.
- The study explored the concerns and challenges of learners with disability only.
- The effectiveness of the developed content on UDL principles was assessed on the learners of the National Institute of Open Schooling only.

Research Methodology

This research had a mixed method research paradigm consisting of qualitative and quantitative tools for data gathering and means of data analysis. The research was carried out in two phases. The first phase of the research had a survey design that focussed on exploring the challenges of the learners with disability (LwD) whereas the second phase had a quasi-experimental design, with two groups; control and experimental groups, pre-test, post-test design. 2 stage sampling was done for sample selection. For the first level of survey research, random sampling was done. However, for the second stage of experimental research, the purposive sampling technique was adopted. Non-probability (purposive sampling) was used for this study as the researchers recruited only the learners with disability in the study. Generally, the learners visit to NIOS Headquarters (Hqrs) for various purposes. Hence, LwD visiting Hqrs were recruited. The recruitment drive carried out for 45 days. At the end, based on their willingness to be the part of the study, 50 learners with different disabilities were finally made the part of this study after taking their consent. A questionnaire was administered to gather the data. The questionnaire was translated into three languages i.e. English, Hindi and Indian Sign Language and was shared with the sample through different means video

format, personal interaction and hard copy (as per the convenience of the learner).

In the second phase, after finding the core problem area and modifying the content as the need and interest of the LwD, modification of one of the chapters of X grade Science subject, topic 'AIR' was done. For the piloting and to check the effectiveness of the content, a fresh sample was prepared which consisted of 30 LwD. 15 LwD were made part of control group and 15 LwD belonged to experimental group. Most of the times, the learners of open school study the content on their own and take the help of the study centers as and when required. Hence, there was no change made in the transaction process. The entire process was left untouched for both the groups. The change was brought only to the textual content supplied to both the groups, the modified content was provided to the experimental group. They studied the target chapter in the usual way. Before giving the modified content to the LwD, a pre-test was administered and a post test was again administered after 15 days. The feedback and post test were used to reach to the conclusion on the effectiveness of the content.

Sample

The learners of the NIOS were selected as a sample for this research. The data of enrolled learners who were having the disability was taken from the organisation's database and a list was prepared. From the list, randomly 75 learners were approached for the study. 58 of them gave their consent to be part of the study. But, as per the availability and other factors, the final sample constituted of 50 learners with disability. A sample of 50 learners was prepared. For a better understanding of the sample, the questionnaire was administered to the sample through different means i.e. explanation of the statements through Indian Sign Language, simple statements in written format and verbal explanation of the statements in face-to-face meetings. The data gathered through the questionnaire was analysed through percentage analysis. Out of these 50 learners, purposively, 30 were further contacted for the intervention programme. These 30 learners were again divided into two groups (control group and experimental group) having 15 learners in each group. Before the start of the intervention, the knowledge of the groups on the chapter 'Air' was assessed through the pre-test. The control group was asked to study the chapter 'Air' of grade X through the textbook (NIOS textbook) provided to them whereas the other group was given the modified content of chapter X which was developed by the researchers on the universal design of learning. The learners were given the time of 15 days to study the content. After a period of 15 days, the learners were asked to attempt a post-test (pre &post-tests were presented as per the needs of the learners i.e. verbal, non-verbal or written). The results of the post-test of both the groups were compared and the findings are presented in the analysis section.

The following tools were used in the study to gather the primary data:

Questionnaire

The questionnaire was prepared on the following dimensions:

- The registration process,
- accessibility to study centres,
- study material,
- examination and
- support services extended by the organisation.

The validity of the questionnaire was established by 4 experts and necessary changes were made to construct the final draft of the tool (Figure 3).

NIOS is in process of making the learning environment better for all the learners. NIOS requests you to kindly fill this form honestly and contribute in the system development process. Your responses have no relation with your academic assessment; rather will help in modifying the NIOS system to serve you the best in learning.

We wish you a happy learning with NIOS!

Learner's Profile	
Name of the Learner (Optional)	
Registration Number	
Gender of the Learner	
Learner's Age	
Class/ Grade/ Level (Secondary/ Senior Secondary)	
Study Center Name, Code and Region	
Mobile No.	
e-Mail ID	

		Very Good	Good	Acceptable	Poor	Very Poor
1	How is the Online registration process of NIOS?					
2	What is your opinion on the Admission Fees charged by NIOS?					
3	How are the facilities like of drinking water, electricity, and sitting arrangement at the Study centers?					
4	How did you find the information given to you at the study centers regarding TMA submission, Date of Examination and Dispatch of Books?					

Figure 3: A glimpse of the questionnaire used in the study

Content on UDL principles

The sample content on UDL principles of Xth grade Science subject, topic 'Air' was prepared and validated by 03 subject experts. The content was designed on three principles of UDL i.e. multiple means of engagement, expression and representation. The researchers incorporated various features like visual dictionary of the keywords, pointers, colourful and appealing images, flow charts, tables, graphs, mnemonics, and in-text questions etc.

Pre-test and Post-test tools

Pre-test and post-test tools were constructed from the Xth grade Science subject, topic 'Air', piloted and validated by the subject experts. The Pre-test and post test tools consisted of 15 objective type questions assessing the knowledge, understanding, application and value domains. The concurrent validity of the pre-test and post test tools were established and were observed as 0.65.

About the Institution

National Institute of Open Schooling

The National Institute of Open Schooling (NIOS) is a significant educational institution in India that operates as an autonomous organization under the Ministry of Education, Government of India. Established in 1989, NIOS serves as the largest open schooling system in the world. Its main goal is to deliver high-quality education to everyone, including learners who are not in school, working professionals, and people who want to advance their education. At the secondary and senior secondary levels, NIOS offers a wide variety of courses in addition to career, life-enrichment, and skill-development programmes. One of the two National Boards for secondary education, the National Institute of Open Schooling, provides schooling through the ODL style. Some of the primary features that make NIOS an appealing option for students looking for a non-traditional and flexible education system are the flexibility of learning at one's own pace, the availability of multimedia and online study materials, and the opportunity for on-demand tests. It has been crucial in advancing inclusive and egalitarian education, reaching out to remote and underserved places, and enabling people to realize their educational and professional ambitions.

NIOS is determined to work in the area of expanding learning opportunities in different domains and contributing to enhancing enrolment retention, vocational competency and life skills. NIOS is striving to maintain a symbiotic relationship between demand and

supply by preparing and training the people as per their individual and societal needs.

Please use this scan code to visit NIOS website (https://www.nios.ac.in/)

Educational Provisions for learners with disability in Open Schools in India

Many modifications are brought into the system with respect to having better inclusion of learners with different disabilities in the open and distance learning environment. Some of the reasonable accommodations and facilities given at various open schools in India are:

- Provision of additional time: Extra 20-30 minutes in the examination with short breaks in between.
- Provision of Amanuensis: Permission to have a scribe, reader, lab assistants, and Sign language interpreters to take the examinations.
- Provision to use of Assistive Devises: Learners are allowed to use computers, having text to speech, speech to text software, Braille typewriter, talking calculators, talking abacus, Taylor frame, geometry drawing kit, use of adapted hardware like trackball instead of a mouse, augmented communication board, use of adapted chair etc.
- Provision of change of exam centres and seating arrangement
- Provision of alternate questions
- Provision of the presence of near and dear ones during the exam.
- Special study centres for learners with disability like NIOS have Special Accredited Institutions for Education of the Disadvantaged (SAIED) centres, with special arrangements for disabled learners.

Special Accredited Institutions for Education of the Disadvantaged (SAIED) Centers of NIOS

The NIOS has recognised institutes for the education of the underprivileged in order to meet the requirements of those with physical or intellectual disabilities. Through SAIED, academic courses like open basic education (OBE), secondary and senior secondary courses, and vocational courses are provided on their own or in conjunction with other academic subjects.

The approximate enrolment data of the learners with different disabilities in the last 4 years (2018-2021) in Table 1 reveals that there are quite a good number of learners with disability (LwDs) enrolled with NIOS. The data is as follows:

The above data in Table 1 highlights that NIOS has learners with different disabilities. The disability category here in the above table covers almost all the disabilities listed in the Rights of Persons with Disability Act, 2016 of India (the recent revised disability act of India).

The data reveals that there are more numbers of learners enrolled with locomotor and hearing impairment in the last 4 years whereas the learners with Parkinson's disease, sickle cell anaemia and acid attack are quite low in number. And, if the pattern of

Table 1: Enrolment data of NIOS: learners with disability (2018-2021)

	Type of Disability	*Year of enrolment*				*Total*
		2018	*2019*	*2020*	*2021*	
Number of learners enrolled with NIOS	Acid Attack Victim	0	2	2	2	6
	Autism	275	311	348	295	1229
	Cerebral Palsy	167	217	187	168	739
	Chronic Neurological Condition	-	21	18	9	46
	Dwarfism	-	5	3	6	14
	Hearing Impairment	850	1180	807	599	3436
	Haemophilia	-	6	4	3	13
	Intellectual Disability	642	1185	1043	886	3755
	Learning Disabilities	945	1166	905	578	3594
	Leprosy Cured	33	19	23	10	85
	Locomotor Disabilities	1790	19126	470	254	21640
	Low Vision	3	600	90	89	782
	Mental Illness	55	45	57	33	190
	Multiple Disabilities	252	225	177	109	763
	Multiple Sclerosis	-	10	8	1	19
	Muscular Dystrophy	1	78	31	37	147
	Parkinson's Disease	-	1	1	2	4
	Sickle Cell Disease	-	6	1	0	7
	Speech and Language Disability	1	34	26	29	90
	Thalassemia	-	4	8	1	13
	Visual Impairment (Blindness)	267	232	166	124	789

Table 2: Demographic profile of the sample

S.No.	*Academic Level of Learners*	*Number of Learners*	*Type of Disability*
1	OBE Level 3	12	Hearing Impairment, Intellectual Impairment and Visual Impairment
2	OBE Level 2	09	Intellectual Impairment and Visual Impairment
3	Secondary Stage	23	Hearing Impairment, Intellectual Impairment, Speech & Language Disability, Low Vision and Visual Impairment
4	Senior Secondary Stage	06	Hearing Impairment and Visual Impairment
Total	50		

enrolment of learners is studied, it is found that in the year 2021, comparatively the admissions were less. Though, in the year 2021, the learners with intellectual disability, hearing impairment and learning disabilities are found to be in significant numbers.

The above data of the last 4 years reveals the enrolment data of the learners with different disabilities with NIOS, it is observed that NIOS have quite a good number of learners with different disabilities enrolled. Moreover, if the total enrolment status of learners with intellectual disability, mental illness, learning disabilities, multiple disabilities, cerebral palsy and autism is observed, it is found that approximately 10, 316 learners are enrolled with the NIOS who all require content to be presented in modified and adapted form.

Analysis, Findings and Interpretation

Objective 1: To explore the challenges of learners with disability studying in open schools

Findings

A questionnaire prepared on 5 dimensions was administered on 50 learners having different disabilities. The demographic profile of the learners is presented in Table 2.

A list of all the learners with disability was prepared and randomly some learners were contacted for the research. Majorly, learners with visual, hearing, locomotor and intellectual disabilities were taken in the sample and learners from the secondary stage were more as compared to another academic stage.

Dimension-wise analysis of the questionnaire was done.

The above table (Table 3) reveals that there are 76% of learners with disability acknowledged that they find problems in accessing the study material (text-books) and experienced the student support system of the institution to be less available during their course of study. Further, on personal interaction with the sample, it was found that the content presentation of the textbooks of the organisation was felt not to be so comprehendible and easy to access to most of the learners. Also, 58% of the sample shared their concern about the examination. It was reported that the learners want the examination to be conducted in an accessible format. Some of the visually impaired learners stated that it is difficult to find a scribe to write the exams and expressed their wish of taking a verbal exam rather than a paper pencil exam. Likewise, learners with hearing impairment also expressed their concern about taking the exam in sign language. There were only 36% of the learners acknowledged their problems with respect to study centres. Hence, it could be observed that the challenges pertaining to study material, support service and exams are high and accessing, assistance, sitting arrangement, and information sharing at study centres of NIOS was observed to be better as compared to others. On disability-wise analysis, it was found that learners with intellectual disability and hearing impairment were facing more challenges as compared to others.

When the academic level-wise analysis was done, it was revealed that learners belonging to the secondary and senior secondary stage were found to have more challenges as compared to the others.

Objective 2: To develop sample content on Universal Design of Learning (UDL) principles for learners with disability studying in open schools

Findings

The purpose of education is not only to make information accessible, but also to teach learners how to transform accessible information into useable knowledge. Decades of cognitive science research have demonstrated that the capability to transform accessible information into useable knowledge is not a passive process but an active one. Constructing useable knowledge for future decision-making depends upon active "information processing skills" like selective attending, integrating new information with prior knowledge, strategic categorization, and active memorization. Individuals differ greatly in their skills in information processing and in their access to prior knowledge through which they can assimilate new information. Proper planning, design and presentation of information can provide the scaffolds necessary to ensure that all learners have access to knowledge.

The ODL system promotes self-paced learning as it allows the learners to design their learning experiences on their own and use the materials and resources according to the availability of time, interest and learning preferences. Therefore, the learning resources of the ODL system are deliberately organised in such a manner that it caters the needs of the learners. Hence, it has got various interesting features like content in small chunks, learning stations, self-checks etc.

Table 3: Dimension-wise analysis

Dimensions	*Learners acknowledged Challenges*	*% of the Learners*
Registration/Admission to the course	24/50	48%
Accessibility to the Study Centers	18/50	36%
Accessing the Study Material & Curriculum content	38/50	76%
Examination at NIOS	29/50	58%
Student Support System of NIOS	38/50	76%

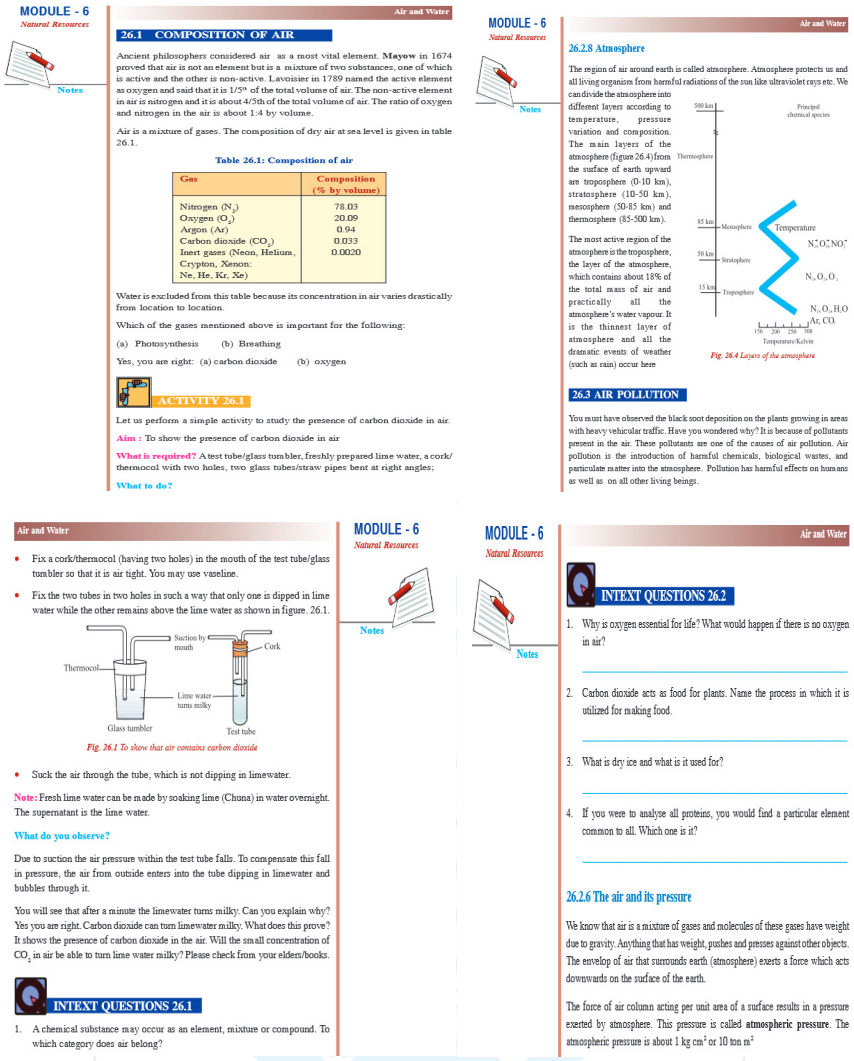

Figure 4: Screenshots of NIOS Science Text Book content

Figure 4 shows the existing content of Xth grade Science text book of NIOS, Air & Water chapter.

The chapter of NIOS Science textbook is very well written, following the guidelines of how to write a textual content for open and distance mode learners. But, on performing critical analyses from inclusion of 'learners with disability' lens, it was observed that the content has a lot of scope for experimenting and bringing modifications as per the recent norms and principles suggested at global level for preparing content for the LwDs.

Also, to gauge how it can be improved further, the researchers attempted to design the existing (NIOS, Xth grade Science Book content) content on Universal Design principles. The modified content was prepared by keeping the following principles in mind:

- Breaking down complex sentences into simpler ones.
- The visual dictionary of the Keywords of the chapter.
- Short sentences and pointers.
- Use of images, flow charts, tables, and graphs to comprehend better.
- Use of Mnemonics to memorize the concept.
- Simple In-text Questions to give the learners a sense of achievement, etc.
- Provision of QR Code

The preview of the modified chapteris as follows (Figure 5):

- The use of a visual dictionary (key terms) in the chapter
- Use of simple sentences with highlights on important words of the sentence.
- Use of Graphs, Tables and flow charts for better understanding and linking of concepts.
- Use of pictures to comprehend the concept.
- Use of Sciencetoons for the explanation of experiments.
- Use of comic interactions.
- Use of Concept Maps
- Use of Mnemonics
- Use of simple in-text questions for self-assessment.

Objective 3: To observe the effectiveness of the content developed on UDL principles on the understanding of learners with disability

Hypothesis

H_{01}: There is no significant difference in the post-test scores of control and experimental groups on the understanding of concepts of Science chapter of Xth grade: 'The Air' after the intervention.

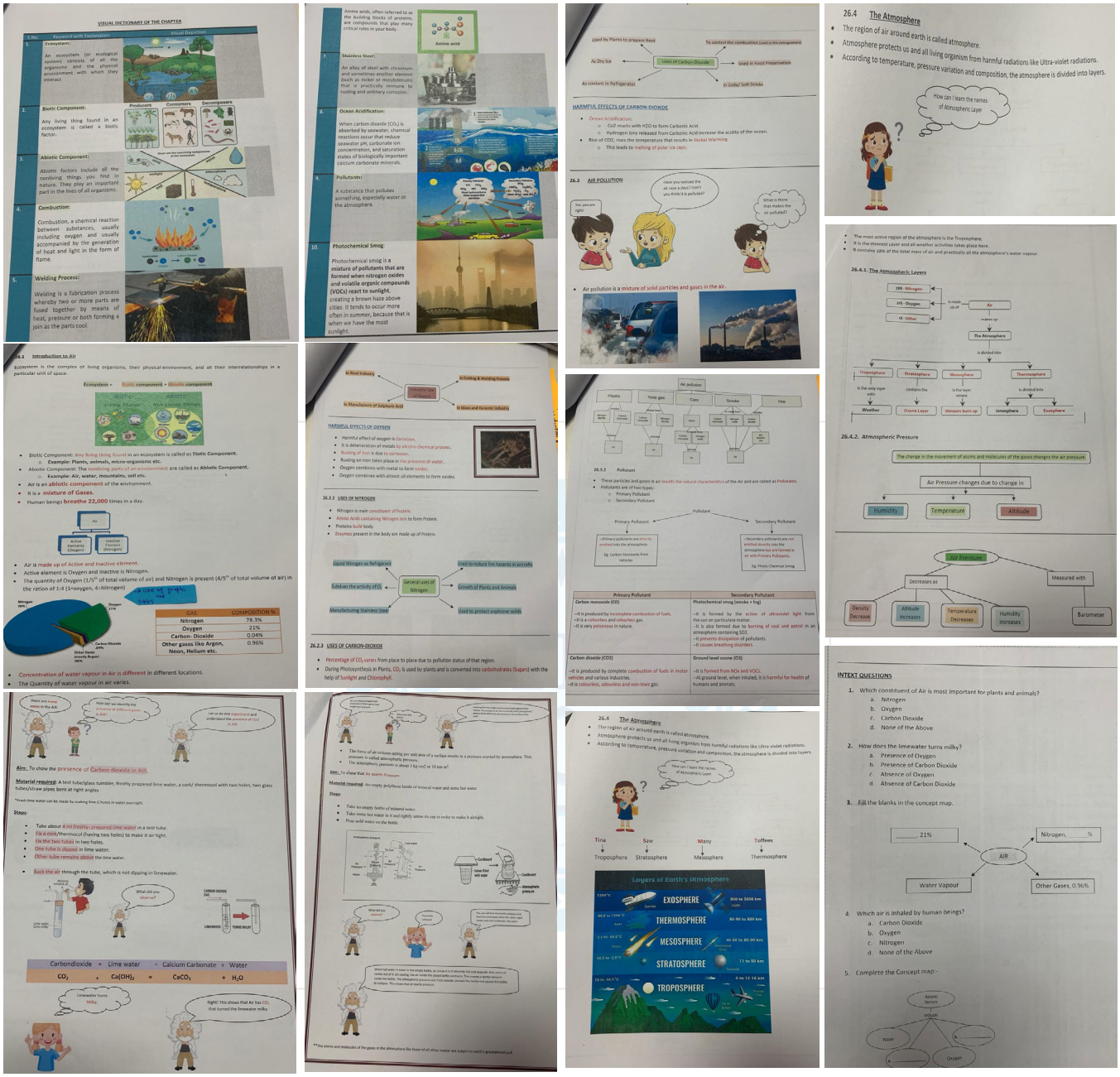

Figure 5: Preview of the modified chapters

Table 4: Descriptive Statistics presenting the comparison of Post-test scores of control and experimental groups

Variable	*N*	*Mean*		*SD*		*Variance*	
Post-test scores of Science Achievement test	15	Control Group	Experimental Group	Control Group	Experimental Group	Control Group	Experimental Group
		4.42	11.43	1.71	1.81	2.95	3.28

The comparison between the control and experimental group in the post-experimental phase was done by comparing the post-test scores of both groups. The comparative analysis of the post-test scores is as follows:

Table 4 revealed that the mean post-test scores of the control and experimental group on the Science achievement test were 4.42 and 11.43 with SD 1.71 and 1.81 respectively. This shows that there was a difference in the mean of the post-test scores of both groups i.e. 7.01. Hence, a gain score was found in the experimental group and it was interpreted that the performance in the post-test of the experimental group was better than the control group.

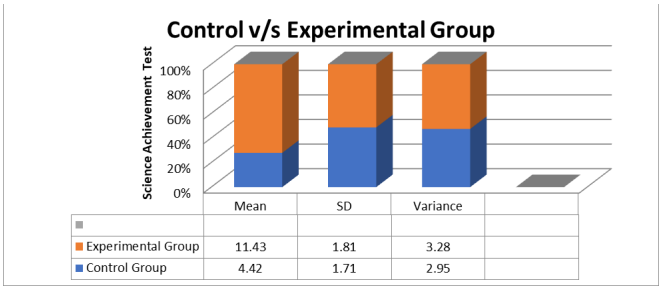

Figure 6: Test scores compared between Control and Experimental group

Table 5: Inferential Statistics presenting the comparison between the post-test scores of the Control and Experimental Group

Science Achievement Test	*N*	*U*	*U Critical Value*	*Z Value*
Control v/s Experimental Group	15	0	p< .05 is 8 p< .01 is 4	-3.06661

Formula used:

$$U = NM + \frac{N(N+1)}{2} - \sum_{x_i} Rank(x_i)$$

On computing the Mann-Whitney U Test on the achievement test to test the hypothesis, it was found that the computed value was found to be 0 and the critical value at 0.01 and 0.05 level of significance was 4 and 8 respectively (Table 5 and Figure 6). Since the computed value was smaller than the critical value, hence, the H_{01} was rejected. Therefore, it could be interpreted that there was a significant difference in the post-test scores of the control and the experimental group on the science achievement test after the intervention was provided.

Hence, it is stated that:

"There is a significant difference in the post-test scores of control and experimental groups on the understanding of concepts of Science chapter of Xth grade: *'Air'* after the intervention.'

Conclusion

Though various inclusionary practices are practised at NIOS like integration of academic and vocational courses, online admission process, accessible content in ISL for the learners with hearing impairment, dictionary in ISL, study materials in ISL, talking books and large-print books, mobile app, NIOS virtual open school, on-demand examination, and assessment in the preferred language etc., still, there are diverse challenges that remain in the ways of open school learners, especially the LwDs.

On the basis of the findings, it is concluded that the LwDs face challenges in the open school system, especially in accessing the textual content, taking the examination and student support services of the institution. Furthermore, it is also concluded that when the material of the NIOS Science course of Xth grade was modified using UDL principles, the content became more comprehensible, engaging, and learning outcome driven.

Every child has a different style of learning and understanding the knowledge provided by the teacher. Hence, it is accurate to say that the different means of presentation, assessment and engagement of the learners with the content make the learning system efficient and less challenging. All learners need to be able to generalize and transfer their learning to new contexts. Learners vary in the amount of scaffolding they need for memory and transfer in order to improve their ability to access their prior learning. Of course, all learners can benefit from assistance in how to transfer the information they have to other situations, as learning is not about individual facts in isolation, and learners need multiple representations for this to occur. Without this support and the use of multiple representations, information might be learned but is inaccessible in new situations. Supports for memory, generalization, and transfer include techniques that are designed to heighten the memorability of the information, as well as those that prompt and guide learners to employ explicit strategies.

Suggestions

Learners may have various sensory (hearing, seeing) impairments, physical impairments, mental health conditions/psychosocial disabilities, intellectual disabilities, and developmental delays and educational institutions must explore different means to welcome them in the best possible manner. Based on the findings of this research, the researchers present some suggestions to make the learning more accessible and interesting for the open school learners:

- Every open school must conduct small-scale research studies to explore the challenges of the learners enrolled with them. It provides a chance to assess the extent and potential regions for development.
- Learners belonging to the marginalised societies are the major chunk of open schools in India, hence, it is suggested to focus on the educational strategies, curriculum construction and transaction keeping the under-served population in mind.
- Research studies revealed that the LwDs at Open schools are facing challenges in accessing the curriculum, hence, it is suggested to revisit the textbooks of open schools and bring modifications in the content as per the need of LwDs. The textbooks must be prepared on the UDL principles so that they are made accessible and available to all.
- With the change in educational policies, the practices at the ground level may also need to be changed. Therefore, a change in the assessment and examination system at open schools must also be welcomed wholeheartedly in India. It is suggested that there must be multiple means of taking the examination at open schools in India. The learners may be allowed to take the exam in different modes like verbal, non-verbal, written etc.
- The learners in this research also reported a lack of student support services. Hence, it is suggested that open schools must have support services in their best shape. As the learners don't get the opportunity to interact with the tutors and teachers on the daily basis and are also not associated with the regular system, they tend to face numerous problems pertaining to registration, submission, examination, study material etc. Therefore, it is suggested that a well–established student support service along with a guidance and counselling center at the open school must be in place with proper public dealing and grievances addressing deadlines. It creates a bond between the learner and the institution, motivates for better learning and enhances the academic aspirations of the learner.

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