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CONCEPTUALIZING DIGITAL ACCESSIBILITY FOR STUDENTS IN EDUCATION

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ABSTRACT
The primary aim of education is to bring all-round and harmonious development of individuals in different aspects of their life and enable them to attain their full potentialities for performing any productive tasks. Hence, every individual has the right to receive equal opportunities for quality education irrespective of their physical, socio-cultural, and economic backgrounds. However, in the recent decades, the roles accomplished by modern technologies in the domain of education with respect to delivery of instruction, learning activities, teaching strategies, process of evaluation etc. are very much crucial and noteworthy. Thus, it is important to understand the necessity of equal access towards advanced technologies of all students at different stages of education. Therefore, the present paper aims to explore the very notion and issues of digital accessibility, recognizes its major provisions and practices that are designed for all learners so that they may perceive and utilize those digital media effectively. Finally, the researchers of the paper try to address various benefits and challenges besides examining the educational implications of digital accessibility for ensuring adequate students' engagement in learning.

KEYWORDS: *Digital Accessibility, Provisions and Practices for all learners, Benefits and Challenges, Educational Implications*

INTRODUCTION
One of the fundamental rights of every individual is to receive proper and quality education that essentially as well as positively impact upon their growth, development of character and personality. The Constitution of India guarantees Right to Education for all without discriminating any individual with respect to class, caste, creed, sex, religion, or physical and mental disabilities. Hence, it is a prime duty of the state to ensure equal access to education for all to empower them in various spheres of their life. Without necessary education, it becomes impossible for any person to acquire the necessary knowledge, skills, and experiences for participating in any productive works. Thus, it may be said that education is a key factor for the welfare and development of the society and nation. For securing equal and proper access to education for both the abled and disabled learners, the Government of the country adopted several legislative measures and policy-programmes to reduce the barriers confronting easy access of the learners.

However, the whole education system has undergone a transformative change in the recent times due to the introduction and integration of advanced digital technologies at different levels of education. For this purpose, though the technology-mediated teaching-learning methods enable the students to learn in a more innovative way, there remains the problems of equal learning opportunities due to unequal access and inadequate engagement of learners from diverse backgrounds. Hence, it becomes difficult for all individuals to participate effectively throughout the learning process who are having low or limited access to such digital platforms or services. This may perhaps due to the incompetencies of the teachers because of insufficient digital knowledge and skills, the learners usually do not get enough support services from their teachers to enhance their accessibility in digital platforms. Besides these limitations, the learners are unable to involve themselves actively in the digital forum because of their ignorance, insufficient skills, inability to access digital tools and technologies, lack of necessary finance to procure digital materials, environment or contextual barriers or individuals suffering from disabilities hampering their digital accessibility.

Digital accessibility is all about the process of planning, designing, and implementing various forms of digital technologies, software programmes and platforms for guaranteeing equitable access of every individual despite of their abilities and disabilities. In the field of education, one of the basic objectives of introducing the elements of digital accessibility is to achieve sustainable development goals in education appeasing inclusive learning environment for the country in the long run. Digital accessibility is not only concerned with the delivery of instruction or method of teaching but essentially encompasses the strategies for fostering equal learning experiences of the learners regardless of their ability and disability backgrounds.

Therefore, it is imperative to promote digital access for fostering inclusion of all learners and thereby bridging the gap of digital -divide prevailing in the society. Since, technologies are increasingly integrating into various aspects of human lives, thus, equal opportunities and access to digital realm are extremely necessary this may enable all individuals to achieve

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their full potentialities for effectively communicating, collaborating, understanding, and participating in different affairs of the state.

Concept of Digital Accessibility

In recent times, education is being imparted to students in digital platforms. From the registration of the students in a particular class to the distribution of study materials, assignments and their assessments are all being carried out through online process. This subsequently enhances the convenience of the users to access those digital platforms for education very easily. However, in the sphere of education, the educational stakeholders usually pay adequate attention to students access for proper learning. But when the question arises for the students with disabilities, the educational stakeholders attempt to remove all sorts of physical, social, economic obstacles hindering the access of students to education by accelerating the provisions and usage of online resources.

According to **Spiegel (2016),** Digital accessibility means to ensure that the products of both online and offline resources as well as various online programmes shall be made available and user-friendly for all kind of individuals. Thus, digital accessibility in the educational sphere, aims to promote educational websites, software programmes, videos etc., that are accessible in nature for all and follows the principles of Universal Design for Learning (UDL). The main goal for advocating digital accessibility is to create enough learning opportunities for all learners without any discrimination to bring their desired academic performances. Such digital accessibility may support and benefit every student equally irrespective of their disability backgrounds in acquiring knowledge and developing the essential skills for learning. Therefore, it is of utmost requirement to follow the **Web Content Accessibility Guidelines (WCAG)** to improve the degree of digital accessibility of all students and upgrade the user interface design. This eventually facilitates proper navigation of the websites and other online programmes or platforms by the learners according to their pace and requirements. The Web Content Accessibility Guidelines (WCAG) include mainly the four key aspects that are as follows-

- **Perceivable-** It is related to the aspects of availability of the content for learning purpose. It enables the learners to perceive the learning content so as to suit their unique learning requirements and their individual choices. It mainly emphasized on the appropriate presentation of relevant information to the users by considering the ways and modes that support their proper perception.
- **Operable-** It is an important aspect of web accessibility that relates to the ability of the users to communicate, engage, operate and collaborate with the given digital learning content and the interface.
- **Understandable-** It is another significant aspect of web accessibility that enable the users to understand the content available in different digital modes such as in pictorial format, in tabular form, textual data, streaming data, speech form, videos. Thereby using such digital content, it enables the users for carrying out a specific learning task. Such aspect is essentially concerned with the processing of information by the users based on their unique learning needs.
- **Robust-** It is one of the key aspects of digital accessibility that aims to expand the learning experiences and skills of all learners. It mainly focused on the ability of the users to interact and perform with the digital content effectively. Hence, it basically refers to the development of the learning content to such as extent that may work in contemporary days with the existing technologies as well as in the forthcoming days with advanced form of future technologies.

Hence, the term digital accessibility is a wider concept that usually remains aligned with the concept of '**Universal Design**.' The term 'Universal Design' refers to designing any product, service, or environment according to the need of the individuals so that they may utilize those as far as possible without undergoing any form of modifications, adjustments or expertise. However, in case of imparting education, '**Universal Design for Learning'** is an approach that attempts to provide meaningful learning experiences to all learners by accommodating their learning needs and considering their potentialities. Such teaching-learning framework proposes varied means for presenting relevant information to improve the learner's perception as well as comprehension of those information. This approach intends to increase the active engagement of all learners in the whole learning process that enable them to access the study materials effectively for desirable learning outcome. The **Rights of Persons with Disabilities (RPWD) Act** enacted and passed by the Parliament of India in the year 2016 enumerates the guidance and understanding of digital accessibility. The Act preferably laid emphasis upon "reasonable accommodation" for exclusively persons with disabilities so that they may have adequate access to mainstream educational facilities with the other normal students without disabilities.

Status of Digital Accessibility in Education

According to the **Report of Ministry of Education, Government of India (2021**), nearly about **28.6% of government schools** in India have facilities to computer. On the other hand, only **11.6% of government schools** in India have proper internet services.

Table:1 Showing percentage of students without access to Smartphone or digital devices in different states of India

Name of the State	Students without access to Smartphones
Bihar (Highest)	53.8%
West Bengal	46.5%
Uttar Pradesh	34.3%
Rajasthan	33.4%

Source: BusinessToday. In

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As per the survey report obtained from the **Unified District Information System for Education (UDISE) 2021-22,** about **5,04,989 (33.9%) schools** out of **14,89,115 schools** in India have access to proper internet services.

Table: 2 Showing percentage of schools with Internet access in India

Type of School	Schools with Internet Access (%)
Government	24.2%
Government-aided	53.1%
Private	59.6%

Source: Data obtained from UDISE 2021-22

The Unified District Information System for Education (UDISE) data also showcased that in the year 2021-22, about **13.4% of schools** in India lacked functional electricity connections. **Delhi** occupied the top position with respect to highest number of schools with internet facilities in government, government-aided as well as private schools than other states in India. It has also been observed in the report that, the percentage of schools having functional computer facilities has increased from **33.34%** in the year 2018-19 to about **45.8%** in the year 2021-22 in India.

However, according to the data obtained from the **Education Ministry of India in 2023**, there is only **24% of government schools**, **53% of government-aided schools** in India having internet services. Despite of having a greater number of government schools in the states like Odisha, West Bengal, Maharashtra, Assam, the access of the schools with internet connections is extremely low in these states.

Table: 3 Showing percentage of Household accessing Internet facilities in West Bengal

Rural Households	Urban Households
15%	42%

Source: The Survey reports obtained from National Statistics Office (NSO)

Table: 4 Showing percentage of Schools with access to ICT labs in West Bengal

State/ Districts	Secondary Schools	Higher Secondary Schools
West Bengal	21.9%	24.9%
Bardhhaman (Highest)	43,47%	47.75%
Kolkata	14.44%	19.82%
Purulia (Lowest)	13.06%	12.10%

Source: Report obtained from DISE 2015-16

Several major Schemes and programmes have been launched by the government of West Bengal for ensuring proper education through digital platforms. The notable schemes include **West Bengal Free Tablet Scheme 2022, E-Counselling, Unified District Information System for Education (UDISE), Student Credit Card, Banglar Shiksha Mobile App, Students' Scholarship Portal, m-Priyadarshan Mobile App etc.**

Provisions for Ensuring Digital Accessibility for Learners in Education

Digital accessibility aims to foster universal access and equal usage of digital services and programmes by everyone without considering their type of devices being used, contextual backgrounds, and kind of disabilities. Several provisions are being offered to ensure equal access of all learners to the digital platforms.

These are discussed as follows-

i. **Provisions for Equality of Educational Opportunities**- All the educational institutions must take necessary measures to ensure equal educational opportunities for online learning to all learners irrespective of their diverse backgrounds at different stages of education. Hence, all learners including both the abled and disabled learners have equal freedom to enroll themselves in any of the educational course or programme of their choices.

ii. **Provisions for Equal Treatment and Equality of Participation**- Every learner must be treated equally in their learning setting and be encouraged by the educational institutions to participate actively throughout the online learning process. This strategy enables all the learners to receive equal learning experiences to develop their academic potentialities in a viable manner.

iii. **Provisions for Equal Access to Educational Resources**- The educational institutions must provide user-friendly website interface for all learners so that they may access the relevant learning materials and ither related educational resources equally for engaging in online learning process. Hence, the educational stakeholders must develop the innovative web design for online learning platforms that better suit the learning needs of the learners and enable them to access those effectively with their limited financial investment.

iv. **Provisions for Equal Engagement of Learners**: For ensuring digital accessibility, it is required to engage all learners equally in the online learning programmes with respect to their process of enrolment, registration, attendance, teaching-learning process, assessments etc. Hence, all sorts of discrimination relating to their diverse socio-cultural and economic backgrounds as well as

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varying degree of abilities and disabilities must not be entertained in any circumstances to guarantee accessibility of learners in digital learning process.

v. **Provisions for Inclusive Setting for all Learners**- One of the fundamental aspects of promoting digital accessibility in the field of education is to foster the principles of inclusive education at different stages. Inclusive setting enables learners to develop effective interpersonal skills, communication skills, collaboration, and active learning skills. All these aspects are very much significant to provide equal learning experiences to all learners without any discrimination. Hence, the educational stakeholders must incorporate the principles of universal design for learning while formulating and implementing digital curriculum for the students for any course.

vi. **Provisions for Prioritizing the Learning Needs and Capabilities of all Learners**- For assuring digital accessibility in the field of education, it is of utmost necessary to consider about the present learning needs and thereby prioritize the capabilities of all learners before the actual implementation of any online learning programmes. This may help the educational stakeholders, policy-makers, and the web-designers to design the appropriate form of curriculum.

vii. **Provisions for Designing Accessible Curriculum and Pedagogy at Different Stages of Education-** For effective delivery of instruction, provision of learning materials, conduction of exam for assessment, generation of progress reports etc. it is essential to design accessible curriculum and pedagogy so that every learner may access and participate actively and adequately at their own convenience. For example, use of digital tools and equipments to ease the process of learning by students such as PPT for discussing any topic of learning, providing course materials such as learning materials in audio-video clippings to the learners.

Practices Involve to Promote Digital Accessibility for Learners in Education

The Government of India has adopted specific policies and programmes to promote digital accessibility in the field of education specially focusing on four major aspects. These include-

A. **Aspects related to Procurement**: Accessibility must be seen as a compulsory criterion while taking any decisions regarding procurement policies about digital services and resources.

B. **Aspects related to maintenance of Global Standards**: This implies advocating the guidelines and standards of accessibility across the world in a harmonious manner.

C. **Aspects related to inclusiveness**: It indicates promotion of inclusive society by encouraging creation of advanced, modern innovative technologies and thereby to empower the teachers through enhancement of their teaching competencies.

D. **E-Government:** The Government of India shall take necessary measures to make the available e-government services more accessible to all regardless of their abilities and disabilities.

Therefore, the major practices that are involved in ensuring digital accessibility for all learners include-

a. **Adopting Policies related to Public Procurement, Information and Communication Technologies**- It refers to recognizing the web accessibility standards, promotion of advanced web content for learning and digital services, software learning programmes so that every individual may access those services equally.

b. **Development and Implementation of Educational Curriculum following Web Accessibility Guidelines**: The educational stakeholders must develop the online learning platforms and learning materials by following the general principles and guidelines mentioned in the Web Content accessibility Guidelines and the provisions enumerated in the Rights of Persons with Disabilities Act (2016). This may help to promote inclusivity as one of the major goals in the field education in the long-run.

c. **Formation of Accessible Web User Interface**: This approach may help every learner to navigate online adequately to procure the information needed by them at their own convenient time and place. Such strategy is also required to improve the accessibility of any digital website for the purpose of imparting quality education to all. For example, organizing the learning content sequentially in the website, using color contrast checker, application of various patterns and textures for highlighting the content of importance. All these practices help to ease readability of the learners to a huge extent.

d. **Developing Universal Design for Learning (UDL) for Educational Websites**:

The term Universal Design for Learning refers to an educational approach that vehemently supports the accomplishment of inclusive practices in education. it embraces the design and development of teaching-learning strategies and materials that universally suit all the learners while disseminating the relevant information related to education. The basis aspects of Universal Design for Learning always have deep contemplation in considering the unique learning needs and capabilities of every individual regardless of their ability and disability conditions.

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According to **Meyer et al. (2014),** the concept of Universal Design for Learning (UDL) encompasses three major principles. These are-

- Principles of providing multiple means of Engagement
- Principles of providing multiple means of Representation
- Principles of providing multiple means of Action and Expression

Therefore, such practice is very much essential to ensure digital accessibility of all learners. It advocates the development and design of educational websites with low bandwidth. This enables all learners to easily access those platforms, actively participate on it and obtain their required learning materials by their smartphones or tablets as well as using a very limited cell data.

e. **Formatting the Educational Websites to Promote Digital Accessibility**: In order to guarantee digital accessibility in all sphere of education for all students, the educational websites meant for the purpose of imparting education and other related programmes are needed logical and appropriate formatting for all web browsers such as google Chrome, Mozilla Firefox etc. for ensuring equal access to these web browsers, the educational stakeholders must make those free for all learners.

f. **Practices for distributing printed versions of learning content:** The web pages are generally developed by the web designers keeping in mind the learning needs of all learners for assuring equal access to quality education. Thus, the educational stakeholders are required to investigate the matter regarding provisions for distributing printed versions of those developed web pages to the learners specially those who are not having proper internet connection to access online.

Some other important practices that are involved in promoting digital accessibility in the educational sphere are discussed below-

i. Offering learners **perceivable alternatives to any textual materials** for improving their understanding.

ii. **Adaptable design for structuring the content** according to their unique learning needs and abilities of different learners.

iii. **Modifying the learning content** for increasing its visual appearances and audibility.

iv. **Accommodating all learners** in the learning process for engaging them actively in digital websites by creating **user-friendly online interface.**

v. Provision for **multiple options** for presenting the information to the learners according to their learning preferences and choices.

vi. **Providing captions and descriptions** to the learning, material containing images. Using **different types of color to highlight the** important areas for study.

vii. **Use of transcripts** for any video play to enhance its meaningful perception and improve the readability of the content.

viii. Provisions for using **closed captions** for providing instructional videos to the learners. This method not only benefit a normal student but also help the student with disabilities especially those suffering from hearing impairment to search the required learning content online.

ix. Indicating the essential learning content and relevant information with sufficient and appropriate **color contrast**. This may foster deeper understanding of the study areas and related content.

x. Providing **adequate time** to the learners so that they may navigate more online for their requirements. Extra time helps to accommodate learners as per abilities to interact with digital content.

xi. **Breaking up the single digital learning content** into some sections and sub-sections to improve the comprehension skills of the learners for easy as well as better acquisition of knowledge and processing of information.

xii. **Use of descriptive online links** for enhancing the clarity of the information provided to huge extent.

xiii. Increasing the **accessibility of the output devices** such as in keyboards using shortcut keys for ensuring the feasibility and access of all learners to the digital content equally. For example, all the available functionality on the mouse will be made obtainable on the keyboard.

xiv. **Usage of simple and lucid language** on digital learning platforms for providing directions to the learners.

xv. **Maintaining consistency** in the structure, arrangement, and format of the digital learning content such as use of underline for the hyperlinked content.

Therefore, to provide deep insight into the knowledge, it is necessary to organize the whole learning content into some meaningful relevant sections. This approach may help the learners in shaping their understanding and synthesizing of learning experiences effectively. The educational stakeholders must formulate the appropriate design of the digital learning programmes that tend to support students learning in any academic discipline by encouraging their equal access and participation.

Benefits of Digital Accessibility in Education

i. Digital accessibility allows the learners to meet their learning needs at their own pace and place. Hence, it improves self-instructed learning of all learners to bring their academic progress.

ii. Digital accessibility facilitates equitable educational opportunities for all learners with regards to access to educational facilities, providing support and guidance according to their individual learning needs, providing them with equal treatment, modifying the teaching-learning strategies to foster true inclusion.

iii. One of the significant purposes of digital accessibility is to allow the learners to access and receive information immediately and instantly. This enables the learners to get motivated in their self-paced learning activities.

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iv. To provide ample opportunities to communicate effectively in various new ways by using digital tools and technologies may be enhanced due to the advancement of digital accessibility in education.
v. Creation of inclusive environment for all is a primary goal of digital accessibility. For achieving this goal, the aspects of digital accessibility essentially encompass the principles of inclusivity in areas of teaching methodologies, assessment procedures, examination process, involvement of students in educational activities that carried online to bring desirable learning outcomes.
vi. Digital accessibility enables learners to develop certain essential life-skills that eventually empower all learners in their life-long learning process.
vii. Digital accessibility positively impacts on the contemporary educational system which tends to remove all sorts of hindrances faced by the users to access educational services online.
viii. It also impacts positively on economic empowerment of all individuals by extending employment opportunities through creation of various expected life-skills and competencies.
ix. It enables all learners in exercising their fundamental rights effectively so that they may realize the necessity of equal opportunities for all and develop right perspective towards true essence of inclusion in society.
x. Digital accessibility specially emphasized in empowering the marginalized groups of the society and tries to remove all sorts of barriers that generate digital divide from society.

Challenges in promoting Digital Accessibility in Education

There are several challenges that hampers the proper implementation of different aspects of digital accessibility for students in various stages of education. These mainly include the following challenges-

i. **Challenges related to institutional limitations:** The educational institutions generally face several challenges while implementing digital accessibility for imparting education through online programmes. These include inadequate funds to procure necessary digital tools and equipments, appointment of web designers and recruitment of skilled teachers. Hence, lack of limited resources, improper infrastructure and necessary professional training of the teachers hinder the actual dissemination of knowledge and information through advanced digital technologies.
ii. Challenges related to teaching-learning approaches and pedagogical issues: Due to lack of required training and competencies of the teachers for handling online classroom, to develop online teaching-learning materials, to conduct examinations for assessing the learners, the very goal of digital accessibility get disrupted in the sphere of online education. Inefficiencies of the teachers are responsible for the varied reasons of pedagogical limitations. Hence, due to lack of sufficient digital literacy skills, the teachers fail to encourage learners in improving their communication skills for participating in online educational activities. Thus, lack of necessary supporting services, lack of necessary pedagogical knowledge and understanding of disability issues, inadequate professional training, lack of awareness compels teachers to follow the traditional method of instruction and gradually they become reluctant to adopt modern technology-oriented online teaching-learning process.
iii. **Challenges related to low level of online integration into education system:** Very low integration of digital accessibility aspects into the web systems are generally noticed that put challenges in promoting equal access to online educational resources by all learners. These include the problems such as incorrect textual pattern, images, wrong application of color and contrast that hampers proper perception and understanding of the learners. Another major challenge is non-accessible to any assistive devices and technologies which ultimately hinder the greater participation of disabled learners in the learning process with their normal peer groups.
iv. **Challenges related to economic limitations:** The economic barriers such as lack of sufficient funds to procure digital technologies and devices, to develop web browsers, software programmes faced by the institutions as well as financial problems suffered by the learners of low-income groups adversely affect the implementation of the aspects of digital accessibility in education. Due to high cost of digital devices, internet cost for running those digital programmes, all learners may not afford such online learning process. These barriers also restricted the fundamental objectives of digital accessibility of learners effectively.
v. **Challenges related to technical issue**: Proper implementation of digital accessibility is not possible without necessary digital infrastructure for all learners with respect to their registration process, enrolment and attendance, conduction of exams, management of educational administration, monitoring of educational websites for imparting education and providing library services. For all these services, the educational stakeholders must adopt measures to make the digital infrastructure technically sound enough and feasible to all learners for enhancing digital accessibility. The policy-makers and curriculum frame workers must take initiative to eradicate the issues related to improper standardization of learning. For this to happen, they must take into consideration about the diverse backgrounds of different learners to promote true inclusion in education setting.

Educational Implications of Digital Accessibility

The educational implications of digital accessibility for ensuring adequate students' engagement in learning are discussed below-

a. Digital accessibility is necessary to foster effectiveness of teaching-learning process online and

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thereby promote creativity of all learners irrespective of their diverse backgrounds.

b. Digital accessibility tends to offer innovative way to learn for all learners.
c. Improvisation of the educational system through adequate integration of digital technologies may be facilitated by the aspects of digital accessibility.
d. Promotion of life-long learning for all learners are possible to proper implementation of digital accessibility issues.
e. Digital accessibility aims to encourage adequate collaboration of all learners with teachers and peer groups, their active engagement in learning programmes and emphasizes on development of interpersonal as well as communication skills to bring better learning outcomes.
f. Digital accessibility seeks to provide equal access to all learners for obtaining more and quality digital learning resources.
g. It becomes possible for the learners to learn at their own convenience since learning occurs at their own pace and place.
h. It becomes easier to stimulate more participation and interaction of the learners throughout the learning process because of implementation of aspects of digital accessibility.
i. Dissemination of information to all learners without any discrimination becomes possible due to digital accessibility in the field of education.
j. Digital accessibility aims to ensure equality of opportunities for all learners with respect to their enrolment, participation, attendance, assessment, and feedback procedures and helps the learners to benefit from advanced digital technologies. As a result, their learning experiences also get modernized due to integration of such digital technologies.

Conclusion

Digital accessibility is a basic aspect for guaranteeing equitable opportunities of all individuals in the field of education. It tends to empower all for achieving better livelihood and well-being. It aims to prioritize collaboration of all learners, their proper engagement, representation, and expression for performing any educational tasks through digital platforms. The principles of digital accessibility are essentially interlinked with the goals of sustainable development in relation to imparting quality education to all, establishing inclusive educational setting, and fostering innovative ways of teaching-learning methods. Therefore, the government of the country along with the educational stakeholders must take measures to embrace the key aspects digital accessibility through proper collaboration and legislation of appropriate policy-programmes, creation of enough awareness among public about the necessity of accessibility, following the accessibility guidelines to design and develop the educational websites, digital learning contents accessible for all.

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