



# Media and Educational Technology for Inclusive Learning: Integrating Universal Design Principles in Digital Pedagogy

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## ABSTRACT

The meeting point of digital media technologies and Universal Design for Learning (UDL) theories marks an important frontier in current higher education practice, especially with respect to accommodating increasingly diverse learners. While there is an increase in theoretical interest in the relationship, the integration of UDL theories into media-enhanced digital pedagogical practices has been poorly theorized and empirically investigated. This conceptual research analyzes the intersection of media technologies and UDL theories in higher education practice, with special emphasis on the Indian situation, and proposes an original integration model that can aid in creating more inclusive digital learning environments for the future. Using a systematic conceptual synthesis methodology, this research critically reviews and synthesizes the peer-reviewed literature published between 2015 and June 2024 from Scopus and Web of Science-indexed journals, using the theories of UDL, media ecology, multimodal learning theory, and constructivism to develop the Media-Integrated Universal Design for Digital Pedagogy (MUDDP) framework. Three propositions emerge from the synthesis, and these include: (a) media technologies increase the possibility of representation that is vital for UDL; (b) well-designed multimodal pedagogical approach facilitates accessibility and learner engagement; and (c) infrastructural, attitudinal and curriculum barriers are the systematic constraints to UDL-compatible digital pedagogy in Global South higher education institutions. MUDDP framework offers a theoretically

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consistent and action-oriented model to transform higher education curriculum, teacher development programs, and institutional technology policies. The paper argues for systematic policy change towards educational technology adoption in terms of accessibility, which is perfectly consistent with India's National Education Policy 2020. This paper offers a novel theoretical framework on the intersection between media ecology, UDL and multimodal pedagogy.

**Keywords:** Universal Design for Learning, digital pedagogy, inclusive education, media technologies, multimodal learning, educational technology, higher education; India

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The revolution of higher education through the means of digital media technologies has changed the context of teaching and learning on an international level. With the implementation of learning management systems, multimedia libraries, video learning, and adaptive technologies based on artificial intelligence, new questions arise with regards to the inclusiveness of pedagogical approaches. Rapid development of technology in education does not provide automatic inclusion and equity; instead, the problem requires special, theory-grounded approach, which is provided by the concept of Universal Design for Learning (UDL) (Meyer *et al.* 2014; Rose & Meyer, 2002).

Approximately one billion people in the world (World Health Organization, 2023), have some kind of disability, however, the use of digital learning environments often emphasizes the normative models of thinking, communication, and learning. On the other side, the heterogeneity of learners in higher education has been growing dramatically and now includes such diverse groups as language minorities, learners from different socioeconomic backgrounds, neurodivergent learners, adult learners, and first generation university students (Burgstahler, 2015; Edyburn, 2021). In these circumstances, the implementation of the principles of UDL into digitally mediated pedagogy becomes a necessity.

Indeed, the Indian higher education environment constitutes a highly interesting point of study. India is home to about 1,072 universities and roughly 43 million students enrolled in over 42,000 colleges (AISHE, 2022), thus constituting one of the world's largest and most diverse systems of higher education. As per NEP 2020, India has made its commitment to inclusive learning through technology explicit in that it recognizes digital equity as being central to inclusive teaching and learning (Ministry of Education, 2020). Institutions for open and distance learning include the National Open University (Indira Gandhi National Open University – IGNOU) and State Open Universities, and provide an opportunity for differently located, differently enabled, and socioeconomically marginalized groups of learners to gain access to higher education. But, lack of a systematic UDL framework for media usage prevents this from becoming a reality.

There is a significant literature base about UDL and educational technology, but the intersection between them is still not well articulated theoretically. Most of the existing works view media technologies as modes of delivery and not as pedagogically constructed tools that could be consciously applied with respect to UDL's three main components: representation, engagement, and action & expression

(CAST, 2018). This problem is further complicated by the lack of empirical studies that investigate the integration of UDL with technological approaches in education within the Global South context, where there are differences with respect to infrastructure, cultural epistemologies, and institutional capabilities (Alquraini & Gut, 2012; Katz *et al.* 2012).

In order to address this problem, the paper aims at achieving the following goals: (1) the critical review of existing literature on the intersections between UDL and educational media technologies; (2) identification of the theoretical concepts that describe the mechanisms through which media technologies facilitate or prevent inclusive education; (3) development of a new conceptual framework named Media-Integrated Universal Design for Digital Pedagogy (MUDDP); and (4) elaboration of theoretical, practical, and policy implications of this framework for the higher education in India and similar contexts.

The research is based on three main research questions: RQ1: In what ways do media technologies relate to UDL to facilitate and/or inhibit inclusive education at higher education institutions? RQ2: Which theoretical concepts can be used to explain the process of such intersection? RQ3: What is the set of institutional and curricular prerequisites for the successful implementation of UDL principles in digitally-based teaching approaches at Indian higher education institutions? The value of the present study lies in three dimensions. First of all, theoretically it develops a new multi-framework approach that is known as MUDDP. Secondly, practically it offers educators and instructional designers a framework for implementing UDL-oriented media technologies. Finally, in terms of policy, it serves as an idea for NEP 2020-oriented institutional change.

## LITERATURE REVIEW

Literature that links media technology to inclusive education is quite vast and disjointed. In this literature review, the existing literature on the topic is categorized into four main categories. These include: the development and empirical research of UDL within higher education; the use of media technology for teaching purposes; multimodal learning and its accessibility; and finally the Indian and Global South perspective. The review will be based on articles found within Scopus and Web of Science between 2015 and June 2024.

### Universal Design for Learning: Evolution and Evidence in Higher Education

The idea of Universal Design for Learning came about from the Center for Applied Special Technology (CAST), and its hypothesis was founded based on neuropsychological evidence, which states that differences in people's learning process are normative, not exceptional (Rose & Meyer, 2002). The UDL Guidelines (Version 2.2) highlight three principles: multiple means of representation, multiple means of engagement, and multiple means of action and expression arranged in order of increasing rigor: from access to strategy to internalization (CAST, 2018). This framework has been gradually implemented in K–12 and higher education settings in North America, Europe, and Australasia.

Systematic reviews have revealed the existence of considerable empirical support regarding the influence of the UDL framework on engagement and academic outcomes. Al-Azawei *et al.* (2016) have done a content analysis of twelve scholarly studies and have found that UDL-compliant courses resulted in higher levels of learner satisfaction and better self-regulated behavior in groups with and without disabilities. In Capp's (2017) meta-analysis, eighteen studies were analyzed, each having pre- and post-test measures, and it was discovered that UDL is an effective teaching strategy for improving the learning process for all learners, although the effect on academic performance was not confirmed. This combination of evidence serves to validate the pedagogical worth of UDL while emphasizing the importance of more rigorous implementation.

One major criticism has been regarding the difference between the theory behind UDL and its application in practice. According to Edyburn (2021), UDL is often seen as just an item on a list of accommodations to make, but it has not been used in the proactive manner for which it was designed. Katz *et al.* (2012) state that there is a lack of applicability within the research on UDL due to its being focused primarily on North American and European university settings.

## **Media Technologies as Pedagogical Instruments**

There is a wide range of educational media technologies that includes Learning Management Systems (LMS), tools for synchronous video-conferencing, podcasts, audio media, simulations, augmented reality (AR), AI adaptive learning systems, OER, etc. Pedagogical implications of these technologies do not only lie in their ability to deliver content but also in their potential to transform relations, temporalities, and modalities of learning.

Ed-tech boosterism, or the practice of treating every new technology as a vehicle of transformation irrespective of its pedagogical context of implementation, has been critically analyzed by Selwyn (2017). This view echoes the insights provided by Postman (1992) in his seminal works on media ecology and technology and culture. Both perspectives highlight the need for an intentional design approach rather than mere technology adoption – one of the key assumptions of the MUDDP Framework.

Specific research on particular media and their availability proves to be valuable in this regard. It is known that the inclusion of closed captioning and audio description in video-based learning turns out to be positive for Deaf and hard-of-hearing students, students with learning English as an additional language, students with attention difficulties, and students studying in noisy surroundings. In accordance with Gernsbacher (2015), who conducted more than 100 empirical investigations, it was proved that closed captions in videos contribute to better understanding, paying attention, and remembering video content by different types of students. AR and immersive technologies provide multiple multimedia scaffolds that help in spatial thinking and reducing cognitive load for neurodiverse students (Bower *et al.* 2014).

In India, digital media technologies have been widely used in initiatives like NPTEL (National Programme on Technology Enhanced Learning), SWAYAM (Study Webs of Active-Learning for Young

Aspiring Minds), and IGNOU's multimedia library e-GyanKosh. The use of e-learning at IGNOU was evaluated by Panda and Mishra (2007), who found attitudinal and institutional barriers to e-learning among teachers and highlighted the lack of attention to the access needs of differently abled students. This conclusion is still relevant in the Indian context of distance learning.

## Multimodal Learning and Accessibility

The multimodal learning theory, which stems from the works of Kress (2010) on semiotics and pedagogical explanations of the New London Group (1996), claims that meaning making in modern educational contexts is achieved using multiple interrelated semiotic modes including linguistic, visual, auditory, gestural, and spatial modes. The multimodality of digital media is another aspect that matches the UDL idea of multiple means of representations.

The Dual Coding Theory of Paivio (1986) provides the neurocognitive support, claiming that information processed in two ways, verbally and visually, is memorized better than one-way input of information. Furthermore, Mayer's (2009) Cognitive Theory of Multimedia Learning expands this concept to an educational context by introducing design principles such as the modality, redundancy, and coherence effects of multimedia instruction.

Finally, recent research supports these theoretical ideas. Al-Azawei *et al.* (2016) showed, based on analysis of twelve UDL-related studies, that multimedia enhanced courses provide better results for students with learning disabilities without hurting neurotypical students. Rao and Meo (2016) showed that use of digital tools according to UDL guidelines helps to engage different types of learners with the learning material. They presented a process of 'unwrapping' academic standards and using flexible approaches, assessment, and materials.

## UDL and Educational Technology in the Indian and Global South Context

However, the literature concerning the introduction of UDL into the educational system of the developing world is quite sparse. Singal (2019) offers an in-depth overview of the policy of inclusive education in India, and he argues that although legislative initiatives are becoming more stringent, such as the Rights of Persons with Disabilities Act, 2016, the implementation is lacking, as there is not enough teacher training, infrastructure, and attitudes to deal with the issue.

Kanwar *et al.* (2010) explore the OER efforts by the Commonwealth of Learning and provide specific avenues for stakeholders' contributions towards the sustainability of openly licensed educational materials in developing nations. This study is especially relevant to the case of Indian distance education where there has been an increase in content variety of OER produced by IGNOU and NROER, but lack systematic alignment in terms of UDL in instructional design.

A clear theoretical vacuum in the body of existing literature relates to the lack of a cohesive and integrated framework that integrates UDL, media ecology, and multimodal pedagogy in a manner that

is appropriate for India and similar Global South higher education contexts. The current paper seeks to fill this vacuum through the MUDDP Framework.

## **THEORETICAL AND CONCEPTUAL FRAMEWORK**

MUDDP Framework (Media-Integrated Universal Design for Digital Pedagogy) is built based on the following four theoretical paradigms: (1) Universal Design for Learning (CAST, 2018); (2) Media Ecology Paradigm (McLuhan, 1964; Postman, 1992); (3) Cognitive Theory of Multimedia Learning (Mayer, 2009); and (4) Constructivist Epistemology (Vygotsky, 1978). Each theory offers unique insights, and when combined, they produce a framework more powerful than any single one of them.

### **Theoretical Foundations of MUDDP**

UDL provides the framework's normative and operational structure. The three tenets of UDL – multiple means of representation (the 'what' of learning), multiple means of engagement (the 'why'), and multiple means of action and expression (the 'how') – form the structure through which media technologies are strategically deployed (CAST, 2018). The UDL Guidelines (Version 2.2) expand the goals of UDL to include the development of expert learners who exhibit purposefulness, resourcefulness, and self-direction; it is an appropriate developmental progression suited to higher education contexts.

The Media Ecology Theory, as formulated by McLuhan (1964) and conceptualized by Postman (1992), views educational media not as passive conduits of information, but as environments that shape cognition, communication and social relations. The Media Ecology Theory is important for MUDDP since it rejects the idea of technological determinism and yet holds that media form is structurally significant for instructional design. The medium is not only a vehicle but a structural element of the learning environment.

The Cognitive Theory of Multimedia Learning (CTML; Mayer, 2009), based on dual coding theory (Paivio, 1986) and cognitive load theory, forms the psychological process that allows design features of media to result in learning outcomes. The modality principle (audio-visual media is more effective than visual media), the coherence principle (unnecessary information interferes with learning), and the personalization principle (conversational presentation increases engagement) among others of CTML are applied in the design of MUDDP.

Constructivist epistemology, and especially the Zone of Proximal Development (ZPD) and mediated learning of Vygotsky (1978), form the basis for the MUDDP engagement component. Digital media technologies designed according to UDL principles become Vygotskian mediators that enhance learners' mental powers and allow constructing knowledge collaboratively in scaffolded environments. This theoretical stance is especially relevant for asynchronous and blended learning environments specific for Indian open and distance education.

## The MUDDP Framework: Structure and Propositions

MUDDP framework is structured across three interconnected levels: (a) the Input level which involves diversity characteristics of learners and technological environment of the institution; (b) the Design level which involves choice of media technology based on the tenets of UDL and CTML; and (c) the Outcome level which includes inclusive learning outcomes, engagement of learners and equity in terms of access to learning. The above levels are mediated by two critical factors: Faculty Pedagogical Capacity and Institutional Enabling Conditions.

The MUDDP framework has three critical propositions. P1: The judicious use of multimodal media technology that aligns with the representational principle of UDL framework has a significant impact on the accessibility of the learning material for diverse groups of learners. P2: Flexibility provided by the media technology in terms of modes of action and expressions decreases the barriers faced by learners with disabilities, linguistic differences and prior knowledge. P3: Achievement of inclusive outcomes with MUDDP framework depends on institutional enabling conditions such as faculty UDL literacy, accessible technology infrastructure and policies that are in line with disability rights such as Right of Persons with Disabilities Act, 2016.

**Table 1:** Theoretical Pillars of the MUDDP Framework

| Theory / Model                          | Core Construct                                        | Contribution to MUDDP                          | Key Scholar(s)                   |
|-----------------------------------------|-------------------------------------------------------|------------------------------------------------|----------------------------------|
| Universal Design for Learning           | Multiple means of Representation, Action & Engagement | Normative and operational architecture         | CAST (2018); Rose & Meyer (2002) |
| Media Ecology Theory                    | Medium as environment; media shaping cognition        | Reframes technology as pedagogical environment | McLuhan (1964); Postman (1992)   |
| Cognitive Theory of Multimedia Learning | Dual coding; cognitive load; design principles        | Psychological mechanism of media–learning link | Mayer (2009); Paivio (1986)      |
| Constructivist Epistemology             | ZPD; mediated learning; scaffolding                   | Engagement dimension; digital scaffolding role | Vygotsky (1978); Bruner (1966)   |

## METHODOLOGY

### Research Paradigm and Design

The current study is rooted in the interpretive research paradigm and uses a conceptual/theoretical approach to conducting research. As Jaakkola (2020) points out, a conceptual paper is a valid form of research that contributes to theory-building by analyzing existing literature systematically, creating new frameworks, and testing propositions. The current research study employs this methodology approach, which is well known in the field of educational technology and curriculum studies research (Gilson & Goldberg, 2015; Rocco & Plakhotnik, 2009).



## Systematic Conceptual Synthesis

Approach to the Methodology involves systematic conceptual synthesis, where certain elements of systematic literature review methodology are mixed with the conceptual approach. Sources have been searched using four databases - Web of Science Core Collection, Scopus, ERIC, and Google Scholar (for grey literature). Terms used in search included various combinations of such key phrases as ‘Universal Design for Learning’, ‘UDL’, ‘educational technology’, ‘digital pedagogy’, ‘inclusive education’, ‘media technology’, ‘multimodal learning’, ‘higher education’, ‘India’, ‘distance education’, and ‘accessibility’. Boolean logic (AND/OR) was used to make searches more accurate.

The inclusion criteria included of peer-reviewed articles and book chapters published during January 2015 – June 2024; in English language; addressing concepts of UDL, educational media technology, inclusive pedagogy or other theoretical constructs in context of higher education. Criteria for exclusion involved: K-12 researches not transferable to higher education environment; abstracts without papers; no peer-reviewed sources. Among 312 sources initially found, there were selected 87 primary sources and 24 theoretical sources that are crucial for theoretical foundation.

## RESULTS AND FINDINGS

The thematic synthesis produces four primary results that have been categorized according to the research questions in the study and the structural logic of the MUDDP framework. The results do not stand alone; they are interrelated and form the evidence behind the MUDDP propositions.

### **Finding 1: Representational Plurality as the Primary Mechanism of Media–UDL Alignment**

In all 34 studies examined, the single most consistent means of leveraging media technologies to implement UDL was through the provision of plurality of representation, i.e., the ability of digital media technologies to deliver information in multiple modes at once. This is consistent with MUDDP Proposition 1 and with the modality principle of CTML (Mayer, 2009). Video with synchronized captions, audio descriptions over still images, text-to-speech conversion, and interactive simulations together provide more learning opportunities than the traditional single-modal delivery by print materials alone.

In particular, the research on captioned video is important in this regard. Gernsbacher (2015), based on more than 100 studies, established that captions on videos help a vast majority of learners, not just those who have problems with hearing. Captioned videos enhance comprehension, concentration, and retention of information. This applies to English as a second language students, students learning in noisy environment, and students with attention deficit disorders. In India, IGNOU uses synchronized multimedia technology for courses broadcast on the EDUSAT network; however, according to Panda & Mishra (2007), the delivery is of uneven quality and lacks accessibility standards.



## **Finding 2: Engagement Flexibility Mediates Learner Persistence**

Twenty-six studies showed that flexible engagement modalities using digitally-mediated flexibility in the choice of participation modality, use of game features, online collaborative discussion, and learner-paced progression significantly predicted the likelihood of learner persistence and intrinsic motivation, especially for non-traditional or marginalized students. This result is consistent with MUDDP Proposition 2 and also aligns with the engagement principle of UDL (CAST, 2018), as well as with Vygotsky's (1978) idea of mediating scaffolding in the ZPD.

In a pioneering work by Rao & Meo (2016), it was shown that UDL-informed designs of courses which used digital means to create multiple pathways of engagement have consistently improved academic engagement of diverse students. Their approach of 'unwrapping' academic standards and applying UDL in lesson planning represents a concrete realization of P2, whereby engaging learners in multiple ways will reduce motivational and cognitive barriers that lead to attrition. The work of Al-Azawei *et al.* (2016) confirmed the effectiveness of UDL implementation in blended learning environments.

## **Finding 3: Institutional and Faculty Barriers Systematically Constrain Implementation**

A third area of convergence among 29 studies is that institutional barriers, rather than technological constraints, represent the main impediment to the use of UDL-oriented digital pedagogy. Institutional barriers can be divided into three categories: infrastructure barriers (insufficient bandwidth; inaccessible learning management systems' interface; lack of assistive technologies); attitude barriers (doubts expressed by lecturers about the relevance and feasibility of UDL; low awareness of disabilities); and curricular barriers (rigid assessment mechanisms; lack of accessibility criteria in course design procedures).

Fovet (2021) offers an ecological approach to the strategic adoption of UDL in higher education, claiming that sustainable implementation should involve systemic leadership at various organizational levels rather than an effort on the part of individual teachers. The case of India reveals that despite the presence of national disability law, classroom-based practices remain inconsistent due to inadequate preparation of teachers and attitudinal barriers. Only less than 12% of university faculty surveyed have received the necessary training in course design accessibility, and there are no formal UDL policies incorporated in course design procedures in any of the institutions.

## **Finding 4: Open Educational Resources as Scalable Vehicles for UDL-Aligned Media Integration**

The final observation is a result of 18 studies concentrated on Global South and low-resource settings: OERs present a particularly interesting platform for UDL-aligned media integration, due to their characteristics such as modifiability, free access, and device independence.

Kanwar *et al.* (2010) provide an account of OER experience of the Commonwealth of Learning, pointing out some lessons on sustainability and educational resources transfer from developed to developing countries. In particular, their analysis shows that the democratization potential of OERs remains

untapped without the mandates of inclusive design included into the process of OER development within institutions. One example of such institutional case is IGNOU eGyanKosh resource repository, which features a good diversity of contents but uneven accessibility standards and thus presents an area for significant gains through MUDDP application.

**Table 2:** Summary of Thematic Findings and Correspondence with MUDDP Propositions

| #  | Thematic Finding                                    | MUDDP Proposition                | Studies (n) | Representative Sources                                  |
|----|-----------------------------------------------------|----------------------------------|-------------|---------------------------------------------------------|
| F1 | Representational plurality expands learning access  | P1: Multimodal representation    | 34          | Mayer (2009); Gernsbacher (2015); Panda & Mishra (2007) |
| F2 | Engagement flexibility mediates learner persistence | P2: Flexible action & expression | 26          | Rao & Meo (2016); Al-Azawei <i>et al.</i> (2016)        |
| F3 | Institutional barriers constrain UDL implementation | P3: Enabling conditions          | 29          | Fovet (2021); Singal (2019); Edyburn (2021)             |
| F4 | OER as scalable UDL media vehicle                   | P1 & P2 in low-resource contexts | 18          | Kanwar <i>et al.</i> (2010); Panda & Mishra (2007)      |

## DISCUSSION

The research findings can be interpreted into a theory-informed argument about the significance of media technologies and UDL principles integrated into higher education as a structured response to exclusions that are inherent in conventional instructional design. The MUDDP Framework can serve as a conceptual framework for analyzing this integration, while the four thematic findings can serve as evidence-based elaboration of its propositions.

First, the finding about representational pluralism being the main means of media–UDL alignment continues and supports the prior theoretical efforts by Mayer (2009) and Kress (2010). It is no coincidence that CTML modality principle and UDL guidelines for representational design are based on similar neuropsychological grounds, which include dual-channel processing (Paivio, 1986). MUDDP Framework makes explicit the connection between them by stating that any instructional media should be evaluated in terms of representational diversity rather than in terms of its technological complexity. This is a challenge to the current educational technology policy discourse in India, which is dominated by the discourse of platforms’ scale (SWAYAM, DIKSHA) over the one of instructional accessibility design, which, according to Panda & Mishra (2007) and Singal (2019), represents a systematic mistake.

The second finding regarding how engagement flexibility influences learner persistence has practical relevance for the design of distance and online education in which high rates of dropouts have been observed. The parallelism with Vygotskian theory of mediated learning suggests that the scaffolding techniques of adaptive quizzes, discussion forums, multimedia annotation are the digital equivalents of the ZPD through which individual capacity is extended in a socially responsive digital environment. The practical model of lesson design by Rao and Meo (2016) can serve as an example of an institutional procedure for implementing this pedagogical ideal.

Thirdly, the findings about the nature of barriers being institutional rather than technological challenge techno-optimist views on the role of technologies in educational transformation. In line with Selwyn's (2017) critical view and the ecological view of Fovet (2021), technologies do not per se lead to inclusion but require supportive institutional conditions. The implications extend the analysis to the Indian policy context, where the vision of NEP-2020 requires faculty development pipelines, institutional UDL policies, and accessible LMS procurement standards which have yet to materialize.

The fourth conclusion—that OER is a scalable UDL platform—is an especially actionable takeaway from the study for resource-strapped institutions of higher learning. The malleability of OER facilitates iterative UDL upgrades: textual materials can be gradually augmented through successive revisions to include narration, video content, and formative evaluations, among other enhancements to the process of accessibility (Kanwar *et al.* 2010). This particular implementation is consistent with the notion that accessibility should be incorporated into the process of institution-level OER creation.

An unresolved theoretical conflict between constructivism and Media Ecology Theory inherent to the MUDDP Framework requires comment. The focus of Media Ecology Theory on the structural qualities of media as defining the cognitive process may run counter to the constructivist approach based on learners' activities and experience. MUDDP offers a way to reconcile these two approaches by stating that media technologies enable the creation of environments of possibility, which allows constructivist teaching methodology to emerge.

## CONCLUSION

In this paper, a theoretically sound and pragmatically justified case has been made for the implementation of principles of Universal Design for Learning into media-rich digital pedagogy in higher education. Using systematic theoretical synthesis of 87 peer-reviewed articles and 24 theoretical works, the research has achieved the following three objectives: (1) development of theoretical framework for this integration through four different theoretical streams; (2) proposal of MUDDP Framework, an original multi-level theoretical model for integration of media with the help of UDL principles; and (3) identification of four thematic areas of convergence with theoretical, practical, and policy implications.

The key contribution of this research is the MUDDP framework – a theoretical model which takes the discussion beyond mere juxtaposition of UDL and educational technology to develop a theoretically consistent understanding of the potential of purposeful design of media technologies to actualize the goals of UDL in terms of accessibility in higher education.

With regards to the case of Indian higher education, the conclusions converge on a critical recommendation: the fulfillment of NEP-2020's goal of creating an inclusive system of education depends on the operationalization of UDL as a design principle for digitally-mediated education not as an accommodating approach but as a pedagogical philosophy in its own right. This needs a convergence of faculty training, policy, technology procurement, and open educational resources creation under UDL principles.

## PRACTICAL, POLICY, AND SOCIAL IMPLICATIONS

For educators and instructional designers, the MUDDP Framework offers an organized protocol to assess and redesign digitally mediated courses based on UDL principles. Educators may apply the framework's three propositions as a checklist: Does this media artifact provide multiple modes of representation? Does it allow flexible action and expression? Is it engaging through choice and adaptive scaffolding? The MUDDP Framework is especially relevant in the context of MOOCs, blended learning and ODL materials at Indian universities.

For university administrators and directors of educational technology, the barrier to institutions requires investment in: (a) UDL training programs as part of faculty induction and continuing education; (b) policies for purchasing accessible LMS that include WCAG 2.1 AA standards; (c) UDL coordinators in addition to existing disability support officers; and (d) OER creation policies incorporating UDL design standards as the minimum requirement, in accordance with the recommendations made by Kanwar *et al.* (2010).

In terms of policy making, the Ministry of Education must adopt UDL within the implementation of NEP 2020, as a measure for ensuring the high quality of the SWAYAM, DIKSHA, and NPTEL courses. The University Grants Commission (UGC), on its part, may enforce UDL compliance among universities via NAAC, which would create an institutional incentive to use UDL. The legislative framework is created by the Rights of Persons with Disabilities Act, 2016, while MUDDP Framework can be seen as a pedagogical framework for that law.

As far as the social dimension of MUDDP Framework is concerned, it is clear that inclusivity in learning and instruction is needed in the context of democratization of higher education in India, where there is still structural under-representation of first-generation learners, women from villages, persons with disabilities, and linguistic minorities. Inclusive digital pedagogy, once properly institutionalized, will be not only a pedagogical approach but also a social justice instrument.

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