

Disaster risk reduction integration into school curriculum: A global analysis

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ABSTRACT

Climate change and associated disaster risks are contemporary issues of global concern. The school is a transformation agent with a crucial disaster reliance cascading potential which dovetails with the United Nations Sendai framework for disaster risk reduction 2015-2030. This paper reviews the literature on the disaster risk reduction (DRR) curriculum integration imperative and milestones achieved globally to date. School curricula, as conduits for disaster resilience, are explored using the lens of ideal DRR education dimensions to predict achievements, challenges, and opportunities to strengthen this integration imperative. Reviewed literature contributes to our theoretical and empirical scope of DRR to strengthen global resilience to recurrent disasters. Literature implied the need to raise pedagogy above the knowledge dimension of DRR and harness skills and attitudes in the response, action, participation, and integration dimensions. The paper recommends ensuring disaster resilience propagation through the innovative and holistic framework of integration of DRR into the school curriculum. The frameworks should consider pedagogical assessment matrices guided by DRR education dimensions in the learners' social context.

Keywords: disaster risk reduction, resilience, vulnerability, curriculum, cultural historical activity theory

INTRODUCTION

The imperative of disaster risk reduction (DRR) integration into school curriculum has been generally a global consensus given the upward trajectory of natural disaster occurrences. The consensus draws from the view that DRR education is a significant focus on sustainable development (Noviana et al., 2023; Ntim, 2023). United Nations International Strategy for Disaster Risk (UNISDR) elucidates by declaring that "disaster risk reduction begins at school" emphasizing the central role of education in spreading disaster resilience by reducing vulnerabilities in a population (Petal, 2008). A diversity of research has pointed out that incorporating DRR into formal education can be an effective way of reducing risks (Ismail et al., 2024; Petal & Izadkhah, 2008; UNESCO, 2023). The rationale for integrating DRR into the curriculum draws from the strong correlation between disaster education and disaster resilience of communities (UNESCO, 2007; Petal, 2008; Mutsau & Billiat, 2015; UNESCO & UNICEF, 2012). Curriculum integration raises awareness and understanding of risk preparedness and response among students, teachers, and the community (Amiri, 2016; Gray et al., 2022; UNESCO & UNICEF, 2012). The future, threatened by recurrent disasters

requires that sustainable efforts are therefore deliberately prioritized to avert human crises. Youths should therefore be made to be proactive on DRR and sustainable development since they represent the future and are more vulnerable but have a cascading resilience potential (Mamon et al., 2017; Mutseekwa & Razuwika, 2023; Shiwaku et al., 2006).

The three critical objectives of the paper are; i. What competencies inform effective DRR integration? ii. How successful has DRR been integrated into school curricula globally; iii. What strategies can enhance effective DRR integration into the school curriculum? The paper intends to close the gap between rhetoric in mainstreaming DRR into the curriculum and effective practical implementation as the current thin literature is averring that DRR education uptake is still low, especially in developing countries (Ntim, 2023).

There has been thin literature exploring milestones and constraints of DRR education integration in curriculum despite its potency. Existing initiatives globally have been an admixture of limited success and glaring shortcomings as driven by national governments, non-governmental organizations (NGOs), and other stakeholders. A desk review of the literature to illuminate DRR education dimensions, achievements, and challenges to date provides fertile ground

to suggest integration frameworks that would enhance the noble global goal of disaster resilience as enunciated by the current the United Nations Sendai framework for disaster risk reduction 2015-2030 (UNSFDRR) to provide fertile grounds for sustainable development (United Nations Office for Disaster Risk Reduction [UNDRR], 2015).

DRR is a psycho-social concept. Pedagogical approaches and ideal assessment dimensions of DRR still need to be fully developed in line with the diverse social environments of learners. Therefore, re-thinking cultural historical activity theory (CHAT) by Vygotsky (1978) is worth considering for effective DRR education in the school curriculum. This constructivist approach is a reflective and transformative tool for analyzing society targeting change. It analyses human activity and thoughts within its relevant environmental context. An activity produces an outcome, physical or mental. According to Hromalik and Koszalka (2018), using tools (e.g., technology, training, conceptual ideas, and people) the subject moves towards accomplishing an object. The community members set rules, and norms under which the subject operates and establish how the community members organize (a division of labor) to meet goals. The elements are influenced by social, cultural, and historical factors such as background knowledge, personal bias, and availability of tools among other factors.

DRR requires engagement with individuals and societies given its psycho-social orientation. It is therefore an “activity” which according to CHAT, is the engagement of the subject towards a certain goal or object. Such engagements are largely problem-solving and critical inquiry-based learning with more capable peers and with culturally made artefacts in what Vygotsky called the zone of proximal development. The activity has a motive and is complex, dynamic, historically driven, and transforming. It is this transformation through DRR engagement with individuals and communities that can arguably leverage effective DRR education to facilitate the resilience of societies. Resilience has a psycho-social dimension and can best be studied in a social context such as is provided by the CHAT. This is emphasizing the social construction of knowledge through communicating gradual ideas using dialogue in which students learn how to think (Batiibwe, 2019; Engeström, 2014; Mishra & Koehler, 2006). Therefore, it is critical to constantly review DRR education curriculum integration effectiveness globally from the perspective of social constructivism persuasion which this paper stands on.

DRR EDUCATION INTEGRATION IMPERATIVE

Empowering communities and enhancing human capacity through the education system has positive impacts on their disaster resilience (Mamon et al., 2017; Mutseekwa & Razuwika, 2023; Muttarak & Lutz, 2014; Shiwaku et al., 2006). Climate change today is the elephant in the room exacerbating both the frequency and intensity of related disasters (Nifa et al., 2018; UNESCO & UNICEF, 2012). The connection between disaster impacts and sustainable development is made graphic, especially in developing countries where a single

disastrous event can reverse the development gains made in several years (Ntim, 2023). Mainstreaming DRR education in the curriculum is therefore a pre-requisite to sustainable development worth constant reviews to set an agenda for sustainable development in the future since disaster occurrences are on the rise.

DRR-related curricula incorporate competencies that enhance resilience and reduce vulnerabilities. Schools and learners cascade knowledge and skills to other members of the community making DRR learning through schools possible (Ntin, 2023). Students act as important information disseminators to everyone in the community relating to DRR and response (Campbell & Yates, 2007; Mutasa & Coetzee, 2019). This cascading potential makes school curricula catalytic in the spread of disaster resilience in line with the UNSFDRR goal. Mainstreaming DRR competencies is therefore imperative given the potential for raising awareness and understanding of disaster risks, preparedness, and responses among students, teachers, and the broader community.

DRR education supports the achievement of sustainable development goals, particularly those related to quality education, poverty reduction, and sustainable communities (Noviana et al., 2023; UNDRR, 2015). Therefore, sustainable development requires that DRR education deliberately shifts from being driven by external organizations and funded through short-term projects (UNDRR, 2015). Governments and community participation enhance cooperation and a sense of ownership. School curricula thus present an opportunity to spread DRR competencies in a way that ensures sustainability and continuity. Subsequently, a culture of safety is fostered through DRR education (Kamil et al., 2020; Muttarak & Lutz, 2014). DRR education, therefore, equips learners with life-saving skills through practical competencies and knowledge to respond appropriately during emergencies potentially saving lives and minimizing the impact of disasters (Musarandega & Masocha, 2023; Mutch, 2014; Mutasa & Coetzee, 2019). Therefore, DRR education is indispensable for sustainable development. Regular and robust monitoring and evaluation of the program is necessary in the context of increasing disaster recurrences.

Pedagogical approaches that foster knowledge, skills, and attitudes directed towards resilience are therefore critical. DRR is a psycho-social concept that emphasizes community context in acquiring resilience outcomes. Educators therefore need to consider harnessing cultural-historical approaches such as is emphasized by the CHAT in knowledge construction. This is because human cognition, according to social constructivism, is best mediated by culture and social context activities. DRR as an activity is thus better facilitated in a community context. The target is to view all dimensions of DRR education in the context of the learners’ immediate community and build knowledge in collaboration with society for the effective integration of DRR knowledge, skills, and attitudes. Therefore, since DRR is an activity, all the dimensions of DRR education would effectively be learned in a social context.

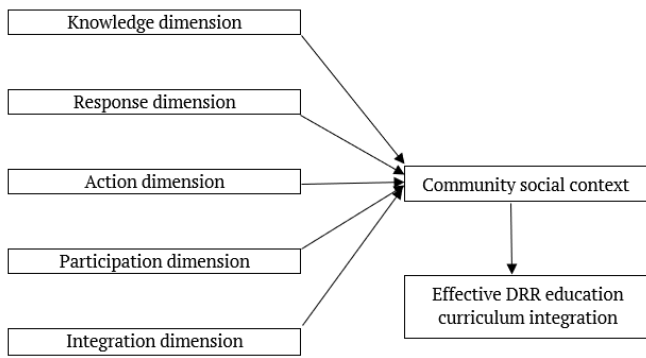


Figure 1. DRR education effective curriculum integration model (Source: Authors' own elaboration)

DRR EDUCATION DIMENSIONS

The initiatives and practices of DRR globally have been far from satisfactory using critical dimensions of DRR. The ideal DRR education curriculum situates DRR education in five dimensions vis-à-vis; knowledge dimension, response dimension, action dimension, participation dimension, and integration dimension (Gong et al., 2021; UNESCO & UNICEF, 2014). Yet, a spectral view of implementation globally has not risen above the knowledge dimension to consider skills in prevention, mitigation, and resilience building required in DRR education disposition for most countries (UNESCO & UNICEF, 2012). A propensity for pro-action is fostered where pedagogy brings knowledge to life using acquired practical skills of resilience and a sustainable culture of safety in the context of the community (Figure 1). Assessment of DRR learning guided by distinct predictors of effective DRR is mediocre, especially in the global south. Figure 1 is a conceptual view of DRR learning in the context of society for effective DRR integration into the curriculum.

Dimension 1: Knowledge Dimension

The knowledge dimension which is frequently addressed in many countries concerns itself with developing an understanding of the science and mechanisms of natural hazards such as cyclones, tsunamis, and volcanic eruptions (Gong et al., 2021; Ismail et al., 2024; UNESCO & UNICEF, 2012, 2014). This is a low-order target in DRR education taxonomy in that the level of ambition does not equip learners to use the knowledge. It disassociates itself from the community by limiting knowledge to the classroom. The social context deficiency is a major letdown in the global south.

Textbook knowledge approach in Pakistan for instance has been criticized for being redundant. It has been noted that the current textbooks continue to teach students from a 2006 curriculum (Jaffar et al., 2024). Besides giving theoretical information, the textbook and the teacher alone are insufficient and were reported to teach students less about DRR. In Indonesia, disaster education is not mandatory and has been subject to school leadership, the discretion of teachers, incentives, and nudges (Desilia et al., 2023). This global south issue has weakened even the knowledge dimension of learners concerning DRR which is a disservice to the sustainable development goal of resilient communities.

In a study of 30 countries on DRR education, UNESCO and UNICEF (2012) noted a strong predominance of knowledge-based outcomes and less on skills and attitude perfection to benefit society. This is common where integration approaches are textbook-driven like in the recent cases of Pakistan, Bangladesh, and Nepal. UNESCO and UNICEF (2012) note that such an approach, where it is being done, fosters knowledge rather than active disaster preparedness and skills development.

The knowledge dimension is critical but insufficient in realizing the resilience of communities. Kamil et al. (2020) argues that the purpose of disaster education is not only to enrich knowledge and awareness but also to overcome the importance of translating knowledge that triggers informed decisions or actions to protect against large-scale disasters in communities. To date, the DRR curriculum globally shows a failure to address skills, attitudes, and dispositions critical to disaster resilience. In a rare case of an advanced economy, New Zealand, it was observed that learners showed weak disaster response though with the knowledge (Gray et al., 2022; UNESCO & UNICEF, 2012). This is the weakness of a curriculum that emphasizes knowledge at the expense of skills, attitudes, and dispositions sought in DRR education embedded in dimensions 2, 3, 4, and 5 ensuing. This is made worse in many instances where teachers' capacity is low even in the knowledge dimension and depends only on personal experiences as noted by Jaffar et al. (2024) in Pakistan.

Integration of disaster risk concepts through multiple subjects and levels, that is, an interdisciplinary approach, ensures students receive a comprehensive understanding of disaster risks, preparedness, mitigation, and response strategies. However, this predictor alone does not sufficiently prepare resilient societies since it remains knowledge-based. Such rote learning does not capacitate learners with practical skills, attitudes, and behavior sought for resilience. Action learning for disaster resilience is highly deficient in developing countries. In worst-case scenarios in developing countries there is even a deficiency in the knowledge dimension of teachers, let alone learners. In Lebanon for instance, it has been noted that there is even a need for knowledge, making disaster response inadequate (Libayao et al., 2024). Thus knowledge is potent but inadequate in effective DRR education.

Dimension 2: Response Dimension

The response dimension includes familiarization with hazard early warning signs and signals, instruction in evacuation or sheltering procedures, drills and exercises, basic first aid, and contents of a first aid kit, health and safety measures, and guidance on how to stay safe after a hazard has subsided (Gong et al., 2021; UNESCO & UNICEF, 2014). It was observed that, like the knowledge dimension, this level is also frequently addressed in the 30 countries studied by UNESCO before 2014 and post-2014 (UNESCO & UNICEF, 2012). Currently, however, there is still evidence of inadequacy in the response dimension capacities of both teachers and learners. This is made so graphic in the case of Ghana where although it is acknowledged that schools potentially offer trained professionals to help the community in response and recovery,

there are low levels of coverage of DRR in the teacher training curriculum (Ntim, 2023).

Disaster lessons are aided by preparedness and practice books for different grades and handbooks for teachers (Petal & Izadkhah, 2008). The DRR educational skills outcomes related to the response dimension can conveniently be classified into skills of information management and skills of discernment and critical thinking. The response dimension also includes skills of coping, self-protection, and management. Like the higher-order skills sought in DRR education, response dimension skills fit so well with countries that had opted for a centralized competency-based approach to DRR curriculum implementation. The government is so visible, especially in monitoring and evaluation to plan for expansion as they are faced with disasters. The sought response has been a quick fix to the extent that pedagogical development, attention to values-related issues, and incremental teacher training are brushed aside for instance in the Philippines, Cambodia, Peru, and Indonesia (UNESCO & UNICEF, 2012). These issues persist today due to low coverage at the teacher training level and school according to studies in Ghana and Zimbabwe (Mutseekwa & Razuwika, 2023; Ntim, 2023).

This predictor of effective integration of DRR into the school curriculum implies practical and hands-on activities that engage students and their communities in practical activities such as drills, simulations, and field trips to disaster-prone areas for experiential learning. These activities foster a deeper understanding of disaster impacts and resilience in the context of communities thereby strengthening community involvement.

Dimension 3: Action Dimension

This is a rarely addressed dimension globally in DRR education. This dimension seeks to encourage learners to act and be proactive in mitigating risk through a thorough examination of the elements at work in the fundamental disaster risk formula, which is $disaster\ risk = (natural\ hazard \times vulnerability) / capacity\ of\ societal\ system$ (Gong et al., 2021; UNESCO & UNICEF, 2014).

Shaw et al. (2011) noted that in the studied 30 countries selected for analysis by UNESCO, imaginative forms of educational assessment that match with active, action-oriented, and competency-based learning are largely notable by their absence. Ntim (2023) argues that the low coverage of DRR in teacher training colleges has led to low usage of DRR kits and the organization of extra-curricular activities on DRR for students. It was also observed in 2004 in Japan that only 30% to 40% of learners practice any preparedness measures suggesting that mere educational knowledge does not translate into desired actions (Shaw et al., 2004). This is the trend observed in the global south countries today. Learners are expected to also be able to do vulnerability assessments and do first aid and other health-related skills. This higher-order dimension dovetails with a symbiosis approach to curriculum integration. This approach relies on the family resemblance between DRR, and other cross-curricula initiatives concerned with developing social awareness and empowering individuals for citizenship in domains that are already mainstreamed (UNESCO & UNICEF, 2012). Such domains include life skills, civic education, environmental

education, and education for sustainable development as is the case in countries like Myanmar, Cuba, and Russia among others.

Emotional and psychological support skills are gained as students are involved in mind activities, counselling services, and fostering of a supportive learning environment in the action dimension of DRR. This is close to the pronouncement of the social construction of knowledge, skills, and attitudes advocated by social constructivists in education. The action dimension echoes the argument that emphasizes DRR skills development in a community context as a potent predictor of effective curriculum integration.

Dimension 4: Participation Dimension

This dimension engages learners in processes of resilience building in their community through grassroots-level initiatives, identifying hazards, developing resilience action plans, and implementing those plans (Gong et al., 2021; UNESCO & UNICEF, 2014). This is a rarely addressed dimension of DRR. DRR curriculum delivery calls for active, interactive, and action-oriented learning that places a premium on in-community learning experience and rescues emotional learning from the marginal position it presently occupies (Ismail et al., 2024; Mun & Kim, 2022; UNESCO & UNICEF, 2012). The goals of disaster education are thus for learners to participate in safety education for everyday life, inquiry, and disaster literacy and use scientific measures to reduce risk in everyday life. Over and above understanding the causes, nature, and effects of hazards, DRR education should inculcate competencies and skills that enable learners to contribute proactively to the prevention and mitigation of disasters. UNESCO and UNICEF (2012) emphasize that knowledge is learned from books but if it is to be internalized, it needs to be drawn upon and tested within real-life arenas collaboratively. This has implications for learning modalities or styles congruent with DRR education. This answers to the social context active learning advocated by social constructivists in education.

There is generally a lack of prominence for DRR education learning styles to build self-esteem for an active citizen in most countries. Textbook approaches to date resonate with the knowledge dimension which lacks DRR education skills sought by the UNISDR (2015). Countries that have adopted centrally managed competency-based approaches whose pedagogies are effective, practical-oriented, and continuously evaluated like Japan, Russia, and Indonesia, have shown a high degree of DRR integration success across the whole spectrum of DRR competencies.

The curriculum therefore should acknowledge the local context and involve the community in DRR efforts. This would involve local experts and collaborating with community organizations to address specific risks and vulnerabilities. This also entails community service and volunteerism to encourage students to participate in community service and volunteer activities related to DRR thus contributing to disaster resilience and becoming agents of change.

Dimension 5: Integration Dimension

This dimension emphasizes blending the structural elements, such as school buildings and facilities, and non-

structural elements such as school disaster management and school policy development so that the school becomes a DRR learning community or organization oriented towards building a culture of safety and resilience (Gong et al., 2021; UNESCO & UNICEF, 2014). It is such a culture that seeks to realize sustainable development. In education, such a culture is made distinct by harnessing the tenets of CHAT for effective DRR education in the context of communities.

The integration dimension is at the pinnacle of DRR in the education pyramid and is the subject of this paper. Jaffar et al. (2024) note that DRR education must be integrated into all levels of school curricula. Petal and Izadkhah (2008) define formal education DRR curriculum integration as referring to an approach that makes use of specifically developed units, modules, or chapters concentrating on DRR. It also envisages both the structural and non-structural elements of DRR. It is rarely addressed in many countries according to UNESCO and UNICEF (2014) review in thirty countries. Currently, there is an inadequacy in the integration of DRR education into the curriculum. In a study of DRR in Singapore, Gouramanis and MoralesRamirez (2021) noted a failure in this integration outcome. The authors noted that educators lacked pedagogical content knowledge to develop students understanding of the concept and suggested inquiry-based approaches to the subject. This resonates with a study in Lebanon where disaster response is inadequate today attributed to the need for knowledge in disaster preparedness (Libayao et al., 2024). In Tanzania, although the education is provided seeking to inherit wisdom, knowledge skills, and culture to the present and future generations, the school curriculum is not well equipped to adequately impart DRR knowledge to pupils and propagate a culture of safety and resilience as in dimension 5 (Magungu, 2023).

The integration dimension implies a whole curriculum approach to DRR education. The interdisciplinary approach integrates various disciplines of knowledge and expertise in holistic mitigation strategies (Peek & Guikema, 2021). Besides the emphasis on safe infrastructure, the development of soft skills emphasizing action, participation, and inquiry-based approaches to DRR learning are the basements of effective DRR education often exhibiting deficiencies, especially in developing countries. In the global south, these are notable by their absence. Inquiry-based approaches in career subjects and activities are crucial in addressing the whole spectrum of DRR education dimensions in addition to making learners interact with the community in DRR activities. The construction of such DRR knowledge, skills, and attitudes in communities by learners is effective in the trajectory of sustainable development as is the case in developed countries like New Zealand and Japan.

IMPLEMENTATION CHALLENGES

Implementation of an effective DRR education that takes cognizance of the key competencies sought by the United Nations has been constrained by an array of challenges for studied countries. These range from lack of capacity in materials and human resources, coordination glitches and policy support, competing priorities, cultural and social

barriers, and deficiencies in monitoring and evaluation biased towards the key dimensions of DRR education.

Resources are central to successful DRR implementation. The majority of developing countries have shown a lack of adequate resources including infrastructure, teaching materials, and trained personnel. Baytiyeh (2018) notes that the effectiveness of DRR education in reducing the negative impacts of future disasters remains uncertain because, after substantial efforts, significant financial, cultural, and technical barriers remain in integrating DRR into the school curricula. In Indonesia, UNESCO and UNICEF (2014) noted that limited financial support curtailed success in DRR education integration into the curriculum. DRR requires that age-related learning materials that can support different learning styles of students are developed and accessed. This material development is significantly lacking as graphically shown by the case of Pakistan where the curriculum was developed in 2006 and is still being used today and the textbook knowledge is now outdated (Jaffar et al., 2024). It follows therefore that the global south needs to invest in material development and workbooks integrating competencies sought for disaster resilience. This has implications for the pedagogy of disaster education which has to be responsive hence the need to invest in teacher education in the field of DRR.

Sujata (2010) acknowledged the need for networking with key NGOs for greater coordination of resources and efforts toward curriculum innovation. This coordination is accentuated by clumsy government involvement as the DRR program is relegated to other stakeholders as projects. Sustainability and continuity are a challenge when DRR programs are driven by external organizations and funded through short-term projects. Mutch (2014) notes that there is often a lack of coordination and policy support. Mutsau and Billiat (2015) avers that Zimbabwe indicated that there is little done by the Zimbabwean government to implement the 2009 and 2011 reviewed commitment to integrate DRR into school curriculum. Issues of policy require political will and prioritization often notable by their absence in the global South.

Teacher training and capacity-building endeavors, especially in the global south, are way too low. Developing countries are currently treating DRR education as an afterthought. In Indonesia today, despite being one of the most disaster-prone countries in the world, disaster education is not mandatory (Desilia et al., 2023). Gray et al. (2022) note that teachers, especially in developing countries, lack the necessary training and expertise to effectively deliver DRR education and call for comprehensive capacity-building initiatives, especially regarding assessment matrices that are alive to DRR education dimensions. Teacher capacity development must be preceded by teacher training and inclusion in training institutions (Mutseekwa & Razuwika, 2023; Sujata, 2010; UNESCO & UNICEF, 2014). Asian countries also showed they were usually overburdened with the existing curriculum to introduce DRR into the curriculum let alone training teachers (Sujata, 2010; UNESCO & UNICEF, 2012, 2014). This has made DRR education remain an extra-curricular program. Disaster perceptions of both teachers and students are critical to the adoption of DRR in education. Teacher training refocuses

teacher perceptions of DRR. In a study of the perception of teachers on the inclusion of the DRR strategy in school curricula in Port Harcourt, Nigeria, it was found that although they were willing, they lacked proper knowledge and understanding of the concept (Elenwo & Onabanjo, 2019). In a related study of students' perception in Belgrade, Cvetković et al. (2015) noted that sources of information on natural disasters and their threatening influence the perceptions of secondary school students. This knowledge deficiency makes teachers spend relatively less time on disaster units (Mun & Kim, 2022). This knowledge deficiency causes resistance. There is a strong resistance in South Korea for instance, to increasing the curriculum content by inserting new topics (Park et al., 2023). Therefore, with a DRR education-deficient teacher, the dream of disaster resilience remains elusive which is a disservice to the sustainable development goal.

Assessment matrices for learners hardly prioritize DRR education in most developing countries. DRR educational competencies are not prioritized over pressing educational needs such as basic literacy and numeracy. Assessment of DRR learning outcomes is the least considered and least developed aspect of DRR curriculum innovation so far (Ismail et al., 2024; UNESCO & UNICEF, 2012, 2014). In Zimbabwe, there is disaggregated DRR content in secondary school curriculum and higher institutions are not mandated by policy to include the policy on disaster management (Mutsau & Billiat, 2015; Mutsekwa & Razuwika, 2023). This has reduced teachers' motivation to concentrate on DRR education skills development.

There are often cultural and social barriers to DRR education effective implementation. Certain cultural beliefs and norms influence the acceptance and implementation of DRR education programs in some communities particularly in developing countries. In Japan, Shaw et al. (2004) noted that traditional school education could not enhance awareness. The same conclusion was reached in China where Zhu and Zhang (2017) reported that their education lacks attractiveness and local features which could not affect students' awareness and capabilities. Park et al. (2023) note that more effort is needed to justify the new topic against the existing aims and structures of school subjects, to consider the unique social and political context, and to bridge the gap between curriculum policy and classroom practice. Participatory pedagogies that are situated in the context of learners' indigenous knowledge systems on disaster stand a chance for effective DRR education acceptance and implementation.

STRATEGIES FOR EFFECTIVE DRR EDUCATION IMPLEMENTATION

Prioritizing DRR education implementation is imperative in contemporary times with increasing disaster occurrences especially due to climate change. Skills of resilience are best imparted by a responsive curriculum that can potentially cascade a culture of safety to communities for sustainable development. Efforts directed towards a holistic implementation of all DRR education dimensions, and their embedded skills must predominate planning and

implementation through inquiry-based approaches in a social context.

Teacher training and capacity-building endeavors need to be more robust in contemporary times. There is a clarion call for teacher pre-service and in-service training on the skills embedded in DRR dimensions (Monte et al., 2017; Mutsekwa & Razuwika, 2023). This is crucial since educators need to be effective in delivering DRR education. This should include efforts to leverage technology and innovation such as learning platforms like virtual reality simulations and games to enhance the delivery and impact of DRR education particularly to emerging younger generations. Assessment matrices in career subjects should therefore be present in the curriculum and aligned to the DRR education skills and dispositions sought. These should be contextualized in the social settings of the students to effectively construct knowledge, skills, and attitudes needed in DRR.

Teacher training therefore provides professional development for educators on DRR topics so they can effectively teach and engage learners in this DRR integration in school curriculum critical issue.

Policy development and coordination need to be comprehensive during curriculum development drawing from global, regional, and national policies that mandate and guide DRR into school curriculum (Mutch, 2014). These policies must be aligned with international frameworks such as the current the United Nations Sendai framework for disaster risk reduction 2015-2030 (UNDRR, 2015). Nonetheless, an effective DRR education program should respond to local settings. Engaging with local communities, traditional leaders and stakeholders can help address cultural and social barriers, foster ownership and ensure cultural relevance. Such policy ensures the sustainability of the program and thus fosters the resilience of communities in the face of increasing incidences of disasters especially due to climate change.

Incorporating all dimensions of DRR would act as predictors of effective DRR integration into the school curriculum. This makes evaluation and monitoring empirical even when assessing knowledge, skills, and attitudes related to DRR education and resilience. DRR in education is a psycho-social theme that should be viewed in the context of CHAT in pedagogy. This makes it relevant to specific communities as they build towards disaster resilience. This is the reason for having to prioritize hands-on activities in the communities for learners to have real-life insights and experiences related to disaster management. Therefore, assessments should consider student-led initiatives like projects in the field of DRR augmenting in-class knowledge.

Resources mobilization and allocation need to be prioritized in DRR education. Governments, international organizations, and NGOs need to prioritize the allocation of resources for DRR education, including funding for materials and teacher training. This can include private partnerships and innovative financing mechanisms to supplement limited resources. In the context of this paper, partnerships can envisage local communities to enhance cooperation, participation, and a sense of ownership of DRR education. Mutsekwa and Razuwika's (2023) study recommended that teacher education curricula should be reviewed to align

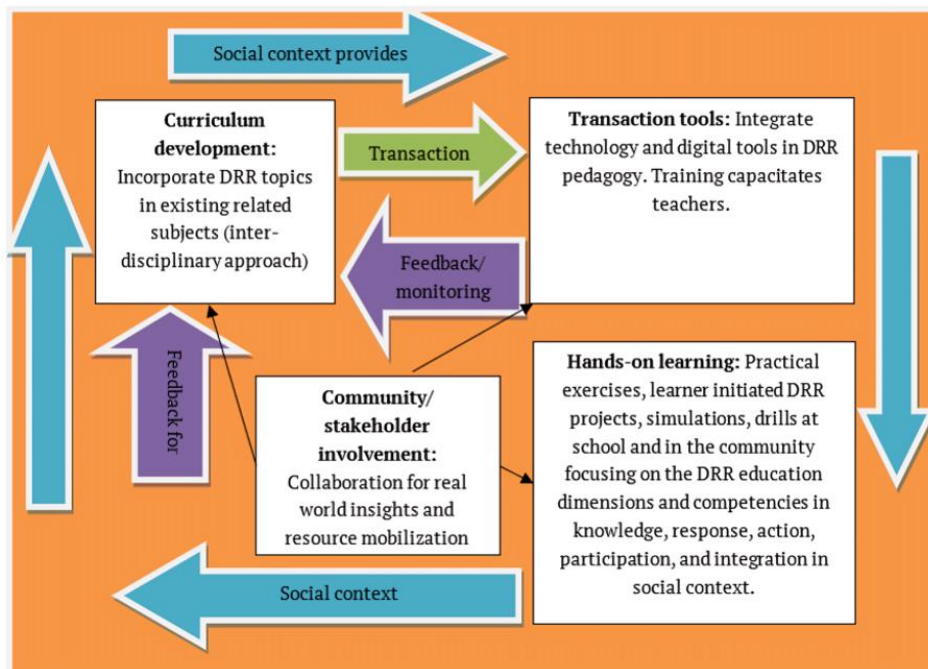


Figure 2. Conceptual framework for DRR integration into the school curriculum in a social context (Source: Authors' own elaboration)

existing syllabi content to current and emerging trends in DRR competencies. These emerging trends should place emphasis on integrating community participation in having safe schools and communities for resilience. In the United States of America, Federal Emergency Management has developed the student tools for emergency planning program which provides curriculum materials and resources for integrating DRR into K-12 education (Maddy, 2020). Such programs should primarily have a government at the center such as the case in Japan where the Ministry of Education, Culture, Sports, Science and Technology has integrated DRR Education into the curriculum successfully (Sakurai & Sato, 2024).

Figure 2 sums up strategies that potentially enhance the effective integration of DRR education in the curriculum hinging on a social-cultural approach to curriculum design. This proposes that if learners have hands-on learning in collaboration with their local communities, it strengthens both safe schools and communities that are resilient to disasters thereby strengthening sustainable development targets. The framework contends that knowledge construction and competencies sought in DRR education are best developed when learners work in their social context. Therefore, curriculum development should consider this critical from curriculum design, methodologies, and assessment matrixes.

This approach is thought to be context-dependent knowledge and effective in fostering DRR education knowledge, skills, and dispositions in a motivating way to both the teachers and the learners. Packaged programs imposed on school curricula lack local attractiveness that motivates curriculum receivers and implementers. Therefore, re-thinking DRR education dimensions in the socio-cultural context of learners, as propounded by CHAT tenets, is potentially effective in enhancing the resilience of communities as the world is increasingly faced with rising incidences of disasters.

CONCLUSION

The integration of DRR education in the school curriculum is imperative to realize disaster-resilient communities and protect lives. This feeds into the resilience and sustainable development goals of the United Nations Sendai framework for disaster risk reduction 2015-2030. Imparting DRR education skills to date has been sluggish and wrought with challenges, especially in the global south. The main challenges revolve around policy deficiencies, material, and human resources inadequacy, competing priorities in education, and skills assessment matrices obscurity. This has made nations fail to rise above the knowledge dimension of DRR. In the face of current trends of increasing frequencies and magnitude of disasters, policy development, implementation, and coordination must be intensified to proffer the resilience of communities as prioritized by the UNSFDRR 2015-2030. These efforts must ensure disaster resilience propagation through innovative and holistic frameworks of integration of DRR into the school curriculum in a social context. Thus, the integration of DRR into the school curriculum should incorporate the Response, Action, Participation, and Integration dimensions in the context of the learners' communities. This implies revamping curriculum design content on DRR.

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Data sharing statement: Data supporting the findings and conclusions are available upon request from corresponding author.

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