Article

Designing for Social Justice: A Decolonial Exploration of How to Develop EdTech for Refugees

Katrina Barnes [1], Aime Parfait Emerusenge [1], Asma Rabi [1], Noor Ullah [1], Haani Mazari [2], Nariman Moustafa [3], Jayshree Thakrar [2], Annette Zhao [1] and Saalim Koomar [1,*]

[1] Jigsaw Education, EdTech Hub, London W6 7JP, UK; katrina@jigsaweducation.org (K.B.); aimeparfait@jigsaweducation.org (A.P.E.); asma@jigsaweducation.org (A.R.); noor@jigsaweducation.org (N.U.); annette@jigsaweducation.org (A.Z.)
[2] Results for Development, EdTech Hub, Washington, DC 20036, USA; haani.mazari@edtechhub.org (H.M.); jay.thakrar@edtechhub.org (J.T.)
[3] Open Development & Education, EdTech Hub, Barnet EN4 8RE, UK; nariman@edtechhub.org
* Correspondence: saalim@edtechhub.org

Abstract: This paper reflects on the lived experiences of young refugees located in Pakistan and Rwanda when interacting with education technology (EdTech) during and following displacement. We offer a broad decolonial commentary on issues related to the design and development of EdTech initiatives for refugees, noting some of the historical trends prevalent in the education and emergencies sector. We are guided by questions such as: Why EdTech to start with? Who designs the products? Where are they designed? How are they designed? And, which power dynamics are at play during the design process? From this, we draw on qualitative data generated through three focus groups, where we explore young refugees' experiences of EdTech. The focus group included a creative element inviting participants to imagine what a liberatory EdTech practice would look like. We aim to illustrate the practical implications of design choices taken by EdTech developers and, from this, recommend a set of justice-centred design principles for developers of EdTech in refugee contexts. These insights relate specifically to the experiences of refugees in Rwanda and Pakistan, though we also discuss the implications of these learnings for other contexts.

Keywords: refugee education; education technology; education in emergencies; technology design; decoloniality; decolonising EdTech; digital neo-colonialism; Pakistan; Rwanda

1. Introduction

There are growing bodies of literature that explore strategies for decolonising EdTech (e.g., [1–4]) and the role of EdTech in emergencies [2]. Yet, scholars have noted the paucity of literature that considers the use of EdTech in refugee contexts [3,4], let alone from a decolonial lens. Indeed, the varied and unstable nature of displacement scenarios may give rise to questions around whether EdTech is appropriate at all in some displacement scenarios, and if it is, whether alternative access routes to it may need to be considered to ensure equitable benefit.

Previous research into refugees and EdTech has tended to focus on primary- and secondary-age students, with tertiary level education de-prioritised [5]. In addition, Crompton et al. call specifically for further research into emergency remote education for "refugees who may not be connected to local educational entities" [2] (p. 1571). With these gaps in mind, this paper focuses on the use of EdTech by young refugees in low- and middle-income countries (LMICs) who are either studying at a higher education level, or who are outside or beyond formal education. This may include those striving to supplement or pick up the threads of prior formal learning; achieve academic recovery; supplement ongoing tertiary education; or gain professional skills for direct employment purposes.

This paper considers a range of injustices in EdTech research and design for young refugees in LMICs during and following displacement. These injustices include the Cultural–epistemic, material, and political or geopolitical, as outlined in the dimensions of human injustices framework [6]. Using the latter, we start by offering a decolonial commentary on existing literature in the field of education (and EdTech) for Emergencies and EdTech for refugees. We then apply the same lens to the experiences of using EdTech of young refugees in Pakistan and Rwanda, delineating the ways in which their interactions with EdTech were positive/helpful and/or unjust/oppressive to their status. Finally, we attempt to present suggestions, based on the views of our refugee research participants, towards a more just EdTech design, inviting a delinking from digital neo-colonial logics. It should be noted that we have added a list of definitions within the Supplementary Materials (S1) of this piece. These definitions unpack some of the key terms we use—and grapple with—while writing this piece, including decoloniality, digital neocolonialism, and displaced person(s).

Thus, this study first reviews the literature on EdTech for refugees through a decolonial lens, and then applies this decolonial lens to present design principles to consider effective and inclusive EdTech development for this marginalised group. It is hoped that this process provides a useful bridge between theory and practice.

1.1. Research Questions

This study will address two core questions:

1. What can the lens of decoloniality add to the evidence of "what works" when using technology for refugee education?
2. How can our current understanding of existing decolonial education frameworks, as well as lived experiences of refugees in Rwanda and Pakistan, help us move towards decolonising EdTech products, policies and interventions for refugees?

1.2. Dilemmas and Paradoxes

We acknowledge some of the paradoxes inherent in contributing to the conversation around how decolonial research can exist within neocolonial structures.

First, we acknowledge the limitations of using a Western-centric research methodology, knowing that such methods have historically been based on extractive imperatives and colonial world views. This issue has been mitigated to the extent possible by choosing to focus on contexts where the majority of the research team has a lived, embodied experience, and that recommendations are based on the voices of refugees themselves.

Second, while we focus on two specific refugee contexts for the purposes of this study, we also acknowledge the heterogeneous nature of refugee experiences. As such, we posit that the suggestions made in this article may be extrapolated to similar refugee contexts, though further research is required in relation to other specific refugee groups that vary in age, educational and political economy goals, and nature and geography of displacement.

Third, we recognise that the literature upon which our research is based is available primarily because it conforms with Western-centric academic conventions, such as peer review processes, journal formats, and professionalised reports that are written in English. Drawing only from this literature means that other epistemic approaches and distribution formats are not represented. Furthermore, the literature itself was sometimes sourced from institutions that have historical ties to colonialism and neocolonialism. It is often these multilateral international development institutions which have readily available data. However, we endeavour to approach this (and all) literature with a critical eye. In addition, seeking publication in a journal may inadvertently lead to a perpetuation of the very exclusionary practices and power dynamics that this paper seeks to dismantle. To ensure more equitable access to our research, we shared our paper and findings with our research participants and their communities in the format and languages of their choice, such as via WhatsApp voice messages. Participants were encouraged to share their feedback on the findings and check that they were satisfied with the way in which their voices had

been represented; any suggested changes were then integrated into the final publication as necessary.

Fourth, we recognise the privilege we have as researchers employed at a research institution that is funded by, and is in partnership with, Global North institutions. In addition, we recognise the payment we take for our work probably stands in stark difference to what most of our refugee research participants can gain. To the recognition of this entanglement, we say that with this privilege comes the responsibility to form partnerships and mediate conversations that do not usually happen between EdTech designers, policymakers and refugees, a central goal of this paper.

Finally, we recognise the risk identified by Traxler [7], that our attempts to suggest ways to decolonise EdTech may be "driven by members of the majority community and inevitably seen through the lens of their (mis)understanding and privileges". It is hoped that the diverse range of lived experiences within the team may serve to dilute this risk; the research team operates in a non-hierarchical format in which members continuously hold each other to account and challenge others' assumptions.

2. Analytical Framework

In this paper, we adopt decoloniality, and by extension digital neocolonialism, as a central analytical lens through which all other relevant concepts are viewed, and primary data are analysed. Among the different decolonial conceptual frameworks, we find the one titled "Dimensions of Human Injustice", developed by Adam [6], to be most helpful.

The decolonial lens enables us to ask questions and look at the data from perspectives that are missing in the general bodies of literature around EdTech for refugees. The broader literature focuses on the products, services, policies, modes of implementation, and even inequities, in the present moment, which are in themselves important for emergency management and response. However, the decolonial perspective centres the geopolitical power dynamics and historical injustices at play when thinking about EdTech. Given the refugee context is one of oppression, related to geographic displacement and entangled historic and political processes, it seems fitting to add a geopolitical lens into the conversation. This means looking beyond the crises of the present moment, and instead analysing what led to them, to be able to imagine solutions that adaptively address root causes rather than offering surface-level technical fixes for symptoms.

The dimensions of human injustices framework emerged from Adam's [6] research on using a decolonial lens to explore South African Massive Open Online Courses (MOOCs) and their conceptualisations with participants and EdTech designers (see Figure 1 below). The framework merges discourses around the decolonial theory between dimensions of coloniality of power, being and knowledge [8], as well as social justice Global North [9] and South frameworks [10–13] between ameliorative and transformative responses. This is in addition to synthesising other philosophical underpinnings, namely embodied cognition, the capability approach [14], and critical pedagogy [15]. All the previous take an epistemological stance towards education and knowledge production as a political issue shaped by historical and geopolitical power dynamics, emphasising that critical, decolonial education can be a means to face oppression.

This paper analyses the lived experiences of refugees in two Global South contexts interacting with EdTech products (including MOOCs) to continue their education. Hence, Adam's [6] framework's emergence in a Global South context, particularly in relation to EdTech research, in addition to its synthesis of a broad literature all concerned with analysing multiple levels of injustice and oppression, makes it a suitable analytical lens for our work. Moreover, the framework adopts a stance of entanglement offering a complex understanding of knowledge, pedagogies and education design that evolve and travel across space and time, while acknowledging the power dynamics that exist among such formulations [16]. We see this as closer to reality and to our research than putting epistemologies in binaries (North–South) against each other. Our adaptation of the framework for the refugee context can be seen in Table 1 below.
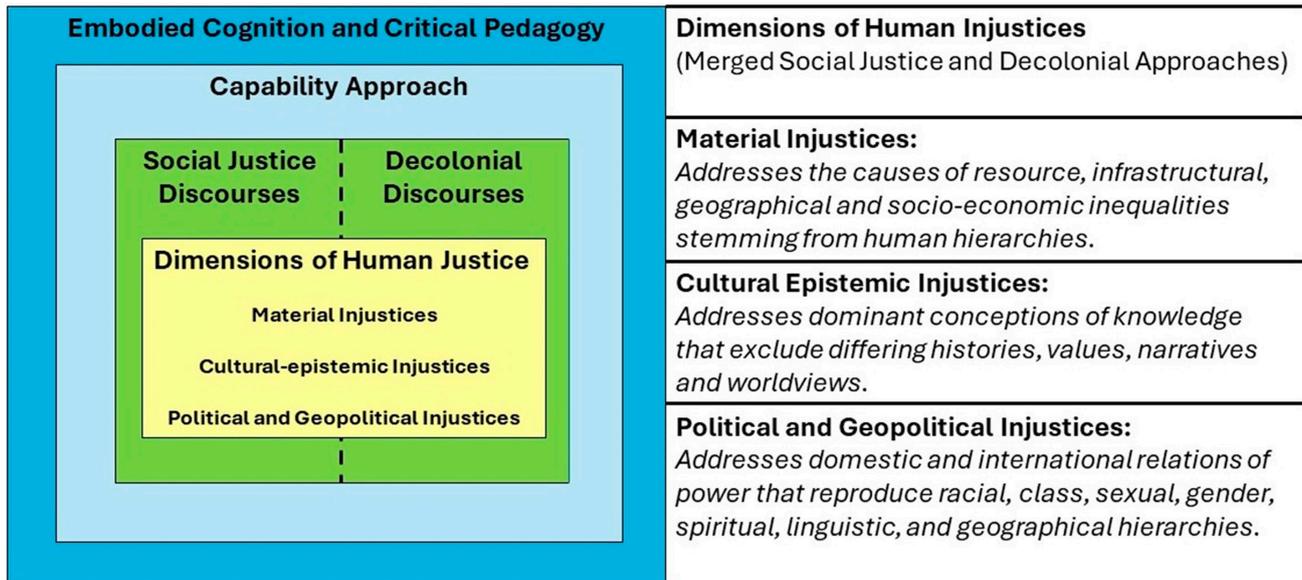
Figure 1. Adam's [6] Dimensions of human injustice framework and the roots of its synthesis, licensed under CC-BY-NC-SA 4.0.

Table 1. Dimensions of Human Injustice: adaptation for the refugee context.

Dimensions of Human Injustice Aspects	Research and Analysis Questions in the Context of Lived Refugee Experiences in Pakistan and Rwanda
Material Injustices	• Who is the product's/intervention's target group? How is this group reached? And who is the provider? What is the financial flow of resources? • What infrastructural or resource-based or socio-economic barriers to access exist? • According to principles of digital development, were users involved in the conception, design and development of the technology product or the EdTech program (beyond user testing)? Would they have liked to? • What data are collected through technologies for refugees? Is knowledge about how the algorithms work to collect data and design learning pathways made open, accessible and understandable? • Do learners/larger community of refugees own the means of producing and/or remixing technologies for their own benefit?
Cultural–epistemic injustices	• What is the underlying assumption around what technology can offer for refugees? Where did this assumption come from? • What pedagogical underpinnings are there in the technology offered for refugees? • What is the content format and type? What were the activities involved? • How were the epistemic and cultural diversities of users considered in EdTech design: (a) language and history; (b) ability; (c) access to connectivity; (d) epistemological (way of knowing)/cultural worldview?
Political and geopolitical injustices	• What are the learning goals embedded in EdTech for refugees? Where do they come from? Are learning goals contextual to the situation of refugees? • On an institutional level, why was this particular EdTech option chosen by institutions as the one to offer to refugees? • What power structures exist within the EdTech offering between the learners, teachers, designers and institutions supporting the design/intervention? • What are the ethics around data collection? Is there an option to opt-out? What are the consequences of opting out of data collection? • How do EdTech products/interventions consider and/or deal with intersecting issues of systemic oppression for refugees, if at all? Do EdTech products reinforce/reproduce, evade, ignore, or transform such systemic oppression for refugees (along lines of geographic, gender, class, racial, spiritual/religious oppression)?

3. Literature Review

While there is a plethora of evidence available about education in emergencies (EiE), there is a widely acknowledged evidence gap about the use of EdTech in emergencies, including refugee contexts [17], as cited in Ashlee et al. [5]. Much of what we know about education in emergencies is in relation to COVID-19 [5,18]. To our knowledge, there are no specifically defined design principles to contextualise EdTech interventions for refugees. More work is needed to unpack existing trends in refugee and emergency education. Acknowledging this evidence gap, below we synthesise the literature around EdTech interventions for refugees.

3.1. Historic Trends in Education for Refugees

Article 26 of the United Nations' Universal Declaration of Human Rights identifies education as a basic need. Studies have shown that schools play a "vital role in the resettlement of refugee children and their families", highlighting that education can play a critical role in addressing the socio-emotional needs of refugee learners [19] (p. 1). Guidelines for EiE are shaped around the interdependency between psychosocial well-being and education. For example, the Inter-agency Network for Education in Emergencies' (INEE's) Minimum Standards for Education [20] highlights the need to address psychosocial well-being to support learning continuity. The guidelines also acknowledge that, as an emergency continues, it is important to address the "evolving learning needs of the affected population". In the case of refugees, however, "once the attention of the international community strays and funds begin to dry up", the pursuit of education is often left unaddressed [21] (p. 211).

In addition, refugee camps are often designed to serve a temporary function. Historically, international development organisations have partnered with host governments to cater to refugees' survival needs with the end goal of repatriation [22,23]. In reality, many refugees spend years in "protracted refugee encampment", requiring pathways for learning continuity [24]. In contexts where education is available to refugee communities, there is less funding to meet the needs of learners the further along they are in their learning journey. Primary education receives the most amount of funding and tertiary education the least, if at all [25]. As a result, only 6% of refugees worldwide are enrolled in any form of a tertiary education programme, compared to 40% of non-refugee people worldwide [26].

Yanay and Battle [27] provide a detailed account of various barriers that prevent inclusion in a host country's education system. On a structural level, refugees may lack the required documentation to participate in education. This is particularly challenging for refugees who have to flee suddenly, leaving behind school certificates. But even when these documents are available, their existing qualifications might not be perceived as equivalent, or the language requirements in their host country might prevent them from enrolling in educational institutes. On an individual level, refugees might lack the resources to participate in education. This is particularly salient for those who are reliant on humanitarian aid. Further, lack of financial resources can also lead to the need for refugees to provide for their families as they grow older, disincentivising individuals from pursuing education.

Refugee situations are primarily political situations, whether they result from war, displacement, discrimination, prolonged market exploitation and extraction of natural resources for production in the Global North or any other forms of violence [28]. Furthermore, critical pedagogy, represented within the dimensions of human injustices framework we adopt in this paper, asserts that "every educational act is political and that every political act is pedagogical" [29] (p. 176), as cited in Mackinlay and Barney [30].

Zembylas [31] offers an in-depth analysis of the refugee situation, applying Agamben's theory of biopolitics, while critiquing the liberal/humanitarian response and language of refugee "inclusivity". In his analysis, Zembylas describes three essential components of the refugee experience, these being (a) "abandonment" as the logic and process by which refugees are left behind as abject figures of fear and precarity in opposition to

society, thereby legitimising their lack of access to rights and protections; (b) "bare life" which refers to reducing human beings to only basic survival needs and stripping them of any political and social significance, serving to reduce refugees' agency; and (c) "the camp" which denotes spaces of confinement and control, that exist beyond particular physical sites and extend into society, thereby normalising dealing with refugees through abandonment and exclusion. For Zembylas [31], the liberal/humanitarian response which calls for "inclusive education" of refugees, aiming to promote recognition and empathy while disregarding the previously outlined power dynamics and structures at play, may inadvertently contribute to the perpetuation of refugee problems by "failing to challenge the separation of humanitarian concerns from politics and by perpetuating exclusionary categories and invisibility".

Dovigo [28] reminds us of the risks of shying away from talking about the politics of refugee education, including the importance of addressing how much is spent on border management to prevent refugees incoming as well as resources allocated to media narratives to "other" refugees versus actual spending on refugee education. Without such conversations, and focusing only on pedagogy and design, Dovigo posits we are shying away from the decolonial process altogether.

Within the politics of refugee education, Dovigo [28] and Mustafa [32], highlight what they call a "differential humanity", that is a full hierarchy of statuses between a refugee, an asylum seeker, and a forcibly displaced person. Additionally, differential humanity is represented by refugees being displayed by the media differently according to their country of origin as either a "good deserving victim" or an "undeserving bogus survivor" coming to snatch away resources from the host country. Such conditions result in differential, unequal legitimacies of access to services and public support.

The previous are all real, material conditions that shape the experiences of refugees. They need to be holistically considered when intervening in education. We cannot pretend that using EdTech alone can solve such deep injustices, or indeed that EdTech itself could not contribute to inequality or injustice [33]. These issues are discussed in the following section.

3.2. Use of Education Technology in Emergency Responses

Over the past decade, the affordances of technology have offered potential avenues to altering the way learners can continue their pursuit of education during disruptions. Since 2015, technology has been widely advocated for as a "solution to humanitarian crises" [34] (p. 313). Cross-sectoral partnerships have emerged to drive EdTech responses in the pursuit of learning continuity. It has been celebrated that private sector actors including Avanti, CISCO, Ericsson, Google.org, HP, Microsoft, and Vodafone Foundation have invested in digital learning. This has led to the development of educational platforms, including Learning Equality's Kolibri platform, and the Learning Passport developed by UNICEF and Microsoft [35].

Pallitt and Kramm (forthcoming) outline various intellectual positions adopted by different stakeholders when using EdTech, namely the instrumentalist, interdisciplinary and the post-digital. In their differentiations, they outline the instrumentalist positionality as a view that privileges the functional use of a neutral technological tool to achieve an educational goal. The interdisciplinary position views the social interactions between technology and humans "in ways that reflect the values, interests and power dynamics of the societies in which it is created and used", including broader phenomena such as neoliberalism. Moreover, the post-digital position encourages the investigation of the role of the non-human and more-than-human as non-neutral actors. As such, we cannot just focus on technical skills when using EdTech, or view refugee education as simply a "bureaucratic activity" [28].

It is important to question the fundamental assumption prevalent in the literature that EdTech is the most effective tool for (re)connecting refugees with learning during and following displacement. Al Habsi and Rude [3] note that "the potential of EdTech for refugee education is large but marked by several pitfalls" (p. 43). Among these are the

material injustices identified by Adam [36], with many refugee communities lacking the infrastructure, device access, and digital literacy needed to take full advantage of EdTech offerings [3].

In addition, EdTech may not only be inaccessible to some refugee groups, but the introduction of EdTech may serve to exacerbate pre-existing societal inequalities and digital divides. As Ashlee et al. [5] noted, girls experience reduced access to technology in many contexts due to cultural gender bias. Investing in EdTech for refugees therefore runs the risk of leaving some members of refugee communities even further behind.

Tauson and Stannard's [4] systematic review expands upon the ethical implementation of EdTech in emergencies. They compile several questions that should inform decisions regarding EdTech implementation. Their review emphasises a need to understand the length of disruption, and whether displaced people are restricted from accessing technology. Asking these questions may help to establish whether a response involving EdTech is appropriate for a given emergency, and doing so may help to challenge the neocolonial assumption that technology is universally desirable and applicable. Importantly, EdTech is not a neutral tool and if we decide to use it, we need to think largely about how it can be leveraged to address systemic colonial problems within the field of refugee education and humanitarian aid at large [37]. Regarding the length of disruption, it is important to note that experiences with technology differ greatly between refugees and displaced persons in protracted crises when compared with more acute crises [38]. Those in protracted crises may use technology for their education more often given the relative stability of their circumstances. However, increased technology use—and expectations of this increased use—can create different emotional stresses. For example, access to power and connectivity may be limited or unreliable, or refugees and displaced persons may carry possible feelings of shame if they are not visibly thriving in their new environment and reporting this on social media or messaging apps [39].

3.3. Designing EdTech for Refugees

Different approaches for designing equitable EdTech in general (i.e., not aimed specifically at refugee communities) have been proposed over the years [40,41]. More recently, in 2017, the principles for digital development (PDD) were developed by the Digital Impact Alliance for use in the development sector. Building on frameworks from UNICEF (2009) and the UK government (2012), the PDD consists of nine principles (see Figure 2).

Figure 2. Principles for Digital Development, 2017.

The principle, 'Understand the existing ecosystem', is echoed in the literature on EdTech for refugees. Menashy and Zakharia [34] advocate for the importance of contextualised and evidence-based interventions that recognise "the knowledge, experiences, and needs of refugees" (p. 325). Ashlee et al.'s [5] rapid evidence review on refugee education similarly signifies the need for "EdTech to be adapted and contextualised to each refugee setting" (p. 6).

There is now wide consensus in the literature that, in line with the principle 'Design with the user' (Digital Impact Alliance, 2017), EdTech products should be designed in collaboration with the refugee communities that the EdTech aims to serve [42–45]. However, positions vary regarding the extent of this collaboration. For some, this may mean consulting with the community about their needs and contextual realities [6,8,34]. Such consultation may help to avoid assumptions being made, such as levels of digital literacy, which may result in adverse effects such as increased "marginalisation, loneliness, and difficulty communicating and learning the social norms of the host country" [3] (p. 46). Furthermore, community participation is viewed as a trust-building exercise that represents a crucial step in ensuring buy-in to, and eventual ownership of, EdTech products [5].

Other scholars suggest that a more active and central role for refugees in EdTech design processes may be key to ensuring usefulness and relevance, namely through participatory approaches. Kennedy and Laurillard [44] propose employing co-design methodologies, in which refugees are not only asked about their context, but actively contribute to the design of the products themselves. Alain et al. [45] describe their approach to co-designing EdTech with refugee children as follows:

"Design work starts with children envisaging solutions and producing requirements. Children are then asked to create both the pedagogical and technological aspects of the design, including contextual elements. The children's designs are then brought to adult design workshops where they are matched with the available resources such as locations, time, human resources, equipment, and funding to insure applicability and sustainability" [1–4,45] (p. 4).

In alignment with the "Design for scale" principle, Butcher [46] cites other scholars (e.g., Bozkurt et al. [47], Rapanta et al. [48]) who posit that the use of technology provides the most efficient, cost-effective, and perhaps the only method to continue learning at scale during emergency situations where face-to-face interactions are not possible. Butcher [46] also acknowledges limitations, including internet access or applicability of language and other contextual needs for students in LMICs.

In alignment with the "Be collaborative" principle, Crompton et al. [2] systematically review the literature related to EiE in light of COVID-19. They highlight the significance of partnerships to ensure effective remote learning in emergencies. They add that the importance of exploring multiple partnerships with organisations, companies, local groups and individuals not only expands the support base (particularly in terms of resources) but can also facilitate a shared responsibility and investment in the outcome.

Finally, and in alignment with the 'Use Open Standards, Open Data, Open Source, and Open Innovation' principle, El-Serafy et al. [42] call on EdTech developers to embrace openness as a key focus of their work. This could involve making systems interoperable, using open-source applications and technologies, and openly licensing their work. The Digital Impact Alliance notes that such practices "can help to increase collaboration in the digital development community and avoid duplicating work that has already been done. Programs can maximise their resources—and ultimately their impact" [49].

Despite the previously noted alignment of the PDDs with the broader literature on EdTech for emergency, including refugee, contexts, we do note the absence of historic and present power dynamics. It invites adopters to "design with the user", "be collaborative", "be data driven", or "use open standards", without giving the end user—refugees in this case—any decision-making power. Such collaborations, and flow of information, are full of hierarchical power dynamics between designers and users, and moreover, humanitarian donors in refugee contexts.

On the "Design with the user" principle, it is important to critically question universalising the "refugee community" experience. The literature reiterated the need for EdTech to "be contextualised and respond to learners' needs" [5] (p. 23), but how can EdTech designers realistically achieve that given the general imperative to design for 'universal' reach?

Adam [16] suggests that "MOOC designers create MOOCs that strongly link to who they are, what they value, and how they understand the world, highlighting the crucial need to have epistemically diverse MOOC designers from different cultures, value systems, and epistemologies" (p. 171). Following this logic, EdTech products can never truly reflect the needs and values of refugee communities unless refugees take a leading role in the design process. Whether consciously or not, designers from other contexts will assert their own identities and beliefs over the products that they create. Selwyn [50] reminds us that "it is crucial that well-intentioned education technologists in the Global North see their primary role as listening and learning from others, rather than attempting to lead and innovate 'solutions'".

Reflecting on the principle of 'Build for sustainability', we posit that genuine strides to make EdTech development sustainable will require analysis of the ecosystem—codified as people, provision, product, practice, policy and place—to determine the interdependencies, levers and barriers to sustainability across the system [51]. For example, in relation to EdTech as a product, this could mean listening to and being led by post-colonised viewpoints—"If we can no longer buy a new replacement laptop every 12 months, then what might be learnt from repair and reuse cultures in Kenya? If there is no longer the guarantee of 'always on' connectivity due to energy blackouts, what might be learnt from off-grid digital infrastructures run on solar, wind turbine or wind-up power?" [52] (p. 1797). Selwyn [50] continues, "perspectives from the Global South might enhance the understanding of 'technological development' from a degrowth perspective and provide paths forward to sustainability".

In thinking about the Design for Scale principle, it is important to question the contradictions between designing for specific contexts—as recommended by the literature on effective refugee education—versus designing for scale, which is described in the principles as "thinking beyond the pilot and making choices that will enable widespread adoption later". Yet, this limits the notion of scale to simply expanding numbers. Alternatively, Coburn [53] offers a reconceptualisation of scale as four interrelated dimensions of depth, sustainability, spread and ownership. She argues that depth, that is, the nature and quality of change, should form the central premise of scale. This alternative notion of what scaling means could resolve the clear tension here between context-specificity and scale.

Yet, even if we adopt the standard approach to scaling; while cross-sectoral partnerships as recommended by the PDD are important in helping bring interventions to scale, it is critical to consider whether solutions are catering to the needs of the communities they intend to benefit. Drawing on McLean and Gargani [54], Mazari et al. [18] argue that, in addition to being justified by implementers or even by technical evidence alone, EdTech in emergencies also should be justified by the experience and needs of impacted communities, rather than being seen as yet another market of expansion for global EdTech companies.

Menashy and Zakharia [34] examined Syrian refugee education in Jordan, Lebanon, and Turkey, critiquing "digital humanitarianism". They found that a "pervasive optimism" around using EdTech has fuelled a problematic, disproportionate focus on technology. In this context, a "surge" in private-sector engagement has led to interventions being designed "free of coordination; driven by profit motivations; and developed in a manner decontextualized from the learning context" [34] (p. 4). Their study aims to counter the "overwhelming optimism" which, they argue, fails to consider the problematic implications of exporting interventions "developed in the Global North into the 'distant other' in the Global South". In interviews conducted by Mazari et al. [18], key informants described the new EdTech for emergencies landscape as "an arms race". One stakeholder in particular feared "the commercialisation of education provision in humanitarian responses" in which

"EdTech resources are dumped" on communities without any localisation, leading to responses that are "colonial at best" (EiE Expert interview notes, in [18]).

Finally, on the "Be data driven" principle, we note two issues. First, is the importance of questioning what kind of data are collected and the extent to which refugees are accounted for in the host country's education sector planning. Second, is the ethical and political role that data collection plays in refugee contexts. Krishnan [55] explains the harm inflicted on refugees through the unethical interplay between aid conditions, government persecution of individuals and data collected by digital systems. Interlinked to this, and cross-referencing the "Use open standards" principle, is the harm publicly available refugee datasets could play in terms of racial discrimination, xenophobia, and related intolerance.

Having explored the broad literature related to education (and EdTech) in emergency, including refugee contexts, we will now present the two research contexts for which this paper is specifically focusing on, Pakistan and Rwanda.

3.4. Research Contexts

In this subsection, we summarise the nature of the situation that led to the study participants' arrival in the host countries (Rwanda and Pakistan). We will discuss the EdTech ecosystems, including educational opportunities and socio-political challenges that currently exist in both contexts. The national education systems of these countries are not discussed beyond the extent to which they relate to refugee experiences due to time and space limitations. However, it is acknowledged that some challenges affecting refugees are likely to also be experienced by host community members; the intention is not to exclude other experiences of injustice.

3.4.1. Pakistan

Afghan people have been "caught in the crossfire" of geopolitics since 1979 [56]. As a result, the number of Afghan refugees in Pakistan ebbs and flows, most recently increasing in 2021 due to the Taliban's return to Afghanistan's Government [57]. While UNHCR estimates that Pakistan hosts 1.43 million registered Afghan refugees, official figures expect there are as many as 4 million undocumented refugees in Pakistan, with several generations born in exile. Of this population, 44% are estimated to be children under the age of 18 [58]. These disruptions have had a drastic impact on education. As UNHCR [59] described, "The education of successive generations of Afghan refugee children [are being] disrupted, discontinued or forgotten, due to a range of barriers that are largely outside their control". Hervé [60] raises the importance of situating these barriers within the context of the mass returns, as well as the structural weakness of Pakistan's education system.

Pakistan has the second-highest number of out-of-school children in the world, of which approximately 56% are girls [61]. Of those who are in school, 74% of children are in learning poverty [62]. The learning crisis is predicted to have been significantly exacerbated by COVID-19 [61] and the recent floods [18,62]. There are also critical funding constraints; Pakistan spends approximately 2.3% of its GDP on education, compared to the global average of 4.21% [63,64]. While there are nationwide challenges to education, it is critical to contextualise the prospects of refugee education at the provincial level. Education is devolved to the provincial level under the 18th Amendment [63–65]. However, there are significant disparities across Pakistan's provinces that shape access to education and technology.

The Afghan refugee population in Pakistan predominantly reside in two provinces: Khyber Pakhtunkhwa (KP—52.3% of total refugee population, see S2 in the Supplementary Materials for more details) and Balochistan (24.5% of total refugee population, see S2 in the Supplementary Materials for more details). The very border implemented during the colonial era that separates Afghanistan and Pakistan, the Durand Line, divided ethnic Pashtoon and Baloch people [64]. As a result, Afghan refugees who speak Pashto and Bruhui share their language with many Pakistanis in these two provinces. In KP, 78.9% of

the population speaks Pashto. In Balochistan, 35.5% of the population speaks Balochi and 35.34% speaks Pashto [65].

Despite being a multilingual country with over 25 languages, Pakistan's official languages are Urdu (mother tongue to only 7.57% of the population) and English [66]. These linguistic challenges lead to ongoing debates on language of instruction (LoI), curriculum, and textbooks. For this reason, the shift to Urdu or English education could potentially be as much a barrier for Pakistani nationals as it is for refugees in some cases.

Across KP and Balochistan, an estimated 50,000 Afghan refugee children have enrolled in government schools, while UNHCR provides direct support to 144 primary and secondary schools across 54 refugee villages. In addition to this, to promote refugee girls' access to education, Accelerated Learning Programmes (ALPs) have been offered, some of which provide home based classes for refugee girls and women [67]. Although there are policies to provide education to documented refugee children at the school-level, there is no provision to continue onto higher education [68]. There are, however, donor-funded initiatives that provide vocational training and scholarships at the tertiary level [69].

Yet, even where educational opportunities are available, there are multiple attitudinal barriers that impact refugee education in Pakistan. Hervé's survey [60] found that only 10% of refugees surveyed were out-of-school because there was not a school nearby; the majority did not attend due to other factors. These reasons varied by gender, where 57% of girls did not attend school because their families do not allow schooling (compared to 1% of boys), and 44% of boys did not attend school because they needed to earn money (compared to 1% of girls) [60] (p. 17). Based on their findings, Hervé argued that attitudes play a greater role in impeding refugee education than national education policy does [60].

Although Pakistan has a vibrant EdTech ecosystem with multiple players offering learning content, many of these solutions cater to primary school students [61]. Furthermore, evidence from COVID-19 exposed that high-tech distance learning runs the risk of leaving marginalised learners further behind [61–63,70,71]. Adding to this challenge, there are also a number of factors that make it even more difficult for Afghan refugees in Pakistan to access digital devices, and thus high-tech learning solutions. Access to SIM cards and Internet services in Pakistan requires all individuals to have identification cards, making access particularly challenging for undocumented refugees. Refugees can buy SIM cards and access the Internet if they have valid Proof of Registration (PoR) or an Afghan Citizenship Card (ACC) [72].

3.4.2. Rwanda

Rwanda has been a host country for refugees for over two decades, with the majority of its refugees coming from the Democratic Republic of the Congo (DRC) and Burundi (59.6% and 39.9%, respectively, of a total of 126,737) [73]. Burundian refugees, the focus of this study, fled Burundi in 2014 due to the acceleration of political unrest in the country, but they have only been officially recognised as refugees in Rwanda since April 2015 [74].

Since the 1994 genocide against the Tutsi, which resulted in millions of Rwandans fleeing the country, Rwanda has made steady progress in social and economic development and this includes continued investment in education. In Rwanda, the Education Sector Strategic Plan (ESSP) provides guidance to the education sector in five-year cycles and specifically aims to "promote access to education at all levels, to improve the quality and strengthen the relevance of education" in order to meet labour market demands [75] (p. i). Rwanda's Education Sector Strategic Plan (NST1 2017–2024) proposes strategic interventions to build a strong foundation for a quality education. The key strategic priorities include improving the pre-primary enrolment rate, upgrading and increasing school infrastructure and resources, increasing the number of qualified teachers and improving their welfare [76].

Regarding EdTech specifically, the National Strategy for Transformation (NST1) includes an aim to increase the use of ICT in teaching and learning through scaling up SMART classrooms and ICT devices. A recent report by Kimenyi et al. [77] also suggests that rele-

vant policies have been put in place at the national level: three National Information and Communication Infrastructure Plans were implemented from 2000 to 2015 which included several ICT for Development (ICT4D) programmes. Additionally, the Smart Rwanda 2020 Master Plan (SRMP) introduced in 2015 included key areas such as education, women and youth empowerment in ICT [78]. The ICT Sector Plan (2018–2024) also emphasises the importance of ICT in education and academic institutions [79].

An example of EdTech available to refugees in Rwanda outside formal education is Coursera for Refugees, launched in 2016. Through the platform, refugees are able to access free education courses covering a variety of disciplines. All refugees, persons under subsidiary protection, and asylum-seekers are allowed to apply for Coursera courses. While refugees worldwide theoretically have access to the platform, they must register through their UNHCR country office. UNHCR Rwanda has partnered with Coursera to be able to offer free access to both its portfolio of online courses and its free certificates provided by universities and educational institutions around the world [80].

The Rwandan government aims to provide the same quality of education for refugees and nationals through free primary and secondary education, equal access to higher and further education, and the certification of their educational progression [81]. According to the joint strategy on economic inclusion of refugees and host communities in Rwanda [82], interventions related to refugees' inclusion and self-reliance (including refugee education) are in line with the Rwandan Government's NST1.

However, the ESSP identifies several challenges faced by the education sector, which negatively impact student learning outcomes. First, insufficient teacher competencies in subject content, pedagogy and languages of instruction (English) jeopardise the delivery of inclusive education, especially in Science, Technology, Engineering, and Mathematics (STEM) and Information and Communications Technology (ICT). Secondly, the insufficient cooperation across districts and between the public and private sectors, with the latter affecting higher education, particularly hinders education sector progress. Lastly, a lack of strong indicators to monitor progress poses a major risk to the provision of equitable access, especially for marginalised groups such as refugees.

Language is also an important aspect of refugee education and social justice. Rwanda has four official languages: Kinyarwanda, English, French, and Swahili [83] and two of them are used as LoIs. Since 2008, students have been taught in Kinyarwanda in lower primary level (grade 1–3), while from grade 4 onwards, English has become the LoI (shifting from French as the LoI associated with colonialism to English, perceived as the global language) [84]. Refugee education in Rwanda is provided only in Kinyarwanda and English, though it is worth noting that, due to the mutual intelligibility between Kinyarwanda and Kirundi (the official language of Burundi), and the use of French in Rwanda, Burundi and DRC, the shift to English education may be as much a barrier to Rwandan nationals as it is for refugees in some cases.

4. Materials and Methods

4.1. Sampling Approach

Participants were selected through convenience sampling [85] (p. 218). All participants were members of three of the research teams' personal networks. This was deemed the most efficient way of sourcing participants who would meet the inclusion criteria:

- Between 18 and 35 years old;
- Based in either Pakistan or Rwanda;
- Experience of using EdTech to access education post-displacement;
- Refugee status at the time of engaging in EdTech.

As recommended by Fowler [86], each Focus Group Discussion (FGD) needed a minimum of six and a maximum of eight participants to ensure that all participants would have a chance to contribute fully, and that groups would be manageable for the facilitator.

The original intention was to conduct one FGD per focus country. However, when asked whether they would be comfortable participating in a group with members of the

opposite sex, several participants, both male and female, said that they would not. This is reflective of cultural norms in Pakistan. To respect such sensitivities, and facilitate active participation, it was decided to conduct two separate, single-sex groups in the Pakistan context, each facilitated by a researcher of the same sex as the participants. Details of the final sample are provided in Table 2 below.

Table 2. Dimensions of human injustice: adaptation for the refugee context.

Focus Group Discussion	Location	Number of Participants	Gender
1	Pakistan	8	Female
2	Pakistan	6	Male
3	Rwanda	6	Mixed

4.2. Data Collection Method

A key aim of the study is to guide EdTech designers and developers along the road of adopting a decolonial lens while creating products that are pluralistic, designing "with" rather than "for" refugees as they navigate their educational journeys post-displacement. With this in mind, and in line with the decolonial literature (e.g., Maldonado-Torres, [8]), it was important to elevate the voices and lived experiences of the young refugees themselves. FGDs lend themselves well to decolonial approaches given their capacity to enable participants' views to emerge through interaction, so that "the participants' rather than the researcher's agenda can predominate" [85] (p. 532). It was also deemed the best choice given the collaborative, creative nature of the second phase of the FGDs (discussed below).

Prior to data collection, a two-part focus group template was prepared. The first part was designed to elicit details of refugees' educational background and learning goals following displacement, as well as their experiences with EdTech products. In the second part, participants were invited to collaboratively imagine an 'ideal' EdTech product that would suit their and their community's educational needs. The FGD template can be found in the Supplementary Materials (S4).

Due to logistical constraints, FGDs in Pakistan were conducted online, while the FGD in Rwanda took place in person. In all cases, audio recordings were made of the sessions for transcription purposes.

4.3. Analysis Approach

FGDs were transcribed verbatim from the session recordings, then translated into English and cleaned and anonymised by the research team. The transcripts were then subjected to a combined inductive-deductive coding process [85], using Google Sheets. Predetermined themes were established according to the dimensions of human injustices framework [6], and data were categorised according to those themes. A second round of inductive coding then took place to capture any additional themes that did not readily fit into the framework.

4.4. Ethical Considerations

Ethical clearance was obtained to conduct the FGDs from the EdTech Hub Ethics Committee on 17 March 2023. As detailed in the clearance application, several decisions were made to ensure that the research was conducted in an ethically sound way, especially given the specific challenges that may arise when involving refugees in research, including unequal power dynamics [87] and heightened risk of distress and re-traumatisation [88].

Firstly, participants were provided with detailed written information about the purpose of the study and were sent FGD question summaries in the days prior to the focus group. Secondly, prior to the beginning of the FGD, participants were reminded of the study's purpose, and facilitators explained in detail what their participation would involve, what would be produced as a result, and how their data would be used and stored. The

full consent script (see Supplementary Materials S3) was read to participants verbally; they also received an email copy for their records.

Thirdly, FGDs were conducted by research team members who are themselves members of the refugee communities involved. These individuals were well-placed to understand the sensitivities particular to their participants, and also to communicate in their languages of preference. Relatedly, while a mutually understood language was chosen as the main language of the FGD (Urdu in Pakistan and Kirundi in Rwanda), the facilitators' multilingual knowledge made it possible to invite participants to respond to questions in other languages that they might feel comfortable using (Dari or Pashto in Pakistan; Kinyarwanda or French in Rwanda). Participants could also request for questions to be clarified in any of these languages. This was deemed crucial to ensuring participants' comfort and making them feel fully understood, especially given the political sensitivities around the use of different languages in both contexts described in the research contexts section.

4.5. Limitations

This study had a limited timeframe in which to complete data collection, resulting in it only being possible to gather data from one source. Ideally, FGD data would have been supplemented with other sources, such as key informant interviews with UNHCR staff in each context.

Due to logistical constraints such as participants' disparate locations or ability to travel, both FGDs in Pakistan were conducted online. Connection stability is a risk with online data collection, though the internet remained stable throughout both calls in this instance. There are also suggestions in the literature that online FGDs present more limited potential for natural interaction [89]. However, Moore et al. also note that interpersonal exchanges can remain rich, especially with the help of ice-breakers to build rapport [89]. In addition, Woodyatt et al. [90] found that online and in-person FGDs yield "remarkably similar" content (p. 741).

It is possible that the dual role of some research team members, who are both researchers and members of the participating refugee communities, may have led to findings being skewed by assumptions based on pre-existing knowledge of their community, rather than discovered through the application of research methods [91]. For example, researchers may have inadvertently asked leading questions based on their experience, or been tempted to interpret data according to their personal experiences rather than being guided by what participants were actually saying. This was mitigated by thorough research methods training prior to conducting FGDs, team conversations to raise awareness of issues of positionality, and all team members sharing the task of data analysis. Indeed, the involvement of team members based in the participating refugee communities in the analysis has also facilitated contextually relevant interpretations of data and ensured that any assumptions made by other team members were addressed.

Finally, it is important to acknowledge that conducting FGDs with participants who have sought access to EdTech and may be studying at higher education level means that our findings are unlikely to reflect the experiences of the most marginalised refugees. We stress that we do not seek to achieve large-scale generalisability within our study, but rather to highlight some examples of experiences, needs and ideas that may or may not be similar in other refugee groups. Further research on EdTech for refugees of different age groups and educational backgrounds would be a welcome addition to the literature.

5. Results

The FGDs were characterised by a diversity of experiences and perspectives, reminding us of the fact that refugee communities are deeply heterogeneous. The section begins with an overview of participants' personal displacement and education narratives to provide context for the subsequent views and ideas expressed. This is then followed by a section on which EdTech features participants had found particularly helpful when seeking to continue their education, and the barriers that they experienced when trying to access

and use these products. Finally, participants' design ideas for EdTech products to meet the needs of refugees in their communities are presented.

5.1. Displacement Narratives

5.1.1. Pakistan (Females)

The eight participants became refugees at different points in their lives. Three (PK1-B, C, D) had been born and raised in Pakistan, and one (PK1-A) had moved to Pakistan when she was very young. The remaining four (PK1-E, F, G, H) had fled Afghanistan when the Taliban came to power in 2021; three had been studying at university (law, medicine and computer science) and one had just completed secondary school. Two of those who had come to Pakistan most recently spoke openly and passionately about the experiences that led to their displacement; they recounted how speaking out about women's rights had led to them and their families being threatened by the Taliban, and their desire for support and compassion in their host country. Sadly, this wish was not fulfilled for these participants; instead, they experienced discrimination:

> *"I went to the hospital with a friend on my first day here. We spoke Farsi, and the guy noticed us not being Pakistani, so he charged us more... When you look for a house to rent initially, the owner doesn't want to rent his house to refugees, and then he asks for double the price. We need support, but we get the opposite".* (PK1-H)

Participants also reported education-related barriers upon arriving in Pakistan. Two participants (PK1-E, G) spoke in detail about how policy-related documentation requirements, for instance to access the internet, posed a major challenge to refugees seeking to access higher education. One was fearful and uncertain about her future given that her visa was about to expire, and she did not possess any other documentation needed by her education institution. Another reported a general lack of advocacy for female education:

> *"Are we unlucky because we are born Afghan women, or is it the world ignoring us because we are Afghan? Nobody thinks about the benefits [our] education can provide to boost the economy. We hear empty words from organisations and activists, but don't see action".* (PK1-G)

Despite these obstacles, two participants (PK1-E, G) reported that they were now studying at universities in Pakistan, with one having received a scholarship (although she shared that the amount she received did not completely cover all her needs). Participants reported dreams of becoming doctors, lawyers, and policy-makers.

5.1.2. Pakistan (Males)

All participants had been born and raised in Pakistan, though one (PK2-F) had returned to Afghanistan, where he completed his final two years of secondary education before returning again to Pakistan. One participant (PK2-A) highlighted that his family had left Afghanistan before he was born for security reasons.

Participants expressed a number of educational and professional goals. Two are medical students, one noted being "on track to achieve my goal of becoming a professional doctor" (PK2-A). Three are IT developers, all of whom had aspired to continue to higher education (one to be a doctor, specifically) but had been unable to due to financial and documentation issues. One had been introduced to web development by a friend and another noted that, while he had been unable to study medicine as he initially intended, he was happy with his chosen profession as an app developer. The final participant had always aspired to become a 2-D and 3-D animator, and was currently studying to realise that goal.

5.1.3. Rwanda

All six participants were from Burundi, arriving in 2014 and 2015 due to increased political instability in Burundi at that time. At the point at which they were forced to flee to Rwanda, two (RW-B, C) were at different stages of their undergraduate degrees (studying law and medicine), while one (RW-A) had just graduated with a science degree. The remaining three (RW-D, E, F) were in different grades of secondary school.

Educational and employment goals varied across the group, and many of the group's original goals had changed in light of challenges post-displacement. Upon arriving in Rwanda, one participant wanted to study journalism, another medicine, another to finish their law degree, and another to study for a master's in mathematics.

The main barrier to continuing their education journeys was financial issues. Four reported having to change their plans because they had been unable to secure a scholarship for their chosen pathway. However, all participants had found different ways of continuing their education. One aspiring journalist had instead started working in a library after taking a MOOC in Library Management. Of those who had been undergraduates when they were displaced, one had aspired to become a lawyer, but had since started studying Business Management remotely with the help of a scholarship. The medical student had been granted a scholarship to enable them to complete their studies in Rwanda. The participant who had graduated before leaving Burundi managed to secure a scholarship to study for a master's in mathematics and is now working in telecommunications. Finally, one participant who had left Burundi during secondary school had secured a scholarship to help them complete their secondary education, and another, an aspiring doctor, had ended up studying Healthcare Management.

Five of the six participants emphasised that their primary focus post-displacement had been to continue their education. The remaining participant explained that they had been focused on being "able to satisfy my basic needs" (RW-A) and had therefore put their education aspirations to one side to look for a job instead.

5.2. Refugee Participants' Experiences of EdTech

This section provides details of the EdTech products with which participants had the most familiarity, followed by reports and analyses of the positive interactions and barriers experienced when engaging with these products. Findings are analysed using the dimensions of human injustices framework (see Figure 1). Further, we draw links, where relevant, between the findings and the general and decolonial literature relating to refugees and EdTech.

5.2.1. Focus Products and Reasons for Engaging with Them

During FGDs, participants were asked to focus on one EdTech product that they had found particularly memorable, either for positive or negative reasons. Chosen EdTech products varied according to context. Female participants in Pakistan mentioned using general websites (such as Google, YouTube and Wikipedia) most frequently, while Rwanda-based participants chose to focus primarily on their experiences of using MOOCs—specifically, MOOCs offered through Coursera for Refugees. Some also focused on an integrated study platform that they had used at university (Canvas) and one participant chose to talk about a platform specifically for accounting students. Similar to the latter example, male Pakistan-based participants chose to talk about online courses or platforms that provided instruction related to a specific discipline: these included a coding course, an animation course, a web development course, and a platform providing academic support for medical students.

Those participants who chose to specify reasons for engaging with EdTech gave rationales that fell into two key categories: to gain professional skills (often while waiting for other opportunities and support to materialise, such as scholarships RW-C, D, E, F), and to obtain certificates with which to apply for jobs (RW-B, E, C; PK1-A, D). One female participant in Pakistan also pointed out that she engaged with YouTube tutorials primarily due to being unable to afford paid courses.

5.2.2. Positive Interactions with EdTech

Participants across all FGDs reported significant benefits to using their chosen EdTech products to continue their education. A theme emerging from the male Pakistan-based group and the Rwanda-based group was the belief that online courses had had a notable impact on participants' ability to achieve their goals within formal education. Three participants in Rwanda and two in Pakistan reported that accessing support from online courses had helped them to pass university exams. Participants across the same two groups emphasised their belief that online courses were effective for developing a range of professional skills, including language skills (RW-D), writing skills (RW-C, D), web development skills (PK2-E) and animation skills (PK2-F). One female participant in Pakistan also noted that browsing the internet had enabled her to develop analytical skills, and to become more aware about global affairs (PK1-A). In Rwanda, skill and knowledge development through online courses (in this case, MOOCs through Coursera for Refugees) were directly linked with securing employment: "I learned a library management course which allowed me to get the job I am currently doing" (RW-D); "[Coursera] enabled me to quickly earn certificates that I used to get a job that I now have" (RW-A).

The supportive factors for such positive interactions with EdTech included: (a) clear purpose of skills development for better life opportunities, (b) contextualised content, (c) language support, (d) illustrative visuals, (e) facilitated interactive elements, (f) expertise of presenters, (g) clear, easy to navigate delivery style, (h) self-paced options, and finally, (i) being free of charge. Below, we offer more details on each of these elements.

Some participants in Rwanda focused their comments on positive experiences of MOOCs that took their context into account. One participant (RW-B) explained that taking MOOCs that used examples from similar contexts to those that he had used in Burundi made the courses feel accessible. Another explained the importance of the accountancy training platform that he used being based on the Rwandan accounting system:

> *"[E]verything was designed taking into account local accounting context. The examples given in the documents and videos were all Rwandese case studies, which allowed me to easily understand the content of the modules. . . it could allow me to integrate myself in the Rwandese accounting industry".* (RW-F)

Relatedly, one participant in Rwanda noted that the variety of different MOOCs available through Coursera for Refugees enabled "people from different cultural and educational backgrounds to easily learn" (RW-D), suggesting that offering diverse courses based in a wide range of different contexts (i.e., not just those in the Global North) may make learning feel more accessible to refugees with varying backgrounds and educational priorities.

Where it was not possible to find resources in the participants' languages of choice, language support was identified as an important feature that facilitated EdTech access for refugees. Subtitling was identified by participants in both the Rwanda-based group (RW-D, C, A) and the female Pakistan-based group (PK1-A, F) as the most helpful means of ensuring their access to online and course content in other languages. One female participant in Pakistan noted that, in addition to captions, highly visual content was particularly useful in helping to overcome language barriers, as well as support from those around her:

> *"Ted Ed is in English, but it provides visuals which can make viewers understand a little, and seeing the captions and having the support of a family member and friend can help".* (PK1-F)

Interaction was rated as an effective component within successful EdTech offerings. Participants from the male Pakistan-based group and the Rwanda-based group highlighted the importance of including an interactive, facilitated element, which enabled participants to receive more tailored learning experiences through being able to ask questions (PK2-D; RW-B, D). In addition, one of the Rwanda-based participants highlighted that the discussion forum component of some MOOCs was helpful for developing cultural awareness through comparing ideas with course peers (RW-D). In contrast, much was made in the male Pakistan-based group of the idea that courses or tutorials that they had experienced had

been effective because they had been delivered by field experts, with four group members citing this factor (PK2-D, A, B, F). These participants also cited a preference for pre-recorded lecture content, reflecting the linear, hierarchical teaching style that typifies the Pakistani education system [1,92].

Other features of EdTech products commonly valued by participants included: content being well-organised and easy to navigate (RW-F, E; PK2-A, B, E); facilitators of pre-recorded lectures having an appropriate pace and clear delivery style (PK2-A, E, F); courses being self-paced (RW-A, C, F); and content being free to access (RW-D, C; PK1-H, B; PK2-F).

5.2.3. Barriers to EdTech Use

While participants reported myriad ways in which EdTech products had enabled them to continue learning, they also indicated a number of barriers that prevented them from taking full advantage of these products.

Using the dimensions of human injustices framework outlined in this paper as the analytical framework, we find that material injustices were represented by lack of infrastructure access and commodification of products. Political and geopolitical injustices were represented; again, by the commercialization of such education services, the power dynamics played by the field of technology and the fear of doubling down on their marginalisation as refugees when not mastering such tools, as well as the lack of access to documentation, rights and consequently, several other restrictions on financial services. While Cultural–epistemic injustices were represented by a general feeling of alienation from the whole experience, and that such products are not designed for refugees in the first place, using Western-centric content, pedagogies and language. Below, we offer more details on each of these experiences.

Numerous references were made to struggling to access EdTech products due to a lack of infrastructure and resources. Several members of the Rwanda-based group and the male Pakistan-based group reported not having access to an appropriate device for learning. As one Rwanda-based participant explained,

> *"I also had challenges at the beginning of my refugee life, because I had no laptop, and I had to use the phone to learn. My phone could not allow scripts, and I was hardly able to understand everything".* (RW-A)

Another material barrier identified by participants from all three groups (RW-F; PK1-A, C, D; PK2-C), was the issue of paywalls, with these participants noting that courses with fees attached would certainly prevent refugees lacking financial means from accessing the educational experience and opportunities promised by some EdTech products. This awareness of the commodification of education was summarised by one female participant in Pakistan: "[h]ere education is a commodity, not a right. You need to pay with your kidneys to learn" (PK1-C). It is also telling that one male participant in Pakistan said "expensive" when asked to name a word that he associated with the word 'education'".

Elsewhere, members of the female Pakistan-based group reflected on how restrictions imposed on refugees in Pakistan resulted in them continuing to be excluded from the benefits of EdTech products. This took two forms; firstly, one participant explained that, even if they have enough money, Afghan refugees' lack of access to payment methods make them unable to access paid EdTech products:

> *"Refugees do not have access to paid websites. . . We are not provided with cards from the bank, and we cannot use e-services. We are provided with cheque books only, not even ATM [access] often. So we can't use these learning resources even if we want to".* (PK1-A)

Secondly, another participant noted that some free EdTech resources developed in Pakistan, such as digiskills.pk, require users to have a computerised national identity card (CNIC), which Afghan refugees cannot apply for. Refugees are therefore unable to access such resources unless they can convince a Pakistani national to give them access to their CNIC.

Indeed, a significant finding from both contexts, and all three groups, is a sense from participants that EdTech products that they have experienced were not designed with refugees in mind, or even to include refugees among other user categories. All members of the male Pakistan-based group and one Rwanda-based participant (RW-B) agreed that none of the products that they had used had been designed for refugees specifically (though two felt that the courses that they had followed had been designed for general ease of access—PK2-C, F). Two female Pakistan-based participants noted their belief that EdTech aimed at refugees did not exist anywhere. The exception to this was Coursera for Refugees, which one Rwanda-based participant identified as having been "designed for emergency learning for refugees to learn quick and useful skills for academic and professional purposes" (RW-C).

Not only were products not felt to target refugees, but participants noted the Western-centrism of EdTech offerings. One Rwanda-based participant describe their discomfort when studying MOOCs that were made by British and American universities, both in terms of the content and the pedagogy used:

> *"[T]he courses were from American or British universities, and it was hard for me to feel comfortable with the programme in its essence due to my familiarity with Burundian education system mostly based on memorisation. I remember having failed in many quizzes at the beginning because I could not [understand] what I had watched in the videos... The context (examples given in the videos) was not familiar to me, and this was also a challenge".* (RW-C)

Similarly, another Rwanda-based participant noted that course examples were dictated by the university that created the MOOC, making them less applicable to refugee contexts: "some business courses are hard to understand, because the scenarios are more related to the location of the university (RW-B).

Rather than rejecting such offerings, however, several participants' comments suggest that many are prepared to buy into these 'universal' products and ways of learning. When asked for words that they associated with the word 'technology', several male participants in Pakistan chose words associated with power and forward motion: "advancement"; "future"; and "ease of work". Crucially, participants from all groups referred to a perceived need to adapt themselves to the products available, regardless of the additional challenges they faced to do so:

> *"Although the course was not tailored for refugees, we made sure to tailor ourselves and our capabilities to learn from it".* (PK2-E)

> *"I think I have to conform to the context... The other students may be familiar with the whole content, and to be able to get that degree, I have to make efforts and find ways of fitting into the context".* (RW-B)

> *"I am not very fond of tech, but now I am getting used to it because it is an essential part of learning today".* (PK1-D)

A final but related barrier identified by participants in all groups (RW-D, A; PK1-E, B, C, F; PK2-C, F) was that of language. While some participants noted that subtitling functions were helpful in overcoming this barrier, this was not the case for all. Female participants in Pakistan focused on the dominance of English as the language most commonly used within EdTech content; one participant identified English as a "universal language", but also noted that trying to access resources in an unfamiliar language added to the strain of being a refugee: "The tech can be helpful but not entirely if you are displaced and unfamiliar with the languages" (PK1-B).

5.3. EdTech Product Design Ideas

Based on their own experiences of EdTech products and their perceptions of what others in their communities might find most helpful, participants made several design suggestions for future EdTech products aimed at enabling refugees to continue their education post-displacement. These ideas are presented below and cover the following considerations: what primary goals should the EdTech product have; what format should it take; by whom should products be designed; what content should be covered; and how should EdTech content be delivered.

5.3.1. What Should Be the Goal of Learning through EdTech?

The most common purpose of education for participants and their communities was employment. Participants across the three groups (RW-F, D, A; PK1-D, C; PK2-B, C) suggested a common belief that education leads to increased skills, which leads to employment, which leads to financial security: arguably the ultimate goal. Accordingly, a key priority for participants, particularly in Rwanda, was that EdTech offerings culminated in some form of tangible accreditation or certificate that could be directly used to gain employment (RW-F, B, D). This idea of placing importance on accreditation was reflected in the fact that, when asked to recall positive educational memories, several Rwanda-based participants chose to speak about formal education milestones and successes, such as passing exams or being accepted to a university.

Conversely, participants in Pakistan appeared to view education in terms of its wider potential. Participants in both male and female Pakistan-based groups used broad conceptual nouns when asked to name words that they associated with 'education'. Three major sub-themes emerged: ideas around helping others ("compassion"; "support for humanity"; and "respect"); ideas around helping oneself ("independence"; "opportunity"; and "self-improvement"); and ideas around hopefulness ("prosperous future"; "development"; and "hope for a better life").

Another purpose of education for refugees identified by participants was community integration (RW-F, C; PK1-C). This emphasis on increasing employability, alongside using education for community integration, are succinctly combined in a comment from one Rwanda-based participant:

> *"Refugee youth need to gain skills that can help them to be competitive in the job market. I think every EdTech product should take into account building theoretical content that is relevant to the current demands, and enabling refugee youth to know the realities of their host community; which can facilitate their full integration".* (RW-F)

5.3.2. What Format Should EdTech Products Take?

Unsurprisingly, given the types of EdTech products that participants were familiar with, participants that commented on their ideal EdTech product format all suggested some form of learning platform. Within this, content format suggestions varied from recorded video lectures similar to those that they had found effective (PK2-A, B, F, E) to interactive courses (RW-A, C, D, E; PK2-F).

In terms of overall format, all three groups' participants debated the pros and cons of apps and websites accessed through computer browsers. Proponents of the app format noted that an app would be more appropriate given that many refugees lack laptops (RW-F; PK1-G, B) and suggested that apps are also easier to navigate and quicker to access than webpages (PK1-A, H, B; PK2-E). One female participant (PK1-B) also noted that app notifications were helpful as study reminders. Conversely, those in favour of a browser-based offering felt that webpages were easier and clearer to learn from (RW-F, C; PK2-D, C; PK1-F). Given these arguments, several Rwanda-based participants (RW-B, F, E, D, A) and one male participant in Pakistan (PK2-D) concluded that it would be best for learning content to be available both through an app and a website.

5.3.3. Who Should Design EdTech for Refugees?

Prior to this research, the vast majority of participants had never been consulted about how EdTech could best be designed to meet their needs. On being asked whether she would be interested in participating in the design of an EdTech product, one female Pakistan-based participant's reply conveys something of the novelty of this idea: "You are the first to ask this question, and I wonder if they [EdTech product designers] have ever thought of designing an online learning platform for refugees until now" (PK1-E). Despite not having been asked, almost all participants in all groups expressed an interest in being involved in design, though the extent of this involvement, and that of others in their community, differed from group to group.

Participants from the female Pakistan-based group were strongly in favour of refugees themselves playing an active part in the design of EdTech products:

"These people think they are experts and don't value our voices and opinions, resulting in failed schemes. We need to play a role in decision-making processes because it will contribute to developing the refugee community". (PK1-E)

Participants from the male Pakistan-based group also indicated that refugees themselves should be involved in EdTech design, with one noting that refugees "can better address their community needs" (PK2-D). However, several group members also indicated that field expertise was equally important; they then combined these priorities to suggest that refugee professionals should play a leading role in developing EdTech content (PK2-D, E, A, B).

Interestingly, while members of this group were eager for refugees to lead on content, they were quick to defer to other actors when it came to technical design (PK2-C, D, E). Again, the issue of expertise was an important concern for these participants, as illustrated by one comment that "the product should be designed by expert professionals, whether local or foreign, and they should be making the decisions" (PK2-D). Another participant took a slightly different view that Afghan refugees should take the lead on design, but that they should do so "with support from expert foreigners" (PK2-F). One Rwanda-based participant shared similar sentiments, noting that "regardless of the origin of the new EdTech product or existing one, it can be useful for refugee education if it is well-organised" (RW-E).

In contrast to comments from the Pakistan-based groups proposing a central role for refugees in EdTech design, participants in Rwanda proposed a more tentative approach. Two participants in this group (RW-A, D) suggested that refugees should be brought in at the user testing stage, but not before, suggesting that they doubt whether refugee actors are capable of taking a more decision-making role. Furthermore, and in relation to the suggestion that online courses were the best form of EdTech to focus on for refugees, five of the six participants in Rwanda (RW-A, C, D, E, F), along with two in Pakistan (PK1-A; PK2-C) indicated that local universities and refugee organisations such as UNHCR should play a key decision-making role in EdTech design. One participant explained that such collaborations would ensure that access was made "easy for the refugee learners" and that courses were "relevant to the needs of the refugees residing in Rwanda" (RW-A).

5.3.4. What Content Should Be Covered?

Given participants' aforementioned prioritisation of employability as a core objective of their learning, several group members (RW-F; PK1-D; PK2-A, D) noted the importance of EdTech products developing practical skills that could be used for employment purposes. One female participant noted the benefits for women in particular:

"I think training programs to make them stand on their own feet instead of asking for support, especially for women: beautician courses and cooking courses, baking cakes, designing, these all are a great idea to help them [women] build their lives and contribute to the host community in general". (PK1-D)

Other skills that were suggested as high priority areas in Pakistan were digital skills (PK1-G, C, E; PK2-B, D, E) and host-country language skills (PK1-H, G, C, E; PK2-A, B, E). In addition, one male participant suggested that English language skills should also be a content focus as a bridge to further study:

> *"Learning and understanding English will provide access to a wealth of content online, making it easier to learn and understand other subjects".* (PK2-C)

While not suggesting that language learning should be the focus of courses, several other participants (RW-C; PK1-A; PK2-ALL) emphasised the importance of making content available in multiple languages, with three in Rwanda (RW-D, C, B) specifically recommending the use of subtitles for access to a wider variety of content.

A common preference across all groups was that EdTech content should be conversant with secondary or tertiary curricula of the host country (RW-A, C, B; PK2-A, B), and that this content should be grouped by age and educational level (RW-F, B; PK1-D; PK2-A). Other participants agreed that content should be organised in terms of the subject studied at different levels, and that a wide variety should be available to suit individual interests (RW-A, C, E; PK1-A, H).

Educational content that directly addresses refugees' needs was proposed by two participants in Rwanda (RW-B, D) and one female participant in Pakistan (PK1-A). For RW-B, this meant providing content aimed at helping refugees to integrate into the host community, echoing previous comments that this was a priority for refugee education in general. For PK1-A, addressing refugees' needs meant having EdTech content that focuses on addressing the challenges experienced by Afghan refugees in Pakistan, including how to deal with experiences of discrimination and trauma:

> *"Initially, we need to teach the refugee community about its value, teaching them to stand up for themselves and how to cope with discrimination and feeling of isolation. We need to target areas that will provide them with support for the trauma they have been through and the sense of isolation they experience. Inclusion can only begin by teaching refugees ways to include themselves".* (PK1-A)

For this participant, educational provision of this nature should be prioritised as it would tackle refugees' most immediate needs, a logic that was supported by one of the newer arrivals from Afghanistan within the group (PK1-H). Both participants felt that this initial support could also act as preparation for other educational content, such as subject-specific, curriculum-aligned content.

In Rwanda, several points were made around the contextualisation of EdTech content, not just for refugee communities, but in terms of their geographical locations. Two participants (RW-F, A) stated the importance of content being relevant to their immediate contexts, with one noting that MOOCs rarely originate in countries in the Global South:

> *"[T]he content of that EdTech product should be adapted to the local programmes, because it is obvious that Coursera does not include programmes from the many African universities. I am not even sure if the African universities have their programmes on Coursera".* (RW-A)

Conversely, two other participants (RW-D, E) took the view that EdTech content should be deliberately made less 'local' as they perceived that being exposed to more international content would better prepare them for the demands of the job market (the group's main priority for education):

> *"I think it should not only focus on the local programme… We are now in a global education… We have foreign companies here which need people with global skills".* (RW-D)

5.3.5. How Should EdTech Learning Be Delivered?

Participants chose to focus on online courses, whereby ensuring that refugees can study at times that are convenient to them was a key concern for three participants in Rwanda, who were in favour of a self-paced delivery format. Though one participant in the male Pakistan-based group (PK2-F) expressed a preference for a live teaching component, no other participants in either Pakistan-based group distinguished between synchronous and asynchronous delivery. Instead, they focused on who should teach or facilitate the online courses.

Both Pakistan-based groups supported the idea of refugee community members delivering online courses, with three members of the female group (two of whom were new arrivals—PK1-E, F) noting the value of these facilitators being long-term Afghan refugees:

"Our Afghan refugee community who have been here in Pakistan can provide great knowledge and skills to other refugees. They are talented and understand the refugee situation". (PK1-E)

Another female group member (PK1-C) added that refugee facilitators should be trained by UNHCR, with PK1-F also noting that this strategy could serve to boost refugee employment.

Finally, and echoing the emphasis on expertise highlighted in relation to who should design EdTech products, four Pakistan-based participants (PK1-A, D; PK2-A, B) noted the importance of recruiting "skilled professionals" to deliver courses (PK1-D). The two male participants added that these should ideally be professionals from within the refugee community.

6. Discussion

In this section, we apply a decolonial lens and the dimensions of human injustices framework [6] to the findings to identify the range of positive interactions, injustices and paradoxes of refugees' experiences with EdTech.

Refugee views on what makes good EdTech are diverse, emphasising the point that there is no 'one size fits all' when it comes to designing EdTech for and with refugees. However, there was strong consensus that technology is central to enabling the participating refugees to achieve their educational goals, and subsequently their core goals of securing employment and integrating within their host communities. Refugees reported numerous positive examples of ways in which existing EdTech products, predominantly online courses and platforms, have enabled them to achieve their educational and employment goals, whether by expanding their knowledge, building professional skills, or providing them with tangible credentials with which to enter the job market. Indeed, they appear to view technology as crucial to accessing prosperity; as one female participant in Pakistan reminded us, "Tech is central".

Despite the positive examples of EdTech use provided, participants reported several barriers that continue to hamper their progress towards achieving their goals, many of which stem from the cultural, material and (geo)political injustices to which they are subjected as refugees. We begin to see that, for refugees, injustices are in fact multi-layered. These multi-layered injustices underscore the importance of going beyond an EdTech "arms race" that prioritises the commercialisation of education provision in humanitarian responses.

On the material front, and in light of their personal and communal experiences and priorities, refugee participants agree that EdTech products should be delivered in a language and format that is appropriate and accessible in the context. The previous was not always the case according to participant testimonies, with reports of limited device access, paywalls and language barriers common among participant responses. Generally, FGDs included significant discussion of MOOCs by participants, particularly in the Rwandan context. Given this paper is framed Adam's decolonial critique of MOOCs [6], we acknowledge the number of issues related to the design and implementation of MOOCs, especially for

refugees, such as the predominance of mobile technologies among refugees, often with smaller screens not conducive to effective engagement in MOOC content.

On the cultural–epistemic front, some participants report alienation due to accessing courses that they do not feel reflect their cultures, epistemologies, or practical needs, reflecting Western assumptions that Western contexts and methods are 'universal', i.e., familiar and applicable in all contexts [6]. Such products are therefore perpetuators of cultural and material injustices articulated in the dimensions of human injustices framework. They have no doubt become so at least partially due to a pronounced lack of effort to design products that meet refugees' needs specifically, and a lack of consultation with refugees—despite their enthusiasm to be involved—around where, how and by whom these products should be developed.

Conversely, while some participants feel that the content available through EdTech products needs to be appropriate to refugees' host country contexts, many recognise a need for EdTech content to be directly conversant either with host-country education curricula, or focused on the development of professional skills, including language skills that will help them to integrate into their host communities.

Several voices also articulate a perceived need to adapt themselves—from the language they use to the pedagogies and content examples they experience—to fit into, or become comfortable with, Western educational paradigms. This need is based on the provenance of the EdTech they use and, crucially, the demands of a Western job market. Through our decolonial lens, this tendency may be understood as a way in which EdTech products reinforce the intersectional oppression experienced by refugees on two levels: a need to deprioritise their own cultures and preferences for the benefit of a host community, and also a need to adapt to the demands of Western ways of thinking, being and learning that characterise most EdTech design.

On the political and geopolitical fronts, the example of refugees being unable to access EdTech due to not possessing a national identity card is particularly striking. Thus, not only are resources being designed with no intention of including refugees, but deliberate attempts are made to prevent refugees benefiting from resources that stand to enrich and improve their education chances.

Moreover, refugees reported a feeling of dependency on technology, a need for it to get ahead, and a fear of missing out. This strikes us as problematic, especially given the vulnerability of the group in question. It is important to bear in mind that messaging around the indispensability of tech is rooted in the techno-capitalist agenda that prioritises tech company profit over the wellbeing and prosperity of consumers [16]. This becomes even more problematic in the refugee context; forcing those with compromised access to technology to feel that they are helpless without it, arguably constituting a key example of intersectional injustice and digital oppression.

While some participants feel strongly that refugees themselves ought to be at the centre of decision-making processes during EdTech design, others appear ready to entrust this power to other agencies: some familiar to them (UNHCR; national NGOs) and others further away (EdTech developers in other countries). It is possible, especially given some comments from the male group in Pakistan, that some do not believe that their own communities possess the knowledge and skills to design their own products. This could be a case of internalised oppression [92] and a sign that colonialism has succeeded in making the colonised themselves believe that they are inferior. It is also possible that some refugees have never questioned the power structures in which they are entangled (another key goal of colonial education: to reduce the extent to which the oppressed are able to question the power structures that bind them) [15]. Alternatively, refugees may be aware, but may have simply accepted, that decision-making power usually lies outside their communities. Either way, this serves as an important example of geopolitical oppression that disempowers refugees and reduces the control they have over their own futures.

As general comments, we offer two concluding thoughts:

On one hand, these findings force us as a research team to face a challenging paradox: decolonial thought posits that placing trust in the tech developers of the West simply perpetuates the role of these developers as producers and decision-makers which, by extension, and given the dominance of tech in all aspects of life today, forces our refugee participants and their communities to remain in the role of dependent consumers. Yet, following this argument carries the temptation to dismiss the perspectives of the refugees we interacted with, some of whom appeared perfectly accepting of this status quo—voices that we, by writing this paper, are seeking to amplify and lend agency.

On the other hand, by reviewing the broader literature, and especially taking into account direct representation of refugee voices and possibilities beyond an instrumentalist functional positionality around EdTech as outlined earlier, Meyer et al. [93] offer portraits of refugee narratives growing up in the Dadaab refugee camp in Kenya. Like our research team, the writers of this paper are all refugees themselves based in a Global South context. In their recommendations, Meyer et al. call for a rethink of curriculum theory for refugee education to consider accounting for "pedagogical possibilities commensurate with: the exigency of time in long-term displacement situations; the implications of crossing physical, social, and cultural borders; the losses endured by marginalised communities; and the problematics of adaptation in lieu of choice in the daily life of displaced people" [93] (p. 1).

Meyer et al. [93] call for an education that serves refugees to critically participate rather than adapt and conform, to view their lives through a "critical consideration of reality, not as marginals living outside society", but as agents who can transform it. They assert that students are more inclined to fatalistically accept and conform when there is no critical examination of such a reality, seeing it as a "closed world" rather than a result of the historic and sociological power dynamics that led to its formation. Furthermore, they call for an education that prepares refugees for a return home, rather than being in an accepted endless state of emergency and forgetfulness. In a similar vein, Dovigo [28] concludes his work on Decolonising Refugee Students Higher Education, calling for a goal of "promoting memory as a critical remembrance process for self-healing, understanding, to build a narrative around self and community that can be alternatively disseminated", to counter political, geopolitical and epistemic injustices.

If anything, this all serves to highlight the complexities and heterogeneity of the refugee experience which cannot just be "solved" or "fixed" through one universal, designed for scale, EdTech product.

7. Conclusions and Future Directions

In light of the decolonial commentary and analysis of primary data presented above, we propose the following design principles for those seeking to develop EdTech for refugees using a decolonial, justice-centred approach:

1. Prioritise designing diverse EdTech products for and with refugees. Refugees are not a homogenous group. Many refugees report that EdTech access is important for their educational success and future prosperity. However, there are very few EdTech offerings that design specifically with and for refugee communities. Rather than aiming for maximum reach and universality, funders and designers should consider focusing their efforts on designing for particular refugee groups, which will involve careful research within different refugee groups' contexts, needs, and priorities. Additionally, in order to avoid disruption to learning progression, the sustainability of products should be considered from the outset.
2. Actively seek refugee involvement and relational accountability in EdTech design. Although the vast majority of participants noted they would be eager to be involved, none report contribution to the design and/or development of EdTech products (though we acknowledge the small sample). They also report that their communities involve people with different professional skills and expertise (though the breadth of educational experiences and attainment among our participants, we argue, should

not be discounted) who can be employed for both consultation on design and facilitation/presentation of the educational content. Doing so will ensure that products are not only contextually relevant, but genuinely empowering for the refugees that use them. It also acknowledges that design is a process of mutual accountability, learning and unlearning rather than a technical fix or end product [28]. The level of this involvement should also be decided by refugees themselves; some may wish to offer their perspectives only, while others may wish to assume a more decision-making role. Fair compensations should be offered for such consultations, commensurate with the time and effort spent.

3. Design for maximum adaptability. Given the diverse needs and preferences of participating refugees, a sensible way forward for refugee EdTech design may be to focus efforts on designing products with high potential for adaptability. Rather than using such tools to distribute 'universal' content, models that provide a 'shell' within which content can be added and adapted by refugee actors for their own specific contexts may enable refugees to take greater ownership of, and a stronger decision-making role within, design processes for the EdTech products they use.

4. Design for holistic interventions. As outlined, the refugee situation is complex, it has political, cultural–epistemic and material facets to it. A holistic intervention would first ensure that multiple stakeholders from across these multiple facets are part of the design process, i.e., that design is in conversation with policy and community. Second, holistic interventions would prioritise both survival skills, host-community integration, social and legal protection from exploitation as well as cultural affirmation and empowering refugees to build a communal narrative of being active agents, critically conscious of their realities and the forces producing it, rather than conforming subjects to the status quo.

5. Raise awareness of power dynamics in parallel with design. Given the apparent lack of awareness of the sources of oppression that refugee participants experience, an important next step could be to increase efforts to engage with refugees about the reasons (and actors) behind their alienating experiences, in order to better equip them to identify and critically analyse the injustices they face [15] and reassert themselves within structures from which they continue to be excluded. How and by whom this is done should be the subject of further discussion.

6. Educate designers into the historical context of refugees and the multiple dimensions of injustice. This starts by acknowledging epistemic limitations of designers and their experiences and the need to understand the complex political, historical, linguistic and psychological realities of the particular refugee group they are designing for. This would avoid reproducing systematic disempowerment. Scaife et al. [40] encourage "shaping the design at different points; for example, at the beginning to help problematize the domain, in the middle to test out and reflect on cognitive and design assumptions and biases, and at the end to evaluate prototypes in real-world contexts" (p. 350).

7. Assess harm and accountability when it comes to data collection and ethics. Krishnan [55] developed a "Humanitarian Tech Ethics Assessment Considerations" framework (p. 8) to be applied in humanitarian settings to assess "plausible, possible and probable future harm", taking into account decolonial principles. Such a framework can be a guide to designers, organisations and governments towards more transparency and accountability during data collection and usage in refugee education contexts. Indeed, the framework could be a helpful guide for the participating refugees themselves to understand possible risks and mitigations.

8. Prioritise environmental sustainability when designing both hardware and software. Open systems that can be tinkered with and repaired have more scope to be used in the long-term. This is particularly important for refugees who may not have significant savings or disposable income to buy new technology, but they may well have the means to repair what they already have, and importantly will know how to use existing tools.

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