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## Article

# Towards an Inclusive Disaster Education: The State of Online Disaster Education from the Learner's Perspective

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**Abstract:** Disaster Risk Reduction (DRR) education endorses educational initiatives that advocate for reducing existing disaster risks. The COVID-19 pandemic challenged the social order around the world, including the education sector. The rise of the pandemic paved the way to significantly convert the education sector towards online/distant learning via digital platforms. Online distance learning was a challenging emergency shift for many who had to change their teaching and learning strategies. This study is an investigation of the significant challenges associated with online learning in DRR education. The objectives of the study were to consider the online learning strategies used in formal DRR education at the tertiary level and to identify the associated challenges faced by the learners. This study presents the findings of an online survey conducted as part of a research collaboration titled INCLUSIVE Disaster Education (INCLUDE). INCLUDE is a collaborative research project co-funded by the EU Erasmus+ program aimed to reimagine online distance learning education. The survey was conducted in the country contexts of the research partners, which include Lithuania, Japan, Sweden, and the UK, with DRR learners who are engaged in online learning. The findings suggest that Learning Management Systems, synchronous learning, and flipped classrooms are the dominant learning strategies that engage learners. The findings further suggest that challenges in online DRR education lie in inadequate ICT infrastructure and digital literacy, health-related disturbances, and professional and personal commitments that lead into learning discontinuity. Hence, the study concludes that in order to enhance the inclusivity of online DRR education, the overall social and vulnerability contexts of the learners should be considered.

**Keywords:** disaster education; inclusivity; online distance learning



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## 1. Introduction

Disaster events are significant phenomena in the contemporary world that affect the living fabric of the people around the world. During the two decades between 2009 and 2019, it was recorded that 7348 disaster events took place, affecting 1.2 million people around the world [1]. With this growing significance of disaster impacts, a discourse has been created on the key role played by the education in the field of disaster [2,3]. In the early stage of the 2000s, the research interest grew to investigate the challenges in continuing children's education amidst natural, as well as manmade, disasters [4]. However, it has been recognized that disaster pedagogy is one of the least studied aspects in the fields

of education and disaster [5,6]. This is one of the main gaps this study tries to bridge by investigating the existing learning strategies available in disaster education in the contemporary world, especially post a global pandemic.

The standard classification categorizes education into formal education (education that takes place in institutional settings with intentional planning by public and private organizations), non-formal education (education that takes place in institutional settings with intentional planning by an education provider to assure equal access to education), and informal education (education that is not institutionalized or not with proper structure but intentional) [7]. Disaster education has been conceptualized as education on disaster risk, disaster prevention, and Disaster Risk Reduction (DRR) [3]. Furthermore, there are studies that consider disaster education to be emergency education [2]. The conceptualization of disaster education has been categorized into three categories based on which a definition of disaster education could be developed: (1) based on if the education is conducted on a regular or irregular basis; (2) based on if the mode of education is formal, non-formal, or informal; and (3) developing the sub-discipline of disaster education under the main subject area of education [8]. It has further been discussed that disaster education is incorporated in the five dimensions of knowledge (the understanding of students on disaster contents), action (motivating students to be driven in terms of disaster mitigation initiatives), participation (practical participation of students in the community-based fieldwork), response (responding to emergency situation and post disaster events), and integration (the structural element of disaster education) [9].

Initial attention towards disaster education was made in the disaster governance level in 1994 when the “Yokohama Strategy and Plan of Action for a Safer World: Guidelines for Natural Disaster Prevention, Preparedness and Mitigation and its Plan of Action” (Yokohama Strategy) was adopted [2]. Knowledge management and education was one of the key challenges recognized in the framework in terms of the prevailing context of DRR [10]. Its importance had been emphasized under the thematic orientations of information management and exchange, education and training, research, and public awareness [10]. Furthermore, Chapter 36 of the Agenda 21 recognizes education as a driving force in handling matters related to environment and sustainable development [11].

In 2005, efforts by the Yokohama Strategy were taken further with priority 3 of the Hyogo Framework for Action (Hyogo Framework) which emphasizes the role of knowledge, innovation, and education [12]. Following this, there have been several campaigns launched, such as Disaster Reduction, Education and Youth (2000, 2006–2007) and Disaster Risk Reduction Begins at School (2006–2007) by the United Nations International Strategy for Disaster Reduction (UN/ISDR) on the importance of integrating disaster aspects to education [13]. In 2015, with the adoption of the Sendai Framework for DRR 2015–2030 (Sendai Framework), education was considered a targeted basic service that should be protected and prevented from disaster damage [14]. It has further been pointed out that education is a vital cross-cutting theme among the priorities of the Sendai Framework that advocates for disaster risk, preparedness, disaster risk governance, and disaster reduction and resilience [3].

Due to the peculiar nature of disaster contexts, lifelong learning is a vital element in the disaster management sector [15]. To support lifelong learning, a number of online, distance learning opportunities have emerged in the field of DRR in the recent past [16]. The COVID-19 pandemic in 2020 is considered a turning point in the contemporary disaster discourse [17]. The pandemic impacted more than 60 million people, with over 1.4 million reported deaths [18]. It had an overall impact on primary, secondary, and tertiary-level education [19,20]. One of the major challenges faced by the education sector was the emergency shift towards online distance learning [21,22]. However, this sudden shift was not an easy task for developing and underdeveloped countries due to the lack of human resources and infrastructural facilities [23]. Online learning is recognized as a special methodology, and it has been reported that there has been resistance to it from both educators and learners due to the unfamiliarity and lack of skills [24].

Albrahim [25] claims that many related studies describe online learning using terminology such as e-learning, internet learning, virtual learning, web-based learning, web facilitated learning, computer-based learning, cyberlearning, distributed learning, resource-based learning, and distance learning. In this context, online learning can be defined as learning experiences that take place in synchronous or asynchronous environments with internet access, using different devices such as mobile phones, desktops, and laptops [26].

The COVID-19 pandemic made a significant contribution towards online and distance learning in the disaster education sector [27]. While the importance of the education sector in the field of disaster and lacuna of many research initiatives in this regard [5,28] have been acknowledged, this study is an investigation of the significant challenges associated with online distance learning in disaster education. Following the definition of Shaw et al. [3], in this study, disaster education is referred to as DRR education. Furthermore, out of the education categories of education [7], this study will cover the formal aspect of education mainly at the tertiary level, as the majority of previous studies covered the primary and secondary levels [19,29]. Hence, the objectives of the study were to consider the online learning strategies used in formal DRR education at the tertiary level and to identify the associated challenges faced by the learners.

This study is one of the major outputs of a long-term research initiative entitled INCLUDE (INCLUSIVE Disaster Education). INCLUDE is a collaborative research project co-funded by the EU Erasmus+ program. This two-year research initiative aims to reimagine online distance learning education so that it better supports the diverse DRR community. The project consortium consists of five higher-education institutions from Europe and Asia. This study is dedicated to the outputs of one of the project's objectives of conducting a survey of online, distance learning strategies used in DRR education, and their effectiveness in identifying their success factors and associated issues and problems.

The next section of this paper presents the methodology of this present study, following the findings as per its objectives.

## 2. Materials and Methods

To investigate the online learning strategies used in DRR education and to identify the associated challenges faced by the learners in the tertiary-level education, the research team utilized a survey method. The survey method systematically collects quantitative data from a relatively large sample selected out of a population regarding a topic that is related to the whole population [30]. In the context of the present study, as there are various online learning and teaching strategies that have emerged in the field of DRR education, specifically post-COVID-19, the survey method was decided to be the most suitable methodology to quantify and recognize online learning strategies and their associated challenges.

The study was specifically conducted in the country contexts of the research partners: Japan, Lithuania, United Kingdom, and Sweden. In addition, to gain insight into the Global South, the survey was also extended to Asia Pacific contexts: India, Sri Lanka, Bangladesh, Pakistan, Philippines, and Nepal. With increased access to the internet through various modes such as smartphones, it has been pointed out that the administration of surveys has become more convenient [31]. Therefore, the research team decided to conduct the survey in an online survey platform. As the questionnaire is considered to be the main data-collection technique of the survey [32], an online questionnaire was developed covering three aspects: background information, online/distance learning strategies used in DRR education, and key challenges for online and distance DRR education. As the development of questions in a survey holds a vital juncture in the survey method [31], the basic foundation for the questionnaire questions was developed based on the general literature on online teaching and learning strategies and associated challenges that have emerged in the field of education, specifically during the COVID-19 pandemic era. Following an extensive review of the literature on the aforementioned generic areas for online and distant education, the key findings were thematized to understand and evaluate their application in the DRR

education discipline. The survey was developed by addressing feedback from a project consortium, which consisted of 14 expert educators in the DRR field in 4 countries (United Kingdom, Sweden, Japan, and Lithuania). The expert feedback was collected in several rounds and conducted online, using an online survey tool. A major change following the feedback was to change the jargons/technical terms and pedagogical styles in a way that is understandable to a non-expert (student/learner) audience. The questions were developed mainly in the form of multiple-choice questions. The questionnaire was structured into four sections, as follows:

- Section 1. General information;
- Section 2. Online, distance learning strategies used in DRR education;
- Section 3. Barriers that hinder inclusivity and diversity in education;
- Section 4. Key challenges for online and distance DRR education.

Following the finalization of the survey tool, the research team gave a thought on the sampling technique that should be utilized in the data-collection process. The decision was made to adhere to a purposive sampling technique over a convenience sampling. The reason to adhere to the said sampling technique was the anticipation that each respondent would uniquely contribute towards the value of the project [33]. As the purposive sample requires defined criteria for the selection of the respondents [34], the sample selection was conducted in two main stages. The initial sample was selected from the partner institutions based on the reason that these institutions offer courses specifically dedicated to DRR and the fact that the focus of the study is mainly on the tertiary-level education. The initial target group was selected to include respondents that fulfil the following specific criteria:

1. Doctoral researchers conducting their research on DRR;
2. Undergraduate and postgraduate students following courses related to DRR;
3. Other researchers following programmes related to DRR.

In the second stage, the sample was extended beyond the initial institutions to the context of the inclusive digital disaster education at the tertiary level in the selected country contexts. This included digital disaster education offered through the following:

- Short-cycle programs;
- Undergraduate studies;
- Postgraduate studies;
- Doctoral studies.

Even though the said targeted respondents were approached through the relevant lecturers/professors who shared the questionnaire among their students, the sampling technique of this study differs from a convenience sampling technique. The above criteria does negate the assumption of a convenience sampling where a sample will be homogeneous [33]. As per the above criteria, the sample covered a range of respondents coming from different cultural, educational, and demographic backgrounds. Furthermore, the respondents were solely selected based on their knowledge, experience [35], and the willingness to participate and ability to communicate adequately [36]. These are, in fact, the characteristics of a purposive sampling. In other words, the study intentionally selected the purposive sampling technique, which was eventually extended to a broader sample.

The survey was administrated online for a period of four months, and the research team was able to collect 141 responses in total. The said responses could be summarized according to the country contexts as follows:

- Asia Pacific (Japan, India, Sri Lanka, Bangladesh, Pakistan, Philippines, and Nepal)—66;
- Lithuania—15;
- Sweden—17;
- United Kingdom—43.

To give a brief introduction to the research sample, a majority, i.e., 54%, are postgraduate students. The nature of the studentship of the sample holds a majority of 80% of full-time students who are following their DRR course as a full-time student. In terms of the mode of study of the selected sample 51% of the respondents used to study on campus

and had to convert most of their studies online due to COVID-19. Further, a considerable number of respondents, i.e., 37%, follow their course via a hybrid method.

The collected quantitative data were analyzed using the Statistical Package for Social Sciences. Frequencies of nominal and ordinal scales were utilized for the said analysis. Furthermore, the outputs were mapped with the literature review that was conducted to develop the questionnaire questions. The presentation of the data was performed as per the objectives of the present study.

### 3. Results and Discussions

This section discusses the main findings of the study as per the sub-objectives of investigating the online learning/teaching strategies used in tertiary DRR education and challenges faced by DRR learners.

#### 3.1. Online Learning/Teaching Strategies Used in DRR Education

In terms of the existing online teaching strategies, the literature review revealed several online learnings strategies. The concepts of synchronous and asynchronous learning environment settings are commonly described based on the type of interactions associated with the learning process [37]. A synchronous learning setting is where the learners attend live lectures and obtain instant feedback/response, whereas in asynchronous learning environments, usually, the learning content is available on different learning systems and forums and not available in the form of live lectures [38]. There is also an active learning method that integrates synchronous and asynchronous learning strategies, which is referred to as online Flipped Classrooms (FCRs) [39].

Open access gives equitable access to the public to access scientific publications [40]. This opens up opportunities to researchers and organizations with a limited budget to access vital research publications and enhance their learning initiatives [41]. This notion of open access has also led to the development of learning techniques such as Massive Open Online Courses (MOOCs), where there are freely available educational online courses allowing anyone who is interested to take the said courses [42]. The Learning Management System (LMS) is another vital learning strategy that emerged in the literature review which could be defined as a platform that enables assembling and uses online courses or online components of courses and contains eLearning tools accessible through a shared administrative interface [43].

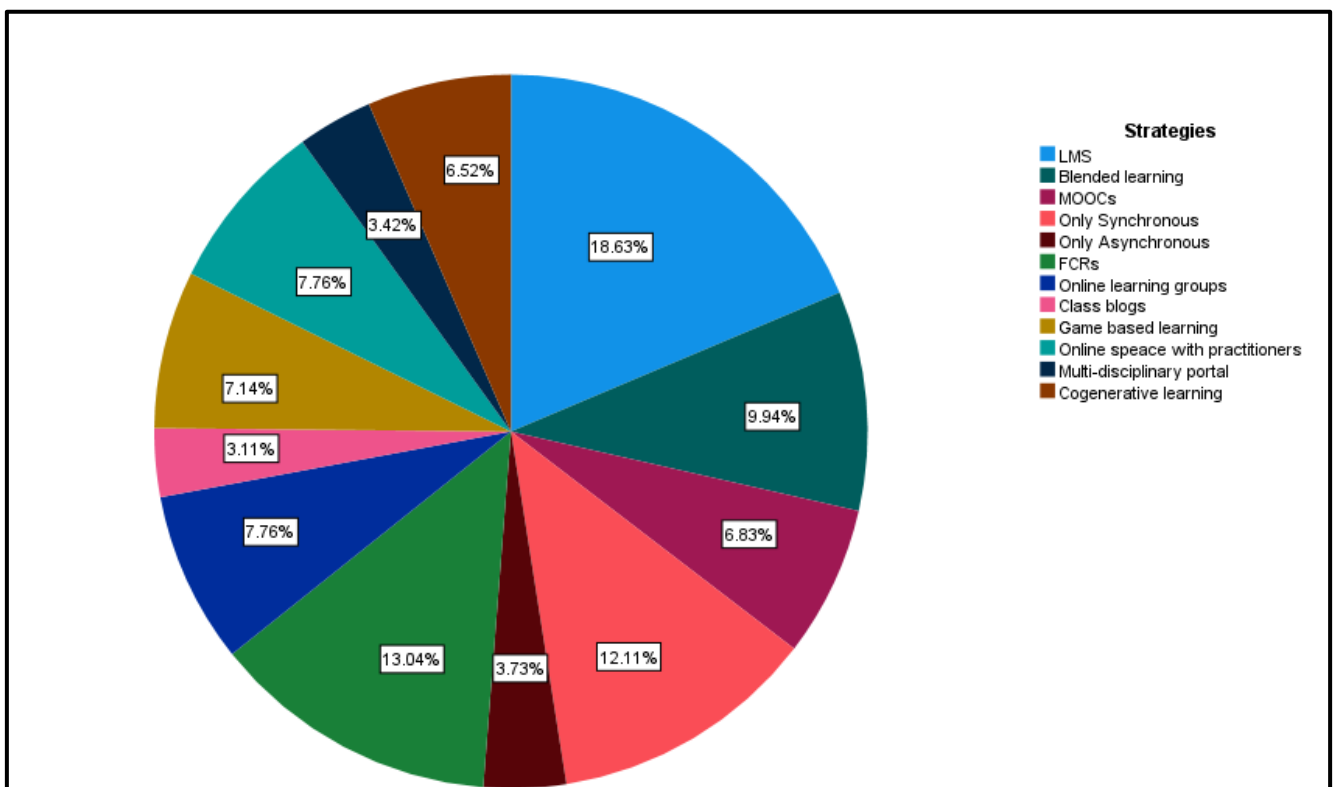
When discussing online learning strategies, along with learning strategies that are conducted solely online, the hybrid of both online and onsite learning strategies has also become significant and is known as blended learning; however, the definition of it is yet to be agreed upon and is open to interpretation [44]. The concept of blended learning could be simply interpreted as a methodical combination of classroom-based and online-based instruction that stimulates and supports learning [45,46].

Apart from the abovementioned online-based learning strategies, the literature review was also useful for exploring further vital online learning strategies. Accordingly, the following set of learning strategies were presented to the respondents to enquire about the learning strategies the learners are engaging in:

- A. LMS;
- B. Blended learning;
- C. MOOCs;
- D. Only Synchronous Learning;
- E. Only Asynchronous Learning;
- F. FCRs;
- G. Online learning groups (where a student learns just a piece of the material and teaches it to the group. The group then works together to synthesize the information and create a presentation about what they have learned);
- H. Class blogs (students creating a blog individually or in a group about what they have learned);

- I. Game-based learning/teaching (e.g., Kahoot);
- J. An online space for students to link with the practitioners;
- K. A multidisciplinary portal site to share knowledge in the same subject area;
- L. Co-generative learning (participatory learning where all students are heard equally, and the teacher holds no specific power or authority in the interactions).

Having recognized the main prevailing online learning strategies, the next step was to investigate the status quo (during the COVID-19 pandemic) of the online learning strategies adopted in tertiary DRR education based on the responses given by the respondents. A summary of the status quo of the use of the aforementioned strategies is being summarized in the following Figure 1:



**Figure 1.** Status quo of the strategies used in online DRR education (source: field survey, 2023).

As per the above Figure 1, a majority of respondents utilize the strategy of a shared online platform containing e-learning tools and online components of courses/modules. This indicates a high use of LMS and virtual learning environments in DRR courses the respondents are enrolled in. A considerable amount also utilizes the following strategies:

- Only synchronous learning;
- FCRs.

This shows a higher tendency of respondents to participate in live lectures where they could obtain instant feedback for their concerns. The lowest number of students tends to use the strategy of class blogs where students explore self-learning by creating a blog individually or in a group about what they have learned. This shows that the self-learning approach is yet to be developed within the DRR course contents.

It is further vital to inquire the status quo of the utility of these strategies based on the country and geographical contexts of this survey. Hence, the following Table 1 depicts status of such utility as per the geographical contexts this survey was based on.

**Table 1.** Status quo of the strategies used in online DRR education based on country contexts (source: prepared by the authors).

	Online Learning Strategy	UK		Sweden		Lithuania		Asia Pacific		Total	
		No.	%	No.	%	No.	%	No.	%	No.	%
A	LMS	21	17.6	7	5.9	6	5	26	21.8	60	50.4
B	Blended learning	12	10.1	5	4.2	15	12.6	0	0	32	26.9
C	MOOCs	11	9.2	0	0	3	2.5	8	6.7	22	18.5
D	Only synchronous learning	7	5.9	4	3.4	8	6.7	20	16.8	39	32.8
E	Only Asynchronous learning	7	5.9	1	0.8	1	0.5	3	2.5	12	10.1
F	FCRs	11	9.2	5	4.2	6	5	20	16.8	42	35.3
G	Online learning groups	5	4.2	3	2.5	1	0.8	16	13.4	25	21
H	Class blogs	3	2.5	0	0	0	0	7	5.9	10	8.4
I	Game-based learning	0	0	4	3.4	14	11.8	5	4.2	23	19.3
J	An online space to link with practitioners	8	6.7	1	0.8	0	0	16	13.4	25	21
K	A multidisciplinary portal	4	3.4	1	0.8	0	0	6	5	11	9.2
L	Co-generative learning	5	4.2	4	3.4	2	1.7	10	8.4	21	17.6
	Total	36	30.3	15	12.6	15	12.6	53	44.5	119	100

A shared online platform containing e-learning tools and online components of courses/modules (LMS) is a strategy that is commonly used in the UK and Asia Pacific. A combination of classroom-based and online-based instructions for the same module/course (blended learning) is utilized in the Lithuanian context; however, it is not the case in the Asia Pacific context. Freely available educational online courses with the aim of unlimited participation (MOOCs) are mainly utilized in the UK, and it is notable that such courses are not utilized in Sweden. The majority of the Asia Pacific context utilizes courses/modules where students can only attend live lectures and obtain instant feedback/responses (only synchronous learning) and courses/modules where students can attend live lectures and obtain instant feedback/responses and sometimes the learning content is available on different learning systems and forums (FCRs). It is to be noted that the following strategies were comparatively low in all the country contexts: (1) courses/modules where the learning content is available on different learning systems and forums and not available in the form of live classes/lectures (only asynchronous learning), (2) class blogs where students explore self-learning by creating a blog individually/in a group, and (3) a multidisciplinary portal site to share knowledge. Furthermore, game-based learning/teaching (e.g., Kahoot) is a strategy that is significantly used in the Lithuanian context.

It is vital to evaluate these strategies against the specific program the respondents are enrolled in. The sample consisted of respondents who follow short cycle programs, undergraduate studies, postgraduate studies, doctoral studies, and professional education/training. It is a point to be noted that a shared online platform containing e-learning tools and online components of courses/modules (LMS) is the most dominant strategy that is utilized in all educational programs. In undergraduate studies, courses/modules where students can only attend live lectures and obtain instant feedback/responses (only synchronous learning) (38%) and courses/modules where students can attend live lectures and obtain instant feedback/responses and sometimes the learning content is available at different learning systems and forums (FCRs) (42%) are two other strategies that are dominantly used. A combination of classroom-based and online-based instructions for the same courses/modules where students can only attend live lectures and obtain instant feedback/responses (blended learning) (39%) and FCRs (39%) are the other dominant strategies used in postgraduate studies. On the other hand, freely available educational online courses aiming for unlimited participation (MOOCs) (30%) and an online space for students to link with practitioners (30%) are the other main strategies utilized in PhD programs. On the other hand, class blogs where students explore self-learning by creating a blog individually or in a group about what they have learned and a portal site to share knowledge amongst students from different disciplines in the same subject area are the least used strategies across programs.



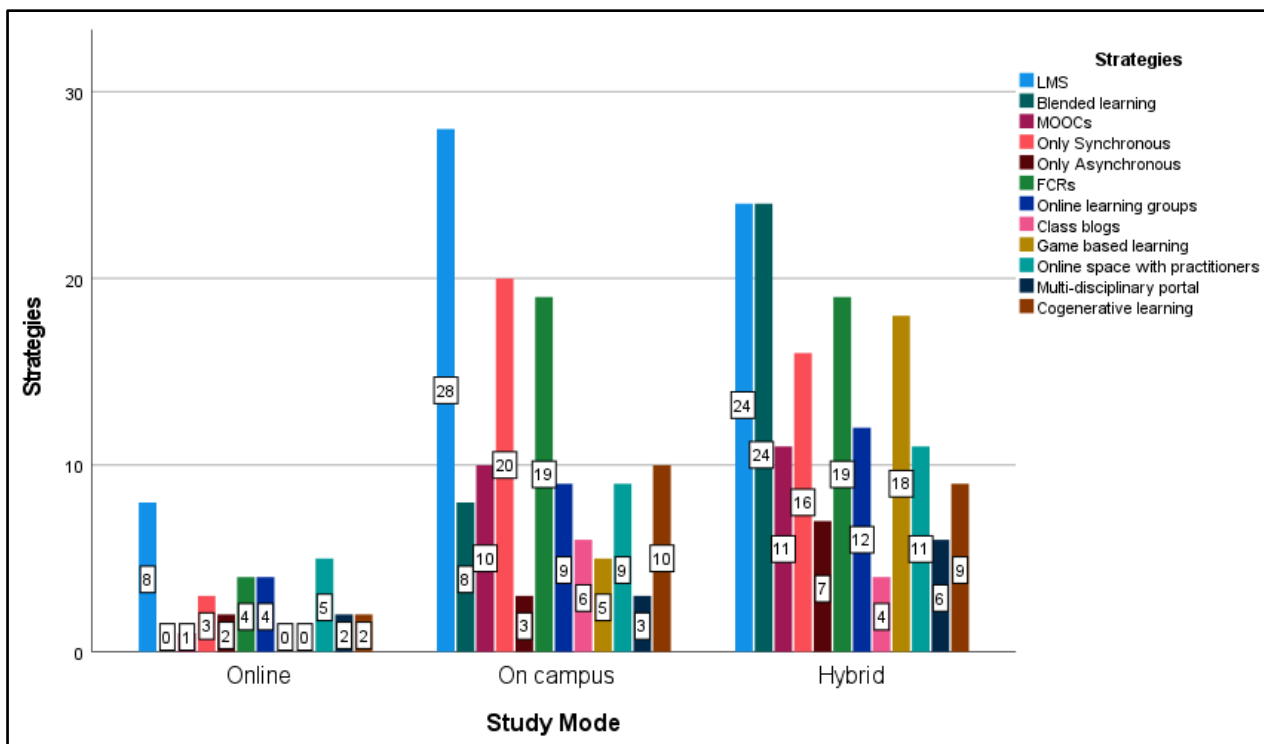
The studentship of a learner requires various time and learning commitments. Hence, the commitment and milestone achievements that are required from a full-time student differ from those required of a part-time student. Therefore, it is vital to investigate the online learning strategies used by full-time and part-time students and whether there is difference between them.

A cross-tabulation analysis was conducted to inquire the use of learning strategies as per the time commitment students are expected to make in their enrolled courses (full time and part time). However, the results do not show a significant change between the strategies used by full-time and part-time students. The majority of both programs utilizes a shared online platform containing e-learning tools and online components of courses/modules (LMS). The use of courses/modules where students can attend live lectures and obtain instant feedback/response and sometimes the learning content is available at different learning systems and forums (FCRs) is also significant in both programs. Class blogs where students explore self-learning by creating a blog individually or in a group about what they have learned and a portal site to share knowledge amongst students from different disciplines in the same subject area hold the lowest response in both programs in comparison to other strategies.

Next, given that this study revolved around the concept of online DRR learning, it was vital to inquire about the various study modes the learners are engaged in order to recognize the level of online learning components they are engaged in and to inquire if there is a significant change in the online learning strategies that they utilize. When evaluating the Figure 2 that discusses the use of the strategies as per the learning mode, all online, on campus, and hybrid modes utilize a shared online platform containing e-learning tools and online components of courses/modules (LMS). Class blogs where students explore self-learning by creating a blog individually or in a group about what they have learned and a portal site to share knowledge amongst students from different disciplines in the same subject area hold the lowest response in all three modes. Furthermore, courses/modules where students can attend live lectures and obtain instant feedback/responses and sometimes the learning content is available on different learning systems and forums (FCRs) are also a notable strategy in all three modes. Similarly, the strategy of courses/modules where students can only attend live lectures and obtain instant feedback/response (only synchronous learning) is vital. However, class blogs where students explore self-learning by creating a blog individually or in a group about what they have learned and game-based learning/teaching (e.g., Kahoot) are not utilized in the online mode.

In the overall discussion on the learning strategies that are being used in online DRR education, it is vital to note that the strategies that are predominantly used are more biased towards instructor-led learning [47] than self-directed [47] or self-regulated learning [48]. Moreover, the fact that the strategies are more biased towards strategies that give away instant feedback only reiterates the findings of related studies that claim the importance of feedback in a learning environment [49]. In this context, lectures in the mode of only synchronous learning have been recognized as a common learning strategy in DRR education [50,51].

However, it must also be noted that the nature of DRR as a subject should not only be theoretical and that education should give the learners the opportunity to come up with their own solutions to matters related to disaster management; furthermore, it must have a practical element attached to the educational experience [3,52–55]. Hence, the importance of active learning in the field of education has been emphasized, and pedagogical approaches such as interactive learning, affective learning, field experiential learning, and action learning have been recognized as suitable pedagogical approaches [56]. However, as per the learning strategies that are in existence, the active learning component is yet to be developed in online DRR education and requires an investigation into how to integrate the practical component of the DRR subject matter into education.



**Figure 2.** Status quo of the strategies used in online DRR education based on the mode of study (source: field survey, 2023).

Furthermore, the most commonly used strategy across countries and a variety of programs is the LMS, which has already been defined as platforms that incorporate course information and modules, as well as tools that enhance the learning experience through a shared administrative interface [43]. It has been recognized as an online tool that is used to create structure for the pedagogical arrangements set by higher-education institutes [52]. Even though it has been pointed out that higher interaction is a major contributing factor for a better learning experience for students [57], the strategies utilized mostly promote real-time interactions between learners and educators and could be recognized as synchronous learning [38,58]. There is a lack of use in active-learning pedagogical methods where interactions among students are encouraged [59]. Even though game-based learning has been recognized as a suitable learning strategy in DRR education, it is notable that this learning strategy is only used in the Lithuanian context out of the countries where this study was conducted [60]. Active-learning strategies are indeed recognized as characteristics of good learning contexts [61]. However, it is noteworthy that respondents who are PhD candidates utilize such techniques where they interact with industrial experts and other students.

### 3.2. The Impact of Student-Specific Challenges/Difficulties for Online and Distance DRR Education

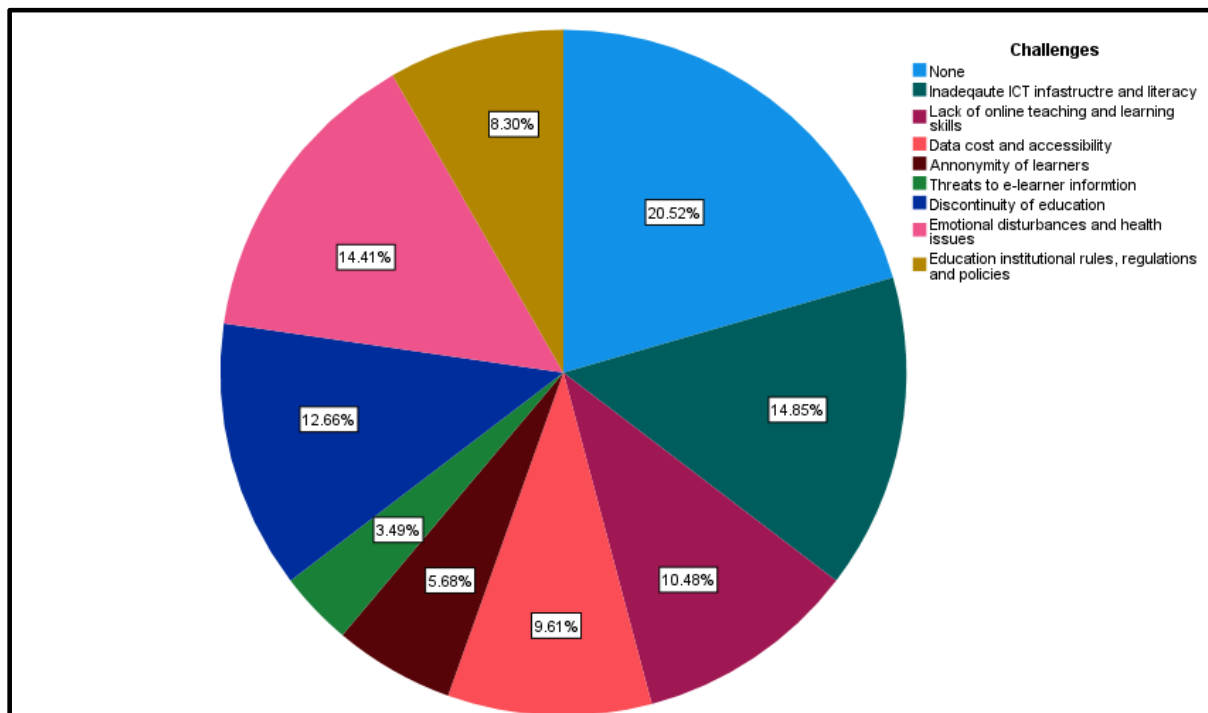
Having explained the strategies that are predominantly used in online DRR education, this section covers the elements of the questionnaire where the challenges faced by the DRR learners were investigated. Respondents were presented with the following general challenges that were recognized in online education during the literature review:

1. None;
2. Inadequate ICT infrastructure, unavailability of certain courses/modules offered online, and digital literacy deficiencies;
3. Lack of essential online teaching and learning skills;
4. Data cost and cost of accessibility (to learning content);

5. The anonymity of learners leading to questioning their academic integrity due to increased cheating and plagiarism-related problems;
6. Threats to the e-learners' information;
7. Discontinuity of education due to personal reasons that affected effective participation in education on the same footing as others;
8. Emotional disturbances and health issues due to prolonged screen/digital-device use;
9. Rules, regulations, and policies imposed by education institutions regarding the mix of online education and fieldwork/on-campus learning becoming insufficient and unsuccessful.

It is notable that the majority claimed that none of the aforementioned was a challenge for the respondents. However, as per the following Figure 3, the following can be recognized as challenges as with the highest number of responses:

- Inadequate ICT infrastructure, unavailability of certain courses/modules offered online, and digital literacy deficiencies;
- Discontinuity of education due to personal reasons that affected effective participation in education on the same footing as others;
- Emotional disturbances and health issues due to prolonged screen/digital-device use.



**Figure 3.** Challenges faced by respondents in online DRR education (source: field survey, 2023).

The following Table 2 summarizes the status quo of the challenges as per the country/geographical contexts:

Inadequate ICT infrastructure, unavailability of certain courses/modules offered online, and digital literacy deficiencies are notable challenges in the UK and Asia Pacific contexts. It is notable that the Asia Pacific context records all the challenges with a significant number of responses. While the lack of essential online teaching and learning skills is not recorded as a major challenge in the Lithuanian context, data cost and cost of accessibility (to learning content) and the anonymity of learners leading to questioning their academic integrity due to increased cheating and plagiarism related problems are not recorded as challenges in Sweden. Furthermore, threats to the e-learners' information is a challenge that is not recorded as a challenge in the UK context.

**Table 2.** Challenges faced by respondents in online DRR education based on country contexts (source: prepared by the authors).

Online Learning Associated Challenges		UK		Sweden		Lithuania		Asia Pacific		Total	
		No.	%	No.	%	No.	%	No.	%	No.	%
I	None	13	10.6	9	7.3	13	10.6	12	9.8	47	38.2
II	ICT infrastructure and digital literacy deficiencies	11	8.9	2	1.6	2	1.6	19	15.4	34	27.6
III	Inadequate online teaching and learning skills	7	5.7	2	1.6	0	0	15	12.2	24	19.5
IV	Data cost and cost of accessibility	4	3.3	0	0	1	0.8	17	13.8	22	17.9
V	Anonymity of learners	2	1.6	0	0	1	0.8	10	8.1	13	10.6
VI	Threats to the e-learner's information	0	0	1	0.8	0	0	7	5.7	8	6.5
VII	Discontinuity due to personal reasons	9	7.3	1	0.8	2	1.6	17	13.8	29	23.6
VIII	Emotional and health issues due to device use	10	8.1	3	2.4	0	0	20	16.3	33	26.8
IX	Rules set by the educational institutions	6	4.9	1	0.8	1	0.8	11	8.9	19	15.4
Total		33	26.8	13	10.6	15	12.2	62	50.4	123	100

In terms of the challenges, it is vital to note the relationship between the use of various DRR learning strategies and the aforementioned challenges. A summary of the challenges as per the most and least significant strategies is presented in the following Table 3:

**Table 3.** Summary of challenges faced by the respondents in online DRR education and the most and least significant learning strategies (source: prepared by the authors).

Challenge	Most Significant Strategy	Least Significant Strategy
Inadequate ICT infrastructure, unavailability of certain courses/modules offered online, and digital literacy deficiencies.	FCRs	Class blogs
Lack of essential online teaching and learning skills.	MOOCs/FCRs	Class blogs
Data cost and cost of accessibility (to learning content).	FCRs	A portal site to share knowledge amongst students from different disciplines in the same subject area
The anonymity of learners leading to questioning their academic integrity due to increased cheating and plagiarism-related problems.	Online learning as a group	Game-based learning/teaching (e.g., Kahoot)
Threats to the e-learners' information.	Only synchronous learning/online learning as a group	Class blogs/a portal site to share knowledge amongst students from different disciplines in the same subject area
Discontinuity of education due to personal reasons that affected effective participation in education on the same footing as others.	FCRs	A portal site to share knowledge amongst students from different disciplines in the same subject area
Emotional disturbances and health issues due to prolonged screen/digital-device use.	FCRs	A portal site to share knowledge amongst students from different disciplines in the same subject area
Rules, regulations, and policies imposed by education institutions regarding the mix of online education and fieldwork/on-campus learning becoming insufficient and unsuccessful.	FCRs	Class blogs/game-based learning/teaching (e.g., Kahoot)

The challenges encountered by the respondents could be further analyzed through the lenses of the time duration and the mode of study the students engaged in during their learning process. This investigation is vital in terms of inquiring whether the different modes and commitments in the learning process make the learners encounter different types of challenges.

In terms of the challenges encountered in the DRR learning process, the following could be highlighted as the major challenges encountered by full-time students:

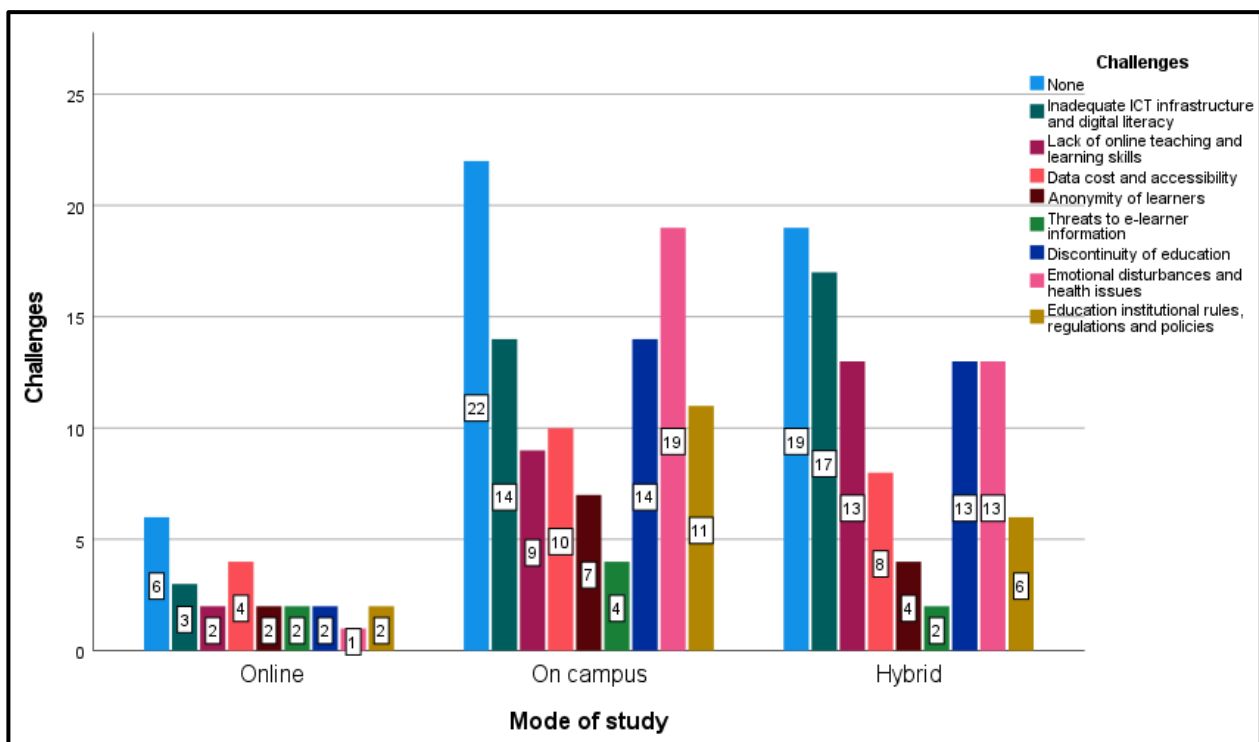
- Inadequate ICT infrastructure, unavailability of certain courses/modules offered online, and digital literacy deficiencies;

- Discontinuity of education due to personal reasons that affected effective participation in education on the same footing as others;
- Emotional disturbances and health issues due to prolonged screen/digital-device use.

On the other hand, the part-time students do not consider the anonymity of learners leading to questioning their academic integrity due to increased cheating and plagiarism-related problems as a challenge. The following were their major challenges highlighted by the part-time students:

- Inadequate ICT infrastructure, unavailability of certain courses/modules offered online, and digital literacy deficiencies;
- Emotional disturbances and health issues due to prolonged screen/digital-device use.

As per the above Figure 4, it is notable that the selected sample represents a lower proportion of fully online learners. However, it is vital to recognize that the respondents are not disregarding any of the presented challenges. Even though a majority of respondents whose study mode is online consider none as challenges, a considerable number recognize data cost and cost of accessibility (to learning content) as a significant challenge. On the other hand, the respondents who learn on campus consider emotional disturbances and health issues due to prolonged screen/digital-device use as the most significant challenge. Furthermore, inadequate ICT infrastructure, unavailability of certain courses/modules offered online, and digital literacy deficiencies; and discontinuity of education due to personal reasons that affected effective participation in education on the same footing as others are also notable challenges pointed out by those respondents. It is notable that the respondents who follow the course in hybrid mode also consider inadequate ICT infrastructure, unavailability of certain courses/modules offered online, and digital literacy deficiencies as the major challenge. Furthermore, the lack of essential online teaching and learning skills, discontinuity of education due to personal reasons that affected effective participation in education on the same footing as others, emotional disturbances, and health issues due to prolonged screen/digital-device use are the other notable challenges highlighted by them.



**Figure 4.** Challenges faced by the respondents in online DRR education based on the mode of study (Source: field survey, 2023).

As per the above figure, both the undergraduates (43%) and PhD candidates (36%) consider emotional disturbances and health issues due to prolonged screen/digital-device use as a major challenge. Furthermore, the PhD candidates also consider inadequate ICT infrastructure, unavailability of certain courses/modules offered online, and digital literacy deficiencies as a considerable challenge (36%). Moreover, discontinuity of education due to personal reasons that affected effective participation in education on the same footing as others is a major challenge recognized by the respondents who follow postgraduate studies (22%).

The main challenges that have been highlighted throughout are matters related to ICT infrastructure and skills and physical- and mental-health-related issues. The availability of adequate ICT infrastructure is vital for the effective delivery of online education [20]. Even if the relevant infrastructure is in place, the course interfaces should be user friendly for a better learning experience [62,63]. On the other hand, a lack of online teaching and learning skills further deteriorates the online learning experience [25].

In terms of the health concerns associated with online education, mental health concerns such as being bored with online learning, especially when learning from home, and frequent changes in mood as a result of multiple assignments which the students considered ineffective [64–66] have been highlighted in related studies. Apart from the said mental health concerns, long hours using digital devices as part of online education led to multiple health issues, such as backaches, frequent headaches, higher body temperature, disrupted sleep cycles, unhealthy increase in body weight, etc. [67].

Given that a majority of respondents, specifically the PhD candidates, refer to the discontinuity due to personal reasons, it is vital to refer to related studies that have highlighted this particular issue. The unavailability of data [64–66] and digital literacy are commonly cited reasons in related studies for such discontinuity [47].

#### 4. Conclusions

This study presents the status quo of online learning strategies and their associated challenges in the field of tertiary DRR education. As per the findings, the experience of the learners in the context of pedagogical approaches in DRR education is a more passive and educator-centered process. There seems to be a high use of LMS and virtual learning environments (VLEs) as a prominent learning strategy. Furthermore, there is more of a preference for interactive synchronous learning strategies over asynchronous strategies. On the other hand, lower utilization of strategies such as class blogs and game-based learning as the status quo shows that the self-learning approach or the student-centered approach is yet to be developed within the DRR education sector. With the lack of use of these strategies in online education, it is clear that the education sector is yet to discover modalities to include active learning in the sphere of online DRR education. In terms of the common challenges in the field of online DRR education, matters related to ICT infrastructure, equal access to online courses, digital literacy, and discontinuity of education due personal issues and health concerns due to excessive digital-device use were vital.

Even though the findings were prepared based on data collected from the Asia Pacific region, Lithuania, Sweden, and the United Kingdom, the contexts cover both perspectives of the Global South and Global North. The future direction of the present study lies in exploring online teaching strategies and associated challenges from the perspective of the educators. It will cover the overall context of DRR education in terms of the main stakeholders in education, namely the learner and educator.

In conclusion, overall, it is apparent that learners prefer synchronous learning strategies and see them as being more effective. However, when inquiring the status quo of the prevailing challenges in the online DRR education field, to divert the existing DRR education sector towards a more effective online education, the authors would like to make the following recommendations that would be relevant to the DRR educators, as well as institutions that are engaged in online DRR education:

- Providing relevant ICT infrastructures

As it has been pointed out above, a lack relevant infrastructure is a vital challenge faced by the online DRR learners. Hence, it is important that the educational institutions have proper records in terms of the ICT infrastructure requirements of the learners, as well as other accessibility barriers (such as data) faced by the learners, and take necessary steps to overcome these.

- Training on required online learning skills

Inadequate online learning skills is another vital challenge that was recognized in this study. Hence, it is important that the online DRR learners are trained in order to get the best out of the online learning strategies. The educators and the institutions can use various modes in terms of raising awareness of the required online learnings skills. Such modes could be online video tutorials and webinars.

- Engaging in active learning strategies

Even though the sample consisted of learners from various learning programs and learning commitments, the strategies utilized by them and the challenges faced by them were quite similar. However, the existing strategies seem to lean more towards the instructor-led learning strategies, with less contribution from the learner. It would be better to get the learners more involved in the learning process with active learning strategies so that the educator could reflect the effectiveness of the teaching and learning process based on the reaction and participation of the learners in the online space, similar to a physical classroom.

- Understanding the social and vulnerability contexts of the students

The findings highlight how various personal commitments and health concerns stand as a vital barrier for the learners to effectively engage in their online DRR learning or continue the learning. Hence, the educators, as well the educational institutions, should be well aware of the various societal contexts of the students. It is vital to conduct a survey or a screening to inquire about these factors of the students. This will also help the educator to be aware of the various vulnerabilities of their students, such as disabilities, poverty, and other health concerns.

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