Empowering Students with Visual Impairment to Prepare for Disasters via Differentiated Instruction Technique: A Case Study in India

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Abstract

Disaster risk management (DRM) education to visually impaired (VI) students has posed a great challenge to worldwide educators. International aid agencies report that people with disabilities have often been excluded from several educational interventions to manage disaster risks. It is, therefore, imperative to ensure that people with disabilities should not be forgotten in any disaster risk initiatives. Education can be a catalytic agent in bringing the disable population to the main stream. Many researchers propose that the process of inclusive emergency planning for DRM should begin at school. However, in most situations, a DRM course is prepared in a traditional way, i.e. for sighted students, and VI students are evaluated the same as sighted students. Thus, VI students remain largely neglected during the stages of instructional planning and learning. To address this issue we successfully designed and implemented an intervention strategy based on the differentiated instruction technique (DIT) to teach VI students about DRM. This article (i) explains how DIT can help instructors deliver DRM content to VI students, using a case study in a school in India, (ii) presents the challenges and solutions to such challenges when teaching DRM to VI students, and (iii) examines the VI participants' perceptions about learning DRM through DIT.

Keywords*: Disaster risk management education, differentiated instruction technique (DIT), India, visually impaired students, empowerment*

Introduction

According to the United Nations Children's Fund (UNICEF) (2003) and World Health Organisation (2011), about 15% of the world total population, about 10% of the young people in South Asian region have some form of disability. A recent figure also indicates that there are about 650 million people living with a disability (Disabled World, 2016), Mitchell (2014) explained that together with the minorities, women, children, the elderly, and people with disabilities, including the visually impaired (VI), have been the most adversely affected by both natural and man-made disasters (Good, Phibbs and Williamson, 2016; Islam, 2014). Article 11 of the *United Nations Convention on the Rights of Persons with Disabilities* has also highlighted the impact of disasters on people with disabilities (Ikeada, 1995; Islam, 2014). People with disabilities experienced higher rates of mortality, possessed little resources and have been neglected in normal conditions and during evacuation, relief, recovery and rehabilitation processes (Hosking et al., 2016; Mitchell, 2014; Rufal et al., 2015). The whole world has witnessed thousands of inhabitants, including the people with disabilities and other vulnerable people left behind due to lack of preparation, lack of evacuation plans, lack of equipment and several other reasons (Hutton, 2008).

Although with limited data (UNICEF, 2003), evidence suggests that people with disabilities have been marginalised, stigmatised, and discriminated in general, and from both immediate interventions and longer term recovery or rehabilitation programs (Todd and Todd, 2011; Back et al., 2016). International aid agencies report that people with disabilities have often been excluded from several educational initiatives (Odongo and Davidson, 2016), including educational programs and interventions to manage disaster risks (International Federation of Red Cross and Red Crescent Societies 2007; Ha, 2014; Ha and Jamil, 2014). Evidence of this exclusion appears in studies of Hurricane Katrina (2005), Cyclone Sidr (2007), and Haiti Earthquake (2010) (Eklund and Tellier, 2012). It is, therefore, imperative to ensure that people with disabilities should not be forgotten in any emergency evacuation plans and any disaster risk initiatives. Education can be a catalytic agent in bringing the disable population to the mainstream. We put forth that the process of inclusion in general, and in inclusive emergency planning for disaster management in particular should begin in the primary and secondary levels in the school system (Horne and Timmons, 2009). Many studies also agreed that disaster risk reduction should be taught at school (United Nations, 2007; United Nations Children's Fund, 2011).

The school curriculum of disaster management in India acquaints students with the types and causes of disasters, and disaster risk reduction through a social studies course. It is very disappointing that in most of the situations the curriculum and content lacks flexibility and is transacted in the traditional manner. All students are evaluated the same regardless their visual conditions, and in the same way as they are in other courses (UNICEF, 2003). In this situation, students with a visual impairment remain largely neglected during the stages of instructional planning and learning experiences. In other words, such students are not sufficiently *"included*" in the preparation for disaster risk management at school. Some general barriers to embracing such inclusion consist of lack of facilities and trained staff,

insufficient resources, and lack of technology (Chan and Yuen, 2015; Nimisha et al., 2016; Odongo and Davidson, 2016; Saleem and Sajjad, 2016). As a result, a life-saving content remains only at a very surface level for these VI students. To address this issue we have designed and successfully implemented an intervention strategy to teach VI students about disaster risk reduction based on the DIT.

This article, using a class in India as a case study, (i) explains how DIT can help instructors deliver the content to VI students, and (ii) presents the challenges faced when teaching topics related to disaster risk management to VI students. It also discusses solutions we have sought to address such challenges. Besides, we have also attempted to study the perceptions of the VI participants about learning this content through DIT. Specifically, two following research questions are addressed:

- What are the pedagogical issues and challenges involved in organising instructional intervention programs when teaching topics related to disaster risk management to VI participants?

- What are the perceptions of the VI participants about learning disaster risk management topics through DIT?

Literature Review

Disaster risk management education

One cannot avoid natural disasters, but disaster risks can be managed and reduced. Disaster risk management is imperative to reduce losses during and after disasters (Ha, Fernando and Mahmood, 2015; Inter-Agency Regional Analysts Network, 2016; Strayhorn et al., 2012). According to many authors, education to improve natural disaster resilience is imperative to any countries (Tilotta, 2010; Good, et al., 2016; Spink, 2017). UNESCO (2009) also explained that the right to education is universal and must be extended to all people, including people with disabilities.

Disaster prevention education has been adopted in many countries. In Taiwan, the Ministry of Education introduced the '*Pilot Programs to Promote Technological Disaster Prevention Education*' in 2003 to educate students on various topics with regards to natural disaster reduction, and building a culture of safety. A number of projects have also been launched, for example, '*Technological Disaster Prevention Education and Cultivation Experiment Research and Development Programs*' (Chen and Lee, 2012). However, these programs have not been designed especially for VI students. In Japan, school education, family, community and self-learning have been promoted to enhance the awareness and knowledge of the citizens and school students of natural disasters (Selby and Kagawa, 2012). In Iran, educational programs of disasters are incorporated in the school curricula of '*one year pre-school, five years of primary schools, three years of secondary schools, and four years of high schools'* (Parsizadeh and Ghafory-Ashtiany, 2010, p. 37). Further, educational information about disaster risk reduction has been disseminated via printed brochures, posters, audio tapes and newspapers by government agencies and other organisations (Parsizadeh and Ghafory-Ashtiany, 2010). Strayhorn, et al., (2012) reported that the pamphlets were an attractive media tool to disseminate information about natural disasters to the public. However, these means of broadcasting of information about disaster risk reduction

is not appropriate for the VI people.

Various instructional approaches have been adopted to educate students with regard to disaster preparation and reduction. For example, the concept of proactive co-learning has been introduced in Japan where teachers and students have worked with each other to develop the curriculum with regard to disaster education given the fact that not all schools have 'expertise on environment and disaster management' (Shiwaku and Shaw 2008, p. 189). Friedman, Rose and Koskan (2011, p. 240) discussed the delivery of a four three-hour module entitled '*Experiential Training in Disaster Communication with Vulnerable Populations*' to public health graduate students in an American university. Johansson and Nyberg (2013) explained that education and social learning can improve capacity in disaster risk management. The concept of integrated education, research and collaboration has been adopted by schools in Sweden to teach students about disaster risk reduction, climate change adaptation and flood risk management (Johansson and Nyberg, 2013). Yet, these programs have been conducted for non-VI students. In other words, there has been insufficient discussion on which methods are effective in teaching VI students at school. Further to this, VI students have to study with sighted students and that a teacher without relevant training does not have sufficient knowledge about inclusive education (Sharma and Desai, 2002; Sharma and Deppeler, 2005).

Differentiated instruction technique

Tomlinson (1999, 2001, 2014) defined differentiation as a technique to tailor instructions to meet individual needs. It is an approach to teaching in which instructors proactively revise or modify content, delivery methods, and learning activities in a way which can address the needs of individual students in order to maximize their learning experience (Tomlinson et al., 2003). In other words, differentiated instruction is a process to teaching and learning for students of different abilities in the same class in which the instructors differentiate content, process, products, or the learning environment for meeting the students' individual needs. It is important to note that differentiated instruction does not mean that (i) instructors provide individualised instruction for every single learner in the program, and (ii) the instructions are designed only for students who are different from others (Kyriakides, 2007).

How to achieve educational effectiveness for all students in general, and in disaster risk reduction, in particular, has been one of the key issues in modern societies' educational systems. Research reveals that educational systems fail to meet the challenge of providing quality and equity, leading to an achievement gap between different groups of students (Strant, 1999). Evidence supports that the achievement gap increases during schooling (Fryer and Levitt, 2004). These findings prove that education has failed to fulfill its primary role and educational systems have not found the way to be effective for all. In order to achieve equity narrowing the achievement gap has been the main aim of socially directed educational systems (Sharma and Deppeler, 2005).

Although many curriculum reforms and policies were conducted based on providing and promoting equity through the enhancement of quality in education, the results of such efforts have not been very promising. Traditional approaches and undifferentiated instructive approaches which do not facilitate the construction of knowledge for all students in mixed-ability classrooms have been seen as one of the basic factors causing this problem. Supporters of DIT and its effectiveness asserted that DIT is an effective way for successful teaching for all students in mixed ability classrooms (Tomlinson, 1999, 2001). DIT guides the planning

and instruction in mixed-ability classrooms based on students' learning styles and their needs, facilitating the construction of knowledge for each and every learner based on their prior knowledge and dexterities (Felder and Brent, 2005). Hence, we chose the differentiated instruction method as an intervention strategy for increasing VI students' awareness about the hazards of different types of disasters and ways to deal with such hazards.

Research Method

We adopted an interpretive qualitative research approach to gather and analyse the data collected through students' comments, and researcher' experiences. We employed the Interpretative Phenomenological Analysis (IPA) approach to gain insights into (i) the pedagogical issues associated with the use of DIT for the VI students, (ii) the way the VI students perceived and experienced learning of the topics 'Earthquake and Volcano' through the process of differentiation (Smith, 2008), and (iii) the interaction between VI students and sighted students. The IPA framework was designed by Smith, Jarman and Osborn (1999). As a qualitative research approach, IPA has its theoretical origins in phenomenology and hermeneutics. A researcher can adopt the IPA approach if the aim of the study is to explore individuals' perceptions as well as understand how such individuals make sense of their experiences. IPA requires researchers to closely examine the experiences and meaning-making activities of a small number of participants, for example, from 1 to 15 participants. The participants are selected based on their ability and subject knowledge to provide the researchers with meaningful insights into the topic of the study. The selected participants in an IPA study usually have certain experiences and/or share some common views with other participants in a given context, and from a shared perspective (Biggerstaff and Thompson, 2008; Smith and Osborn, 2008).

Participants

It should be noted that there are insufficient empirical studies on disaster risk education for VI students (UNICEF, 2003). Thus, to ameliorate this situation, the purposive sampling method has been employed. The participants of this study were 10 VI female students in Class 8 of an integrated school situated in Mumbai, India. Among 10 students, seven were totally blind and three were partially sighted. It was their first year of study in an integrated educational environment. All of them had spent their earlier seven years of study in a special school for the blind. They studied along with other 30 sighted students in the same class in this integrated school.

In integrated schools the disabled students are just physically accommodated, and few special efforts made to facilitate their active involvement in class activities. We have adopted the DIT and designed the learning experiences as per the readiness level, learning styles and interests of all students, including the 10 visually impaired students.

Data collection and analysis

The data for this study have been collected via (i) the researchers' field notes and self-reflections, and (ii) focus group interviews with the participants. The field notes were our observations of the VI participants in the learning process of the two topics related to disaster management, namely earthquakes and volcanoes. Specifically, we focused on the VI students' involvement in the learning tasks, and the group dynamics when doing group work with their sighted peers. Although these sighted students cannot help the VI classmates, but to some

extent, they do influence the learning process of the VI participants through the group interaction process. As suggested by Pearson et al. (2016), self-reflection is an important element in the process of professional development since "*it may contribute to a further sense of renewal, sustainability, and collaboration that may enhance teachers' ability to adapt to the continuing changing demands of the student population*" (p. 2). Thus, regarding the self-reflections, we have maintained the daily diary in which we used to write our daily reflections about what worked well, what did not work well and why, and what needs to be done to facilitate the successful functioning of the project. These reflections have helped us to address the research question, and produce the solutions for the challenges we have faced during the process.

The following questions were designed to obtain feedback from the VI students:

(i) Did the instructional differentiation help you learn topics related to disaster risk management? In what way did it help you?

(ii) Did you face any difficulties in learning these topics in spite of differentiated instructions?

Case Study

Justification and Significance

A growing body of research has emerged in the last few years concerning the implementation and effectiveness of DIT (Jones, Yssel and Grant, 2012). However, there are hardly any studies in the context of India which throw some light on: (i) the pedagogical issues and challenges posed by inclusive learning strategies like differentiation, and (ii) solutions sought for VI students through instructional adaptation. Also, research on different instructions for VI students in the context of disaster risk reduction is rare. To promote the research-based practices (differentiated instruction, adaptation, supports, modifications, etc.) for fostering successful social and academic inclusion of VI students into the main stream (Sthapornnanon et al., 2009), the pedagogical issues and challenges associated with these practices need to be examined and reviewed. Hence, we fill this gap through this case study.

This case is offered as evidence of an instructional program which may seem to fit to a group of VI students who have to study with sighted students. Thus, the value of this case lies in its ability to provide an alternative perspective on the conventional and conceptual thought in disaster risk education to students with visual impairment.

The intervention program

The intervention program was designed to be offered over a two week period. The recipients of the program were VI students in Class 8 of an integrated school (i.e. VI students study with other students) in Mumbai, India. The intervention/model which was based on DIT revolved around two topics mentioned above, i.e. earthquakes and volcanoes. We named this model as 'REACH'. It was a five-phase model, including

- R – Reflect on Will and Skill of students,
- E – Evaluate the Curriculum,
- A – Analyse the Students,

- C – Craft Research Based Lesson, and
- H – Hone students' skills after acquiring the information and knowledge.

The instructions in this model were differentiated in terms of selected content, instructional process and testing strategies for the VI students. We made optimum use of assistive technology for reaching out to the VI students as suggested by other researchers (e.g. Kelly, 2009; Wong and Cohen, 2011; Ahmad, 2015). We agreed with the views of Palincsar (1998) and Huang (2012) and used various group activities to help create a social constructivist learning environment. Every care was taken for building an emotional comfort zone for each learner, including the VI students.

Findings and Discussion

This section presents the major findings and answers to the research questions. The IPA framework helped to derive the superordinate themes.

Research Question 1 - What are the pedagogical issues and challenges involved in organising instructional intervention programs when teaching topics related to disaster risk management to VI participants?

To answer this question we used data from our reflections and notes. In the next section we discuss some major challenges faced and solutions sought by us while teaching the concepts of disaster management to the VI students.

Challenges and Solutions

Non accommodative course content

The integrated schools in India usually use the same textbooks with the same content for both VI students and sighted students. The only difference is that they are made available in Braille print. Bhan (2012, 398) also explained that the '*government does not provide large print textbooks for students*' with partially visual impairment. As a result, we concur with the observations of Sharma and Deppeler (2005) that these standardised text books do not only lack in appropriate graphical presentations, lack of flexibility, but even the content which the VI students can assess is also insufficient. It was noticed by the researchers that the special schools for the VI students also use the same textbooks, and they are made available in Braille print. As a result, these books do not only lack appropriate graphical presentations, but the content and the vocabularies used in the content is not at all accommodative (Hernández, 2003). For example, the text may be '*look at the picture of the volcano and observe the intensity of the erruption*', or it may refer to the concepts of earthquake faults, plate tectonics and plate boundaries. However, the pictures to illustrate such concepts are missing in Braille books. Besides, the description given in the Braille book refers to the visual content (e.g., photos, diagrams, etc.) in the book which is meant for the sighted students, not for the VI students. Such unprocessed content becomes very non accommodative for the VI learners. Hence, the content largely remains out of reach for the VI students.

To solve this issue we did a thorough content analysis of the topics related to disaster risk, identified the complex areas, and provided textual and linguistic scaffolds by creating new learning material. We introduced graphics in a tactile form. Separate audio content regarding relevant topics was also made available for the VI students. The models used Braille labels.

All these changes helped the VI students to access the required information for learning the course.

Lack of resources

The school selected for the experiment did not have sufficient learning resources like models, charts, etc. Whatever they had also was not in a good working condition which was also raised by Sharma and Deppeler (2005) and as an issue in learning. For the problem of lack of resources we developed theme wise models and materials in 2D forms. These documents/materials were produced in multiple copies since each VI student needs a different timeframe and different timing to explore the content in the material. This aimed to avoid chaos in the classroom if only one set of the learning resources was available.

Class management

There were three issues with regard to class management in this case. The first issue was grouping. Differentiated instructions in this project took a path of a guided discovery learning which required the self-exploration of the materials in Braille or in audio and tactile forms. It also required the VI students to work at the work stations together with other group members which caused much difficulty to them. It was, at times, risky to for them touch and feel the chemical solutions used for simulations.

Lack of time was the second issue. Guided discovery required more time for explorations and analysis which could not be fitted in a regular class period of 30 minutes in the context of India.

Finally, the class setting was also a challenge. As put forth by Taylor and Parsons (2011), the discovery learning process required constant interaction between the group members. The students were required to touch the models, access the materials and take part in the discussions. It was difficult for the VI students to move around in a regular classroom setting with traditional furniture and this is noted by an UNESCO study (2009).

To overcome the above challenges, we divided the students into groups. Each group had totally VI and partially VI students, and we assigned each group some sighted students. We ensured that at least one group member in each group could read Braille fluently or could access the learning material comfortably. We requested the school to schedule additional time when teaching these sessions. The students and co-teachers also willingly waited for working at the work stations even after the school hours. We also requested the school to provide us with an empty room with only a few pieces of furniture to create the work stations so that the students could freely move around with their group members in the room for performing the class activities and solving the given problems. It was noted that school management in many Indian schools, in normal conditions, willingly made some minor adjustments to accommodate the VI students' learning difficulty.

Lack of discovery and collaborative learning skills

According to the research findings by Reeves (2006), and Taylor and Parsons
(2011), VI students could best learn the content when (i) they are involved in first-hand exploration and investigation; (ii) discovery/process skills are nurtured; and (iii) the instruction is built directly on the student's conceptual framework and cognitive mapping.

When engaging in guided discovery, students are expected to describe objects and events, ask questions, construct explanations, test those explanations against current scientific knowledge, and communicate their ideas to others. They identify their assumptions, use critical and logical thinking, and consider alternative explanations. Despite widespread agreement on the importance of guided discovery learning, it was difficult to adopt this pedagogical approach in classrooms with VI students. Initially, we found that students getting disruptive, paying less or no attention, or simply not participating. We were aware of the fact that although the VI students have been studying in an integrated school, neither the sighted students nor the VI students were used to working in a collaborative environment (Sharma and Deppeler, 2005). This created the initial gap in the interaction among the two groups when studying the topics on disaster management.

In order to address this challenge, we adopted easily guided discovery steps in which students made transition from one state to another with the help of structured observations, interpretations and conclusions. For promoting collaboration among all the students, purposeful steps were taken by orienting the students to the importance of collaboration and group skills. We also introduced frequent 'ice breakers' sessions during the class to bring the VI students and the sighted students together.

Equality of Learning Experience

Another key challenge we faced was how the totally as well as partially VI students could get a comparable learning experience to sighted students (see Silver, Bourke and Strehorn 1998). As mentioned previously, out of 10 students, seven did not have any functional vision and only three had partial vision. The stated aims of the guided discovery learning stress the importance of exploration of information, observation of the processes and generalisation on the bases of these observations. As stated by other researchers (Shernoff, et al., 2003; Taylor and Parsons, 2011), it is necessary that all the students irrespective of their vision conditions should have been engaged in the process of discovery rather than simply being present in a session. The obvious problem was the visual nature of concepts related to the earthquakes and volcanos.

In this situation, having sighted assistants to describe the visual elements was an obvious and effective solution. Hands-on experience depended on a large degree on the nature of the models and instructional material. In a two-hour session, there was relatively sufficient time for the students to explore the content, the models and other materials related to the topics. Where it was impossible for the totally VI students to manually do the class activities, they instructed the sighted assistant to do it for them. In some situations, the use of audio description of the graphics made the totally blind students enthusiastic, and actively engaged them in the discovery process. Thus, the sighted assistance, flexibility and assistive technology helped us to overcome this challenge as explained by Saleem and Sajjad (2016) that assistive technology contributes to VI students' academic success and 'social interaction' (p. 52). Apparently, social support, i.e. the assistance from the sighted participants, helped the VI student to enhance their learning experience and performance (Keb, 2002).

Assessment

As stated by Salvia, Ysseldyke and Bolt (2010) differentiated instructional strategy helped us adopt an appropriate approach to select specific assessment techniques to test the VI students. The nature of the assignments for VI students was very often auditory; for example, preparing

a radio program on '*Taking precision before, during and after earthquakes'*, or '*Visiting a volcano prone area,* etc. Here, the challenges were multi-faceted, for instance: (i) how could we assess the discovery learning among the VI students?, (ii) how could the international standard of marking criteria be applied to the VI students (who have a sighted assistant) in the same way as to other students?, and (iii) how strictly the marking criteria should be followed?

We decided to assess the students based on the three criteria: (i) discovery skills, (ii) conceptual understanding, and (iii) group oral presentations (see Sharma and Desai, 2002). The first criterion, discovery skills, was marked based on whether the student participated in the following activities, namely (i) asking questions, (ii) accessing information, (iii) sorting information, and (iv) reporting finding. The totally as well as partially sighted students scored well on this criterion. The second criterion, conceptual understanding, was assessed based on the students' understanding of the content of the two topics related to disaster management, and their ability to perform certain practical activities. Initially, the VI students presented a very sketchy note on the assigned tasks. Their work was assessed in a way that it took into considerations their ability to provide a comprehensive written account without being able to visualise earthquakes and/or volcanoes. However, apart from additional assistance to improve their learning experience, no leeway was given to the VI students when they prepared for the actual test papers. The final criterion, group oral presentations, was straightforward in assessment. We evaluated the students against certain dimensions like content clarity, logical organisation of the content and group coordination.

Overall, there were several pedagogical issues and challenges when we have applied the DIT to teach disaster management related topics to the VI students. However, with some flexibility, effective use of assistive technology, and, to some extent, the help of the sighted assistants, we could successfully teach these concepts to the VI students.

Research Question 2 - What are the perceptions of the VI participants about learning disaster risk management topics through DIT?

To answer this question, we conducted focus group interviews with the VI participants. The following superordinate themes became evident after the analysis of the qualitative data collected from the interview.

Unquestioned trust in the students

This was a very prominent theme which emerged from the interviews. All the participants unanimously felt that the researchers (instructors) showed a lot of trust in them. For confidentiality and privacy, we referred to the participants by using coding, i.e. using the first letter of their surnames. S. said that:

> *For the first time someone has allowed us to touch the models, and apparatus independently. Earlier we were never allowed to touch the things on our own.*

K. explained that:

> *We were not scared of touching things as we knew that the facilitators are supportive and if anything would go wrong no one would scold us.*

Several of the students mentioned how surprised they were when the researchers allowed

them to actually work hands-on with the models, graphics, etc. Similarly to other young people and other VI people, these VI students have a strong desire to try doing things by themselves without any assistance, i.e. to be empowered or autonomous (Winchatz, 2004; Saldaña, 2016). N. mentioned that:

> *People do not let me do things (by) myself. They would either put their hands over mine or show me, or they would just do it by themselves; and (they do) not let me do it at all. So, I think this was great*.

By allowing the students to work on their own and develop confidence with some expensive and delicate equipment, the researchers showed the group that they were genuinely interested in the group's learning experience. Similarly to the findings of Taylor and Parsons (2011), this fostered an atmosphere in which the VI students felt very comfortable to share what they did not know by asking questions. V. specifically found the collaborative grouping quite helpful to her learning experience. She said that:

> *You felt like you could ask anything, and you wouldn't be made fun of by anyone. In classroom you still feel uncomfortable, and the teachers don't have a lot of time to answer all the questions you have!*

All the VI students experienced the warmth of the friendship with the sighted students, and this is consistent with the findings by Nyoni, Marashe and Nyoni (2011). This experience was different when they studied in a normal class because they were hardly working with the sighted students. M. said that:

> *I never thought that the sighted students of our class also care for us. Other times they hardly talk to us.*

Enriching moments of learning

All the participants found the learning experiences during the project very enriching. This was evidenced via the comment by D.:

> *It was great to touch the volcano eruption and feel the earthquakes.*

V. also added that:

> *Whatever I could "see" in movie on volcano was very exciting.*

N also agreed with her friends and said that:

> *It was interesting to touch each instrument and the model and feel their surface in the tactile diagrams*.

Apparently, the differentiated instructional technique produced a special learning experience, and improved students' satisfaction via their positive feedback. This is consistent with the study by Watts-Taffe et al. (2011).

Positive and 'willing' attitude of the Researchers

The VI participants appreciated that the researchers were very willing to understand and acknowledge the problems faced by them, and that researchers/instructors were very prompt to make changes in the classroom activities. M. explained that:

> *The facilitators asked me whether I could understand the concepts, what changes I need in the diagrams or models. Nobody has asked me like this before.*

N. also felt the same and said that:

> *The project teachers were always ready to know about my problems and they always asked me how I would have liked to be taught. They do so much for us.*

Every participant rated the project a huge success. Clearly, partnering the VI students who were eager to learn with experts (the instructors) in a particular field is not an easy task. At the same time, it was the energy, enthusiasm, creativity, and open mindedness of all the direct stakeholders, such as the researchers, the VI students as well as the sighted students in the same class, that allowed this experience to become a good example and an inspiration for future endeavour of applying this type of instructional technique in teaching other topics related to disaster risk management.

Lessons Learned from the Case

Overall, there were several pedagogical issues and challenges when we applied DIT to teach disaster management related topics to VI students. However, with some flexibility, effective use of assistive technology, and, to some extent, the help of the sighted assistants, we successfully taught these concepts to the VI students. Our daily observations and reflections also showed that the VI students actively participated in the learning engagement, and displayed lot of enthusiasm during the sessions. Our results support the earlier research that proved the positive impact of the DIT on academic performance of students (Rock et al., 2008; Tomlinson, 1999b). The positive aspect of the DIT was reflected through the significant improvement in the marks of the VI students after attending the program (see Table 1). The standard deviation ranges from +5 to +9.

Table 1: Marks of the VI students before and after the attending the program

Student	Mark before attending the program	Mark after attending the program	Standard deviation
1	12	19	+7
2	11	17	+6
3	14	22	+8
4	10	19	+9
5	12	20	+8
6	14	23	+9
7	13	20	+7
8	14	19	+5
9	13	22	+9
10	13	21	+8

Nevertheless, we learned several important lessons through the experimental experiences as follows:

Teaching the VI students

We, as the educators and researchers, should not work with any rigid assumptions about the ability of the disabled students. As explained by Kirk et al. (2012), teachers/instructors need to be aware of the factors which affect VI students' learning experience.

We need to ask them about their concerns, and adopt different instructional strategies and techniques to suit each group of students. Importantly, we should make the VI students as partners in the voyage of teaching and learning, i.e. promoting co-creation in teaching and learning, instead of treating them as passive receivers of the message (Bovill et al., 2015). We also need to make disaster risk education accessible to all groups of students.

Positive attitude of the sighted students toward the VI students

The younger students are very adaptive and flexible, and they quite easily accept and support their VI peers. We think that the interaction with the VI students would change the attitude of the sighted participants towards VI people for the rest of their lives. The interaction is not only for academics but also provides valuable live lessons for sighted students Thus, an inclusive policy regarding education on disaster risk management should be applied at school, and at an early stage, for all students (Federal Ministry for Economic Cooperation and Development, Davison for Public Relations, Information and Education, 2013). Such policy should be institutionalised within and across institutions so that the young generation can be more sensitive towards the needs of their VI counterparts in the classroom setting.

Designing an alternative mode of examination

Since VI students have different learning styles, and face many challenges during the learning process as Sharma and Desai (2002) rightly point out VI students should be assessed in different modes. Therefore, it is essential to establish a substitute system of examination for the VI students. We agree with Sharma and Deppeler (2005) that an appropriate examination mode should ask the VI students to do activities which can exhibit their abilities to respond to disaster risks in different situations.

Develop new generation of educators who embrace inclusive education

The teacher education institutions should take a lead to make the prospective teachers as champions of the inclusive learning as proposed by Jangira (1995). Sharma and Deppeler (2005, p. 36) also explained that 'attitudinal barriers engrained as part of India's historical response to disability must be changed through education programs for both teachers and the general populace'.

Conclusion

Systematic research on disaster risk management education and the VI students in India is insufficient or almost non-existent. Available documents propose that there has been across-the-board neglect and a lack of suitable instructional models when teaching topics related to disaster risk management to VI students. Thus, this paper has discussed the motivation of this research study, and how DIT was adopted to educate VI participants about disaster risk

reduction. This article has highlighted that the impairments of the VI students should not be treated as barriers to disaster risk management education but as challenges for educators to find new and innovative approaches to educate disaster risk reduction and preparation to VI students.

It is essential for disability studies and disaster risk management education to be incorporated and examined concurrently in order to provide equal opportunities for the VI people to access to information and receive education in all stages of disaster response, rehabilitation and recovery. The most effective way to improve disaster risk management education through the eyes of the VI people is to truly and sincerely engage them in the teaching and learning process as active students, not as passive recipients. In this aspect, the DIT can be adopted as one of the effective techniques to disaster risk management education.

One of the limitations of this study is the small sample size of the VI participants. Thus, further research should expand the scope of this study, i.e. to select a bigger sample size across schools and across provinces in a country as well as across countries.

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