



Institutional and Policy-Level Barriers Shaping the Learning Experiences of Undergraduate Students with Visual Impairments in Natural Sciences and Quantitative Reasoning Courses

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ABSTRACT

Students with visual impairments often have difficulties accessing general education courses, especially courses in Natural Sciences (NS) and Quantitative Reasoning (QR) that are heavily reliant on visual information like that found in diagrams, graphs and tables. In this qualitative study, institutional and policy level obstacles faced by students with visual impairment in Natural Sciences and QR courses in the University of Lahore, Lahore, Pakistan, while taking undergraduate courses were explored. The study was designed to examine the gaps of institutional and policy level support such as HEC Undergraduate Policy and to understand students' experiences and perceptions related to their learning needs, academic participation and performance. Purposive sampling was employed for the interview and the interview was semi-structured until data saturation was reached and themed-analyzed. The results showed that there were seven main themes: university support, barriers and challenges, positive experiences, learning needs, participation and performance, policy and institutional support, and improvement suggestions. The results showed that institutional support was still largely inconsistent, and that it was still dependent on individual teachers, not on systematic implementation of the policy. Issues that prevented access to the visual materials within the lessons were identified as teacher-centeredness and lack of student involvement in practical activities, whereas teacher-student collaboration and peer collaboration were identified as factors that facilitated a more positive experience. The need for easily accessible learning materials, teacher training, curriculum adaptations, assistive technology, and effective policy monitoring mechanisms was noted. The study finds that a single individualized accommodation for a visually impaired student is not sufficient to meet their educational needs; rather, universities should take a systemic approach that puts accessibility at the core of our policy, curriculum, and teaching practice to guarantee equitable learning opportunities in science and quantitative reasoning courses.

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1. Introduction

All Undergraduate students (including students with disabilities) are required by the Higher Education Commission's Undergraduate Education Policy (UEP) 2023 to complete three courses in Quantum Reasoning: What is Science, Exploring Quantitative Skills, and Tools for Quantitative Reasoning. Such a policy puts an explicit obligation on universities as institutions: to make the courses they are required to teach accessible in terms of content, but also in their teaching, in the accommodations they offer, in resources and in governance. This responsibility lies more with decisions made within the institution than with individual teachers and whether they are able to implement the policy with students who have visual disabilities (SWVIs). As these courses build critical thinking and data literacy skills that are linked to employment prospects of graduates (Raffaghelli et al., 2020; Sarkar et al., 2020), and intensive study of Mathematics and Science is related to better employment prospects and preparedness for new fields such as technology and healthcare (Black et al., 2021; Tijani & Adeduyigbe, 2025), this means that they have been made compulsory. National-level rationales for them, however, are mediated in the classroom by the mode of instruction – and if the mode of instruction denies a group of learners, then the benefits are denied to the learners who could benefit most from the mode of instruction. That's not only about what is taught, that's about pedagogy and instructional technology, too, and where accessibility can be made or not. It is a universal right to receive education and it is the institutions who would be expected to make themselves accessible to the student, rather than the other way round (Fernández-Batanero et al., 2022). The numbers affected is huge, the WHO estimates that there are 246 million people with visual impairment in the world, nearly 40 million of which can be considered legally blind, and in Pakistan, a lack of assistive learning materials, limited access to institutional provision of assistive devices and comparatively less developed higher education systems are reported by the SWVIs compared to international advocacy (Ali et al., 2025). The impact of institutional accessibility measures can be shown on student retention. Exclusionary experiences are associated with academic dropouts, and without institutional practices for inclusion, the impact of these experiences can be compounded, making them more likely to result in dropping out of academic programs (Arias-Badia & Hermosa-Ramírez, 2025). It's not something that just falls out of the sky, it takes a disability-support office, a commitment of financial resources to prepare and maintain adapted resources (such as braille or tactile diagrams) and a person who is responsible for coordinating disability support and accommodation across the various departments of a university (which may or may not be part of institutional policy). The institutional accessibility also forms the basis of other institutional commitments on equity and inclusion and the university's alignment with international agendas such as Sustainable Development Goals (SDGs) which emphasize equitable and inclusive quality education for all (Rahaman et al., 2024). It is the institutional duty as well as is binding for digital infrastructure. Remodernizing university websites, learning-management systems and digital course material to make it accessible is of paramount importance to allow SWVIs to access information they need to study. This is because when not designed, digital barriers can become a source of educational inequity, rather than one that is incidental (Asok & Rekha, 2025). In this perspective, provision is not only about classroom accommodations, it is about IT and procurement decisions – whether an institution licenses a certain software or platform, and how it is set up – that will determine the productive capacity of students with varying learning needs. In this perspective, provision is not only about classroom adjustments, it is about decisions within IT and procurement, what software and platforms an institution has access to as well as how it sets them up, as they may enable or prohibit students with different learning needs to being able to participate proactively in their course. The care of the growing variety of student needs is also an institutional and policy question. A diverse student population, both in terms of their learning styles and their diversity, introduces challenges of complexity to university governance and teaching, and broad diversity in student learning requires changes in the university curriculum, assessment and support services, not just in the classroom (Mulnix et al., 2016; Hassan et al., 2024). In view of the plurality of needs, capacities and experiences of the individual student, it is understood that a fair institutional policy, with a focus and emphasis on students' needs, is an integral part of any form of genuine inclusion and not provision (Arshad et al., 2024; Goddard & Kim, 2015; Akram et al., 2022; Mumtaz et al., 2024). The term institutional gaps can be illustrated in some of the most frequently mentioned examples of instructional gaps that seem to be teacher choices, like in the case of science teachers documenting that they do not bring hands-on science experiments to the classroom, for instance, (Nakajima & Goode, 2019). Despite the growing interest in inclusive education, there is sparse research focusing specifically on SWVIs in Natural Science and QR courses in Pakistan and little systematic research to assess institutional accommodations and disability support infrastructure, or policy instruments such as the HEC 2023 in What is Science, Exploring Quantitative Skills, and Tools for Quantitative Reasoning. This study aims to fill this gap by analyzing institutional and policy level support in these required courses.

1.1. Objectives of the study

- To analyze the gaps in institutional and policy-level support (including HEC Undergraduate Policy) for inclusive access to general education courses for students with visual impairments.
- To explore the experiences and perceptions of students with visual impairments regarding their learning needs, academic participation, and performance in the specified general education courses.

2. Literature Review

The Higher Education Commission (HEC) Undergraduate Education Policy is now available, and raises the need for equity in access for undergraduate learners with a visual impairment. International frameworks and national policies encourage inclusive HE but this is not necessarily reflected in accessible educational practices in universities. Many institutional factors such as the provision of disability support services, reasonable adjustments, access to learning materials, administrative coordination, and institutional commitment to inclusion, have a significant impact on the learning experiences and academic engagement of students. The Higher Education Commission (HEC) undergraduate policy requires all students to take Natural Science and Quantitative Reasoning courses, but it does not require that these courses be adapted to institutions. The majority of faculty also have a good knowledge of their disciplines but are not trained in teaching blind students, and certain teaching materials are also scarce and inaccessible in braille, such as a Perkins braille. This is a systemic problem, as found by Firat (2021), by which the visually impaired students experience difficulty when navigating through campuses, accessing resources, the class notes and academic support. A common theme was the STEM lecturers lack training in inclusive, disability responsive pedagogy, which is a major gap identified as one of the reasons for STEM exclusion (Masuku et al., 2024; Cardenas et al., 2025). The use of graphs, diagrams and symbolic notation in teaching of mathematics and physics, which sometimes results in very few words on the board, often leads to faculty using non-inclusive teaching methods if they have not been trained to use other methods. Schreffler et al. (2019) and O'Leary et al. (2020) argue that formal policies for increasing accessibility are not effective in the classroom unless the teachers are aware of the concept of Universal Design for Learning (UDL) and continue to participate in staff training related to this concept. However, despite the above expectations, the reality in universities is that examination systems are still inaccessible, access to websites is limited, and the technology is still not optimally utilized, with no proper pedagogical support or training in staff, as shown in the following evidence: examination systems are inaccessible (Parveen et al., 2024; Mahmood et al., 2023), approaches to accessibility are fragmented (Chimicz, 2025; Sheam et al., 2025), and technology is not being used to its full potential without pedagogical support or training for staff (Aftab & Ghaffar, 2025). Effective training and co-ordination is crucial for effective Disability Support Services (DSS) implementation, as students are likely not to be aware of the services, to receive them at the time they are needed, or to receive services that are not coordinated or lack information they need (McNicholl et al., 2019; Naz et al., 2023), and services are also more likely to improve engagement, satisfaction and retention rates (Akhtar et al., 2025). Other gaps are Digital access (technology needs to be matched by faculty capacity, leadership and formal auditing processes to ensure inclusion) and Institutional readiness (Technology requires faculty, leadership and formal auditing processes to ensure inclusion) (Westine et al., 2019; Islam et al., 2024). This is compounded by an even larger policy-practice gap in which policies and practices state inclusivity but do not suggest or communicate services, standardize implementation or include accessibility in digital platforms and assessment systems (Cerilli et al., 2025; Mais & Lailil, 2025). Another structural challenge is the lack of monitoring and accountability systems – many institutions do not have any indicators or there is no central body in the institution to monitor and hold them accountable on the implementation of the policies, and it is indicated that well-intentioned policies seldom lead to measurable policy outcomes, and support is not consistent across courses and departments (Kochung & Migunde, 2019; Werren et al., 2025). Similarly, the low level of accessibility in direct service delivery, which includes the absence of Braille materials, audio and large print materials, inadequate funding etc. and the lack of appropriate personnel to adapt the materials is another institutional failure affecting the level of accessibility for students (Bhardwaj & Kumar, 2017; Kumar & Nagar, 2024; Mustapha, 2022). Previous research has demonstrated that with a single lecturer, administration or support officer working on accessibility, there are issues of lack of consistency in accessibility across courses, departments and even between individual students within the same course (Tripathi & Thakkar, 2025; Afonso et al., 2025). There are also concrete experiences of these gaps for the visually impaired which are reflected in the institutional structures. Niraula (2024) stated that students rely on the sighted peers for academic and life skills; and teaching and physical facilities are inadequate, the course is too rigid, lack of financial resources, and students lack adequate materials to learn from; and that disability-specific training is needed for teachers along with enough materials and support for students. Power (2024) points out that information from PDFs, slides and group work has a negative impact on participation – even information that is accessible online is not necessarily screen-reader friendly. Pupils are not able to complete work punctually as materials are often handed out later than for sighted pupils. The delays in access to educational materials, inaccessible courses, inconsistent accommodation and insufficient institutional supports, can be quantified as education disadvantage and often experienced by students with visual impairments. Further, assessment has not garnered as much attention as access, with an increase in efforts related to outreach and admissions, but relatively little attention has been paid to the nature of visual assessment formats and their impact on a student's sense of fairness and overall success (Moriña, 2017). Students express learning needs in terms of multisensory, tactile and audio-tactile learning styles which allow them to process scientific and mathematical information without relying on visual support, such as tactile graphs, audio-tactile instruction and haptic feedback technologies that reduce their cognitive load and help them understand the phenomena that change over time, such as the movement of graph/function (Shoaib et al., 2023; Bamdad et al., 2022; Ducasse et al., 2022). There are significant positive accounts of students' experiences when these strategies are institutionalized and not reliant on the choice and skills of the individual teacher: students are more motivated, more conceptual understanding, more independent, more confident, and are more active during class (Kerdar et al., 2024; Castaneda et al., 2025). Looking at the literature more

broadly, it is apparent that there are gaps at the institutional and policy level, compulsory course requirements which are not adapted by the institutions, poorly trained teaching faculty, inadequate support services, and differences in digital accessibility, the lack of provision of materials, and weak monitoring, which clearly relate to the barriers visually impaired students report in their daily academic life. Whereas, if multisensory teaching, the use of accessible materials and coordinated support are part of the institution, pupils' participation and achievement and confidence in their abilities increase.

3. Methodology

The research design used in this study was a qualitative research approach to explore the experiences of under-graduate students of visual impairment with the accessibility barriers in the Natural Sciences and Quantitative Reasoning courses in universities in Lahore, Pakistan. A purposive sampling technique was employed to sample a number of participants who are currently registered in these courses. Data saturation was reached by conducting semi-structured interviews. The following questions were raised in the interview guide: What were the experiences for the participants regarding institutional support, barriers to access, learning needs, participation, and recommendations for making inclusive practices better? The interviews were held by phone, face-to-face, and online, with informed consent of participants, audio-recorded and transcribed verbatim. Thematic analysis was used to look for common themes and patterns in the data. All ethical norms such as informed consent, confidentiality, anonymity, voluntary participation, and right to withdraw at any time were followed throughout the study.

Table 1. Demographic Data of students who Participated in Interviews

Student Id	Gender	Degree Program	Type Of Institution
R1	Male	BS Education	Private
R2	Male	BS ELM	Public
R3	Female	BS IR	Public
R4	Male	BS Urdu	Public
R5	Female	BS English	Public
R6	Male	BS English	Private
R7	Male	BS English	Private
R8	Female	BS Psychology	Public
R9	Female	B.Ed. secondary Education	Public
R10	Female	B.Ed. secondary Education	Public

4. Findings

4.1. Theme 1: University Support for Visually Impaired Students in Natural Sciences and Quantitative Reasoning Courses

University support was seen as low and inconsistent, and accommodations were largely determined by the individual teacher rather than the university. Some universities offered recorded lectures, available learning materials, separate classes, simplified courses and modified exams, but these supports were not available consistently. Students also indicated limited access of instructional resources as there was insufficient verbal explanation in classrooms. A large majority of students reported little academic assistance apart from occasional administrative assistance.

One said:

“There is support at the administrative level... the administration will at least tell the teacher” (R1).

Others stressed the need for teachers' willingness to help:

“Support is dependent upon teachers' willingness to provide assistance” (R3).

Another respondent said:

“It was also noted that institutional support like separate QR classes and simplified content was offered (R6).”

In general, the participants perceived that university support is piecemeal and relies to a great extent on individual teachers' initiative rather than establishing regularly systematic practices.

4.2. Theme 2: Barriers and Challenges

Results indicated that there were several barriers that students with visual impairments faced in their Natural Sciences and Quantitative Reasoning courses. Accessible diagrams, graphs, tables, signs, and symbols were the most common problems reported, as were teacher-centered instructional approaches, lack of accessible learning materials, limited access to practical

and laboratory activities, and small problems due to infrastructure. Participants also commented that notes were reduced in access due to being scanned, and due to the limited supply of braille resources and image-based PDFs. Throughout, participants highlighted the visual content as the biggest challenge for learning.

One said:

“We as the visually impaired students, it's difficult to follow graphs and diagrams, that's the big problem (R6).”

Participants also reported that often teachers provided no verbal explanations and relied on board-work, which made it hard to follow in class:

“Sometimes teachers will write on the board without verbal explanations” (R4).

Overall, the results showed that the main barriers to the full participation and independent learning of students in these courses are inaccessible teaching practices, scarcity of accessible learning materials and the lack of access to practical and laboratory activities.

4.3. Theme 3: Positive Experiences

The findings indicated that although many of the students faced challenges in their learning process, some students indicated positive learning experiences in Natural Sciences and Quantitative Reasoning classes. Most of these experiences were captured in active learning within the classroom, effective interactions between teacher and student, student-student relationships, and through project-based learning. All participants expressed that the teachers were very participative and encouraged participation in the classroom.

One of the participants said:

“The teacher was engaging in the class activities and attempting to engage me during the lecture (R4).”

One of the participants, when recalling a water harvesting project, said:

“The teacher helped us in the project, provided proper guidance for the entire process, and other students in my class were also helpful whenever I encountered problems” (R5).

Overall, participants reported that support from teachers, cooperative peers and opportunities for more active involvement helped to create more positive learning experiences in these courses.

4.4. Theme 4: Learning Needs

The results showed that participants noted a number of learning needs that will enhance the accessibility and participation in the Natural Sciences and Quantitative Reasoning courses. The most common needs were: Easy access to learning materials, teacher development on inclusive teaching, availability of accessible practical activities, curriculum adaptation, flexible assessment, tactile, audio and digital learning resources. The participants emphasized accessible instructional materials, teacher preparation and training, and inclusive teaching methods.

One participant said:

“Include tactile materials, available screen reader compatible files and braille resources to enable learning (R3).”

Another participant said:

“The importance of teachers to be provided with training on how to teach learners who have visual impairment and the types of teaching method to utilize (R6).”

It was suggested that teachers should explain difficult concepts before eliminating them from teaching and instruction, give tactile support when conducting practical activities and employ alternative assessment methods in activities that involve visual learning.

4.5. Theme 5: Participation and Performance

The results indicated that the participants felt that they could improve their academic attainment in the Natural Sciences and Quantitative Reasoning courses by engaging in discussions in the classroom, having an equal access to academic activities, being engaged with the teacher during lessons, having exposure to the topics and learning materials before the class, having a fair and accessible assessment practice as well as psychological support in an inclusive learning system and environment. Being actively engaged in classroom discussions and learning activities was emphasized.

One participant said:

“Also, we should search the topic, and be involved in classroom discussions” (R4).

“Teachers should also ask students to join discussions in class and continually test if the students understand the content (R7).”

Participants also emphasized the critical role of fair and equitable assessment practices as vital tools for boosting students' performance, especially in relation to the content of the lessons learnt for the visually impaired students. They also highlighted the significance of psychological support and disability awareness to build confidence and participation.

As one participant said:

“It is important to have counselling because students' psychological wellbeing is impacted by discrimination and exclusion in classroom activities” (R9).

Another participant emphasized:

“Awareness should be there first... students should think that they are capable of doing everything” (R5).

4.6. Theme 6: Policy and Institutional Support

The findings indicated that the participants felt that effective institutional policies and support, proper implementation mechanisms, teacher training and awareness, administration responsiveness, institutional accessibility measures and support systems were important to enhance the inclusion and equal participation of visually impaired learners in Natural Sciences and Quantitative Reasoning courses. The importance of policy development and implementation, with the assistance of monitoring tools, administrative buy-in and coordinated support mechanisms, in order to provide equal opportunities and long-term academic support, was highlighted. Participants emphasized the importance of effective implementation and monitoring of disability-related policies.

One of the participants remarked:

“Regulations have been drawn up as to how to accommodate persons with disabilities, but it's minimal (R2).”

One also highlighted the need for accountability, saying:

“The policy is not being implemented and it does not have a check and balance (R6).”

Participants highlighted Teacher Training and Administrative Responsiveness as two of the institutional responsibilities. One participant said:

“The training of teachers is very much required” (R3).

Another was the importance of supportive administration:

“If we ask for something, e.g. a facility, then give it” (R10).

4.7. Theme 7: Improvement Suggestions

The results showed the suggestions of the participants to make the courses of Natural Sciences and Quantitative Reasoning more accessible and inclusive for students with visual impairment. The participants highlighted the importance of the need for curriculum design, instructional strategies, learning materials, assessment processes, policy implementation and assistive technology interventions improvement. These suggestions reflected the importance of coordinated instructional and support mechanisms to enhance participation and learning experiences of visually impaired students. Participants proposed to modify the content of the course by offering alternatives and descriptions for parts of the course that are visually intensive like graphs, diagrams and tables.

“They highlighted the importance of accessibility in the curriculum design, as it will provide equal opportunities to the student with visual impairments (R1, R2).”

“Participants emphasized that flexible teaching methods, supportive teacher behavior, accessible learning materials and equitable assessment processes are crucial to enhance students' learning experience (R3, R4).”

“Participants also recommended further strengthening of policy implementation and assistive technology support, such as availability of accessible resources, training on ATs (R5).”

5. Discussion

Results indicated that there was inadequate university support for visually impaired students taking Natural Sciences and Quantitative Reasoning courses, and that this support was mostly at the discretion of individual teachers. Some students were provided recorded lectures, modified exams and accessible materials, but not all, so that merely being offered the accommodations means there is no guarantee that the accommodations are being used equitably in a learning environment unless they are included in the institutional system. This is similar to the results of Croft (2022) which revealed that the types of support that were organized were more important than it being available or not for the inclusion of visually impaired students. Similarly, Wang and Takeda (2022) showed that the level of disability support in institutions that had formal policy regarding disability is more consistent than those that did not have such support in their policy. Board work and visual demonstration were also widely used by teachers with a very limited verbal description, which is similar to the findings of Ijaz et al. (2022) that noted that such limited verbal description constitutes significant learning barriers and recommended that teachers be trained to communicate inclusively. Overall, participants perceived support as a disjointed process and not a single process, following Wang and Takeda (2022) who argue that sustainable inclusion requires coordinated policies, resources that are available and continuous institutional planning rather than isolated policies for accommodating. The main barriers participants identified were: Inaccessible diagrams, graphs, tables and mathematical symbols, teacher-centered instruction, inadequate access to materials, and limited opportunities to engage in practical activities. The results showed it is not visual impairment in itself, but the lack of adequate learning contexts that would correspond to D'Agostino's (2022) claims that the concept of Universal Design and tactile graphics are both important components of ensuring that a student becomes an active learner, as well as auditory description. When employing image-based materials as a barrier, there is reinforcement of Adelakun's (2020) findings that tactile STEM diagrams effectively increased participation and conceptual knowledge. The lack of verbal description of visual information, as suggested by Peng et al. (2021), was a constant concern, and thus, the need for explicit verbal description of the visual information for non-visual access was highlighted. Access to adapted practical activities was also reported to some extent, which is corroborated by Zorluoğlu et al. (2021) who found that the use of tactile materials in these activities is helpful for engagement and reduces the need for visual observation. Despite these challenges, the participants experienced positive experiences around supportive teachers, active involvement, and peer support. Peer support and instructor support were also cited as important facilitators, which is similar to the findings of Firat (2021) that instructor and peer support are important facilitators that assist students to overcome environmental barriers. In addition to academics, the opportunities for peer collaboration were found to enhance confidence and sense of belonging, consistent with the findings of Perveen et al. (2026) that peer support is related to academic access and participation in classes and social inclusion. These findings suggest that, together, interpersonal relationships are a factor in shaping inclusive environments, in addition to formal accommodations. Special attention was paid to the necessity of having braille materials, screen-reader compatible materials, detailed verbal explanations and tactile diagrams as aids to independent learning. This is consistent with Singh and Suknunan's (2023) study suggesting that with the application of UDI students with visual disabilities have an improvement in equitable access. The effectiveness of assistive technologies, however, was only seen when coupled with accessible content, which is consistent with the findings of Kirboyun Tipi (2023), who found that the effectiveness of the screen-reader was seen when coupled with accessible digital content. Another demand that emerged was for staff development on inclusive pedagogy, as Moreira Sánchez et al. (2023) has shown, this is in line with the preparedness of teachers to implement inclusive practices and is linked to successful inclusion. The suggestions by the participants emphasized the importance of making materials more accessible beforehand for learning, disability responsive teaching, increased accessibility of AT and more integration of institutional support, from individual to systemic access. This aligns with Fernández-Batanero et al. (2022) and Cumming and Rose (2022) who both stress the importance of including accessibility in the curriculum design, instead of making adjustments on a case-by-case basis. Zárate-Rueda et al. (2024) also found that technology is a most effective when it is combined with inclusive pedagogy and institutional policies, echoing their participants' perspective that technological and pedagogical reforms need to go hand-in-hand. Consistent with Hussain et al. (2022) who noted that accessibility measures may be present without being properly implemented or monitored, participants highlighted the importance of the quality of inclusion, and that this is more likely to depend on the way in which policies are implemented than the form of policy itself. Insufficient teacher training and unclear administrator guidelines were mentioned as crucial factors, in line with Msimango et al. (2025) who linked inadequate teacher training and unclear administrator guidelines to exclusion problems. Participants also observed that there needs to be a peer mentoring program, which was supported by the research conducted by Cardinot and Flynn (2022) which indicated that formal peer mentoring would facilitate engagement and build confidence and successful transition for students with disabilities. Overall, these results indicate that accessibility is much more about proactive, rather than reactive, provision and that accessibility provision needs to be integrated into the curriculum. This is consistent with recommendations made by Bartolo et al. (2023) to include accessibility as part of curriculum planning, teaching and assessment for equitable participation. The importance of flexible assessment and positive teacher attitudes for improving the quality of education for students with disabilities were also stressed by Pérez-Esteban et al. (2023), and McNicholl et al. (2021) cautioned that AT may be the most effective when combined with adequate training and institutional support. The findings suggest that meaningful participation of visually impaired students in the Natural sciences and Quantitative Reasoning Courses in the institution requires an

integrated approach from the institution which involves disability policy, trained teachers, assistive technology, coordinated peer support and the provision of a disability friendly learning environment. Meeting these needs as a whole group, and not individually, is critical to build equitable and sustainable learning spaces in post-secondary education.

6. Conclusion

In summary, the study "Institutional and Policy-Level Barriers Influencing the Learning Experiences of Undergraduate Students with Visual Impairments in Natural Sciences and Quantitative Reasoning Courses" emphasizes how important institutional support and policy implementation are in meeting the learning needs of visually impaired students in these courses. The study shows that while some universities provide recorded lectures, modified exams, accessible materials and so on, students often struggle as these supports are not systematic, rely on teachers and are not institutionalized. Participants identified inaccessible diagrams and graphs, tables, and mathematical symbols as among the biggest challenges in learning, as well as the teacher-centered approach to teaching and limited opportunities to participate in practical and laboratory activities. Lacks of verbal description of visual information and lack of disability-related policies are compounding these problems. Despite these challenges, many students described positive experiences related to their engagement in the classroom and confidence in the classroom, particularly when they received support from their teachers, peers, and active participation in the classroom. The research recommends that the higher education institutions need to offer more specialized training to faculty members and adequate institutional support to better meet the learning needs of visually impaired students. Some recommendations for improving support are to provide more training on inclusive teaching, better integration of teachers with disability support services and to make accessible learning materials and assistive technology available. The study finally recommends a systemic approach involving institutional policies, curriculum design and teaching practices to provide a more accessible and equitable setting that allows visually impaired students to participate and perform academically. These gaps can contribute to a more inclusive learning environment at universities that supports a student with a vision impairment to achieve academic success in Natural Sciences and Quantitative Reasoning courses.

7. Recommendations

1. Institutionalization of support services including: recorded lectures, modified exams, accessible materials, with a prompt response to requests for accommodation.
2. Ensure that accessibility is considered from the beginning of curriculum planning; ensure that visual materials are made accessible in other modalities, and assessments are made equitable and flexible.
3. Regular training on inclusive teaching, verbal description of visual information and adaptation of lab activities for independent participation for instructors.
4. Improve trained assistive technology use, as well as peer mentoring, counselling and disability awareness efforts to create a more inclusive campus culture.
5. Disability policies need to be accompanied by effective monitoring and accountability, moving from a teacher dependent approach to accommodation to an approach of continuous monitoring and accountability of inclusion at an institutional level.

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