

Teaching Mathematics to Hearing Impaired Students In An Inclusive Classroom In Swat Pakistan

Sharif Ullah*
Musarrat Habib**

Abstract

The primary objective of this study was find the effect of “Total communication technique” for the teaching of mathematics to the hearing impaired students and differentiate the learning outcomes of these learners in an inclusive education classroom. This research was conducted using ABA as a single subject design. The study involved the student of Institute of Government Special Education Center for H.I.C Makan Bagh, Swat. The total number of students was 15 students out of which 08 students were randomly selected as the study sample. 10 different tests were first developed for the proposed study considering the previous 03 tests and taken as a pre-intervention test to assess the current understanding of the “hearing-impaired” learners when they received the relevant special education and instructed through sign language. 04 tests were scheduled for center phase intervention. During the intervention phase, selected students were trained through “total communication technique” and thereafter tests were administered to assess the improvement of those trained through “total communication” method. And finally 03 post-intervention tests were administered. The required data were collected through all the tests which were analyzed by repeated measures ANOVA, and the results of the study were shown and assuming Mauchly's scope assumptions, it was concluded that by rejecting these null hypotheses, the aim was to teach mathematics to hearing-impaired learners using latest techniques. It was also concluded that communication significantly affected student learning.

Keywords: *Inclusive education, Mathematics learning, total communication*

* Corresponding Author: Ph.D Scholar department of Education at University of Lahore), Email: sharifullahkhang@gmail.com

** Assistant Professor at the University of Lahore, Lahore
Email: javaidmusarrat@gmail.com

Introduction

There are many significant determinations regarding the way students with disabilities could be included in mainstream classrooms, but the study is nevertheless customized to a detailed purpose in which there had been a focus on disability or special educational needs. There is a dearth of studies that show with certainty how to create an environment that confine practically all the students. The demand for a study of the same category is imperative holding two main logics. Primarily, the entire perception of inclusion is concerning shifting practices. Secondly, on condition that indication that an inclusive approach be able to be developed, is the most excellent dispute for a school inclusion system (Dyson, 2014). It has been commonly explored that different meanings of inclusion have been given. Four diverse utilities of the word inclusion in two studies were well thought-out in the high-impact study. The definition of inclusion means, as a prelude to it, to be mainstreamed, this inclusion throws back the situation of education. Uses other than placement include the requirement to assemble the social and educational needs of students with disabilities or the need for special support (Magnusson, 2019).

There is a comparatively topical history of enrolling students with disabilities in regular math classrooms. Having such a modern history of teaching practices, the challenge for teachers in designing and delivering programs is to enable learners to participate in and review class work with their class mates. It is unusual for these teachers to gain understanding of inclusive education in their own instruction. Research shows that the greater part of in-service teachers undergoes less prepared at graduation to teach students with the needs of special education. Consequently, opportunities to build up skills can be found mostly through experience, and it will be important to learn the appropriate professional skills at that time (Rose, et.al, 2015). Adjusting and helping learners with major disabilities in math can take many forms. Inclusive education can be defined as an exercise in welcoming, appreciating, and supporting the different learning needs of all students in a common general learning environment. Inclusive education might be seen as a philosophy, practice and a process. Being a philosophy, it respects human multiplicity - all people, without exemption, have a valued and justified position in the educational environment (Carrington et al., 2017).

Access to an inclusive math curriculum is central to inclusive educational practices. Education is everyone's right. Still, differences remain in the scenery of the mathematical education being provided.

Meant for a number of students, especially within high school, entrance to the general math curriculum remains a desire. School leadership teams have a considerable effect on students' math achievement and resultantly affect the involvement of students with different disabilities. In recent years, the leadership aspect of education of mathematics has acknowledged some concentration from the researchers and affecting the practice of inclusive mathematics education has begun to show. One of the most common ways to manage learner variety is to allocate students to classes according to individual school success. Studies commencing 1960s started to account harmful effects of these practices on the greater part of students, and especially those on the downstream. An important aspect of inclusive mathematics education is the recognition of variation among all learners. The research literature acknowledges that a number of individual learners fall into categories that may affect their success in mathematics (Armstrong, 2017).

Literature review

Literatures from researches have shown that very tiny amount of findings that occurs in inclusive mathematics classroom. One of the published observational researches in inclusive education practices has acknowledged only five numbers of publications published yet regarding mathematics inclusive education classroom taught using the practice of Total Communication (McKenna, Shin, & Ciullo, 2015). Large number of researches carried out for the development of mathematics for the learners with hearing impairment has identified aspects of their numbers. Whereas some other studies related to the other fields of studies are very few I number. There are numerous studies that have suggested that the other aspects of mathematics such as algebra could be very easily learned by students with hearing impairment when they have been taught using the practice of Total Communication in a classroom of Inclusive Education (Watson, 2018). The literature from various studies have considered some very crucial aspects for the teachers when they are going to start their work which might include understanding of some common practices of inclusive education for the students with hearing impairments. They might be made able to effectively use the resources in learning mathematics in inclusive education classroom especially audio visual aids using strategies, and using the calculators in an appropriate way. It only just seems an exposure to be noted that applicable evaluation instruments and understanding of consequences is significant in producing a precise decision of the things that learners recognize and might be able to do. Even though, the

expansion of measurement techniques is a long-lasting process of researches in the field of an inclusive mathematical education classroom. Such techniques are necessary for the researchers to consider the consequence of interventions. These are also helpful for the teachers to use these in their classrooms daily. The development and modification of instruments used for assessment by the teachers for the learners with hearing impairments accepting responsibility of the programs being modified in a classroom of Inclusive Education might come out to be promising field of experiences and the research would welcome such emerging and modified working of the inclusive education teacher (Seah & Andersson, 2015).

The teachers teaching mathematics have always been worried for those hearing impaired students who have been striving hard to learn mathematics through the practice of Total Communication in a classroom of Inclusive Education. Several researches in the same field have felt a need for understanding the way to improve achievements in mathematics of the hearing impaired students. Some of the researches conducted in the previous years have found that there are so many approaches that make mathematics learning easier for the hearing impaired children when taught through total communication technique as compared to the other categories of disabilities, where these techniques would benefit the all then students generally (Sullivan, 2015). On the other hand no such techniques have been identified yet that would be needed to benefit the other students more. Moreover, no such specialized techniques exist, that would be needed for some of the categories of disabilities where they would be taught mathematics in the absence of their included peers (Bartlett et al., 2017).

Students who learn mathematics easily have a unique nature. Achievement of mathematics in inclusive education classroom when taught through the practice of Total Communication might be seen impossible when the teachers produce a plan for individuals separately. There is an increasing quantity of research and practices that supports inclusive mathematics education. Literature has examined three sub-themes for this statement which are; the location of the institute, norms, the Values, the beliefs and the expectations of the teachers and the direct Instruction Technique. Literature on special education contain a large amount of work done on teaching mathematics in inclusive education classroom through total communication technique whereas the next theme had been reflected from the statements above (Stosich, 2016). On the other hand, it is unusual that the other 02 areas of special education and general education mathematics education corresponded and there exists small

amount of overlapping between the authors who wrote in both of these areas. This has an association for methodological practices and succeeding findings of the research. Recommendations specified to teachers who wish to build up their inclusive practices could be confusing when they come up from diverse hypothetical backgrounds. Researchers conducted in the field of mathematics education and special and inclusive education areas have attempted to explore new commonly accepted ground and introduce new areas where more accurate and advanced work might be possible (Magnusson, 2019). In the recent times practices in teaching mathematics in inclusive education classroom through the practice of Total Communication has become an area having worth importance. The association of improving these practices has been the target of all the researches being conducted, but it needs more struggle and connections. Literature has paid greater emphasis towards inclusive approaches, where three key themes and concepts have been taken into considerations; the policies and approaches which would be affecting the accessibility to teaching and learning of Mathematics education for all the students especially the hearing impaired ones; different techniques and approaches to learn mathematics in inclusive classroom taught through total communication and teaching of mathematics in inclusive education classroom (Shepherd & West, 2016).

Statement of the Problem

Numerous agendas and projects influencing the process of implementing inclusive education round the globe has been initiated, where the process of inclusion had been viewed like a socially and culturally processed institute, an occurrence, contribution, and as an achievement of all the children in mainstream educational set up, by the identification and the removal of barriers that have been faced by the students with disabilities. Since inclusive education benefits a lot both the normal children and the disabled ones, commencing to a variant curriculum and a child focused learning environment where the process of teaching has been carried out through total communication technique. Since the goal of education is to create numerous opportunities for the neglected and socially isolated categories of the society, people with disabilities have still been affected severely round the world and the case is very special in Pakistan. The ultimate goal is to emerge an environment that would encourage the social inclusion of all the students with disabilities and specially the hearing impaired students. The process of teaching and learning for the people with disabilities has been delimited to the

boundaries of special education in Pakistan which is not enough and having less worth. The students with hearing impairments have very little or no access to the special educational institutions and not able to receive quality education. Students from diverse backgrounds and disabilities have been admitted with a hope to achieve quality education. The introduction of inclusive education has been practiced to include the students with and without disabilities removing the barriers and discrimination into one general education classroom while educating in a least restricted environment.

The study was therefore aimed to establish and initiate the procedures and processes integrated in a flourishing processing of implementing Inclusive Education process by utilizing the practice of total communication and teaching of mathematics to hearing impaired learners, and analyze the efficiency of teaching mathematics through total communication technique.

Objectives of Study

1. To evaluate the efficiency of teaching mathematics to the students with hearing impairments using total communication technique.
2. To analyze the attainment intensity of educating the “hearing impaired” learners in a classroom of Inclusive Education using the practices of Total Communication.

Research Questions

1. Identify the fundamental essentials and components to develop and improve the educational attainment of the “hearing-impaired” learners in a classroom of Inclusive Education?

Hypotheses

H_0 : There is no effect of “Total Communication” technique for teaching mathematics on the academic achievement of students with hearing impairments as compared to their nondisabled peers.

H_1 : There is a significant effect “Total Communication” for teaching mathematics in the inclusive education classroom on the academic achievement of students with hearing impairments as compared to their nondisabled peers.

Significance of the Study

This study can provide teachers, administrators, parents, and students with a extensive variety of information concerning the implementation of a program of Inclusive Education and adequacy of the inclusive classroom designed for the hearing impaired students. The study might provide deep understanding of teaching through the practice of Total Communication and teachers' perceptions and attitudes regarding using the technique in an inclusive education setting which might steer the way towards the best possible interventions for improving the academic achievements of the hearing impaired students. Conclusions drawn would be appropriate for the developments, organizations, the policy decision makers and future researchers to decide about including children with disabilities into mainstream setting.

Methodology

The following methodology was carried out to explore and investigate the efficiency while teaching the "hearing-impaired" learners in a classroom of Inclusive Education through the practice of Total Communication and its effect on the achievements of "hearing-impaired" students.

Design

The design of the study in nature was experimental. The design was ABA single subject experimental for carrying this ABA experimental design of study out.

Population

The intended population contained in this study enclosed the students of 7th class studying at Special Education of government . There were 15 students in 7th class. Permission was granted for carrying out this experimental research properly, from the principal of the institution.

Sampling

The target population for the present study was comprised of enrolled students in 7th class in “Govt Special education center for H.I.C, SWAT” and there were 15 students in that class, 08 students approximately 50% from of the entire population were preferred for this study. Sample was randomly taken from the entire population. Moreover, sample was selected through simple random selection technique.

Instrumentation

It was an experimental research and the design ABA single subject experimental design used was the for conducting the research. A total of 10 tests were produced and administered as the research instrument. The initial 03 tests were supervised as a pre-intervention test, then 04 tests were supervised during the intervention and 03 more tests were supervised at the end of the intervention. While the mathematics book of 7th class was chosen as the foremost area under discussion to be taught through the process of Total Communication, 09 Units out of 17 Units of the book were preferred for this purpose. The earlier 03 Units were chosen for pre-intervention tests aimed at assessing students' current understanding and achievement levels when taught in a special education classroom with related teaching methods. Six units were selected for it i.e unit 4 and 9 were chosen for intervention phase and taught using the practice of Total Communication. And at ending the intervention, 03 tests were supervised to evaluate the academic results and academic achievements of the learners taught using the practice of Total Communication.

Intervention

Three tests had been designed to assess the acquaintance and understanding of the hearing impaired learners before the treatment and were administered to sampled students. The sampled hearing impaired students were taught for 20 weeks in a class of inclusive education setting through “Total Communication technique”. Six Units were chosen for intervention purpose and after completing of earlier 02 Units i.e. Unit No. 4 and 5 the learners were assessed. After completing Unit no.6 the students were assessed again, after unit 7 and 8 these students were again assessed at the after completing unit 9, the understanding of the learners was assessed through an additional test. So, the total number of tests during

treatment was four. The purpose of these tests was to verify the improvement of learners instructed using total communication. Following the treatment, three additional tests were administered to assess the knowledge and understanding of “hearing-impaired” students. All the three tests were taken from the selected content which was taught to the students during intervention.

Data Collection

Data were gathered from study sample by taking tests as pre, during and post intervention. Three tests were conducted before treatment, 04 during and 03 after treatment. The collection of data was carried out for 24 weeks.

Data were gathered by ten different tests in Mathematics of 7th grade. The initial 03 tests were administered as pre-intervention tests to assess students' existing knowledge and understanding levels of what they are trained in the particular normal environments in special education setups. Four more Tests were set in Units from Unit No. 4 to Unit No. 9 which was taught with the technique of “Total Communication”, and after that these tests were administered to assess the existing achievement level of academics and understanding. Subsequent to a period of 20 weeks intervention, three additional tests were organized as post-intervention tests and set the way covering all 09 Units of the book. The 03 tests were constructed in the earlier 03, central three and final three Units and were intended to gather concluding data for student achievement and the learning outcomes.

Data Analysis

The collected data by means of all the tests conducted had been analyzed by means of repeated measures ANOVA, which compared the mean values of variables. the comparative means values of the pre, during and post intervention tests were found out their results were analyzed using descriptive statistics, the Sphericity assumptions were assessed using Mauchly's Assumption of Sphericity, which showed the p-values as 0.03 which appeared less than of standard value i.e. 0.05 And showed a non-significant p-value as it was violating the Sphericity assumptions. it was concluding that practicing Total Communication would enhance the academic achievement of the learners. Tests of within Subject effects in Mauchly's Assumption of Sphericity were assessed as well. Results of the comparative statistics concluding the values showed that the level of

comprehension of the learners was relatively high when the Total Communication practices were applied but the results of the pre-intervention were comparatively lesser. Results obtained from the repeated measures ANOVA created a baseline for drawing conclusions of the study, summary and finally recommendations for more researches and studies.

Table 1.
Mauchly's test of sphericity

<i>Within Subjects Effect</i>	<i>Mauchly's W</i>	<i>Approx. Chi Square</i>	<i>Df</i>	<i>Sig.</i>	<i>Epsilon^b</i>		
					<i>Greenhouse-Geisser</i>	<i>Huynh-Feldt</i>	<i>Lower-bound</i>
Tests	.69	6.74	2	.034	.76	.81	.50

This table showed the Sphericity Assumptions been violated or met. The very important and vital column in Mauchly's Test of Sphericity appears to be the column containing the significance p-value. P-value was 0.034 which was lesser than the standard value of 0.05, meant that there appeared a significant difference in the differences variances in the scores obtained in Sphericity assumptions was therefore violated. Luckily when the sphericity of assumption is violated, the P-value in a standard ANOVA table would misjudge the real P-value and would the chance for a Type I error. To overcome this problem, corrections must be applied to the degrees of freedom (*df*), such that a valid critical *F*-value can be obtained. In order to go for correction of sphericity of violation calculating a new P-value is very essential that would justify the sphericity. Key component for making this necessary correction is based on epsilon (ϵ), which measures the severity of sphericity problem. The value for epsilon ranges from 1 to $1/(k-1)$, where "k" is the number of levels of repeated measures factors which is 03 in this data. The value of epsilon would be lower when the violation of Sphericity is more sever. However there are three ways for estimating epsilon. As a rule of thumb, Huynh-Feldt use this estimate when ϵ is less than 0.75, where Greenhouse-Geisser use this estimate when ϵ is greater than 0.75. Lower-bound estimate is used when neither of the other two estimates is known. This estimate assumes a maximum violation of the sphericity assumption, so $\epsilon = 1/(k1)$. For the present data $\epsilon = 1/(k1)$ the number of levels of repeated measures is 3, so $\epsilon = 1/(3-1)=0.5$ which is less than 0.75.

Therefore, Greenhouse-Geisser estimate of sphericity might be used for

this data to correct the violation of sphericity.

Table 2.
Greenhouse-Geisser estimate of sphericity

Source		Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Tests	Sphericity Assumed	538.53	2	269.27	186.72	.00	.91
	Greenhouse-Geisser	538.53	1.52	353.32	186.72	.00	.91
		538.53	1.63	330.41	186.72	.00	.91
	Huynh-Feldt	538.53	1.00	538.53	186.72	.00	.91
	Lower-bound						
Error (tests)	Sphericity Assumed	54.80	38	1.44			
	Greenhouse-Geisser	54.80	28.96	1.89			
	Huynh-Feldt	54.80	30.97	1.77			
	Lower-bound	54.80	19.00	2.88			

This table declared the extremely important and significant outputs as the ANOVA results were obtained. The F-value for the conducted tests needed to be revealed as it would be allied with the level of significance and effect size (Partial Eta Squared). As the assumptions of Sphericity was violated in the results of the data, it was necessary to deal with the "Greenhouse-Geisser" row. Using Greenhouse-Geisser the mean score for tests were statistically significantly different ($F(1.52, 28.96)=186.72, p<0.05$). The value of F in the Greenhouse- Geisser is 186.718 which reach significance with a p-value of 0.00 (which is less than 0.05 alpha levels). This might meant that there would be a statistically significant difference between means of the different levels of within-subjects variables (tests). The value of ANOVA was appeared to be the significant one meant a significant effect of practicing the Total Communication method for the implementation of Inclusive Education to improve the achievement level of educational outcomes of the disabled students could be seen.

Findings

1. The significance p-value was higher as compared to the critical or standard p-value i.e. 0.05, meant that differences in significance may possibly be seen in the differences variances scores and assumptions of the sphericity was met.

2. Mauchly's Test of Sphericity explored that assumptions of sphericity had not been violated, consequently it was concluded that the differences variances were significantly not different.
3. assumptions of Mauchly's Test of Sphericity meant the null hypotheses would be rejected whereas the alternative hypotheses would be accepted drawing the conclusion that applying the practices of Total Communication to teach Mathematics to the hearing impaired learners in a classroom of Inclusive Education could affect the knowledge and understanding level of the students.
4. The line of Sphericity Assumed provided p-value as .000 where it would be supposed that there was a significant difference among all the 03 categories of conducted tests i.e. pre, during and post intervention tests.
5. A significant effect was observed while teaching Mathematics to the hearing-impaired students in a classroom of inclusive education applying total communication method.
6. Since the value of main ANOVA was significant, meant there was a considerable effect while applying the practice of "Total Communication" in teaching Mathematics to the hearing-impaired learners in a classroom of inclusive education over the educational outcomes of the learners with disabilities.

Conclusion

Results of the study when obtained could be concluded by declaring the mean scores results of the pre-intervention tests were relatively lesser than the mean scores of the tests organized during and post treatment phase. Applying the practices of "Total Communication" teaching mathematics to "hearing-impaired" learners in a classroom of inclusive education might significantly affect the educational outcomes of hearing-impaired students. The pre-, during-, and post-intervention tests did not violate the Assumption of Sphericity, resulting that the null hypothesis was rejected stating that the hearing-impaired children's mathematics skills would be improved with the application of practicing Total Communication would affect the learning of the "hearing impaired" students significantly in a classroom of Inclusive education.

Discussion

There is very limited access to school for the children with disabilities. It is also a fact that even at places which provide learning to disabled students, there is dearth of facilities and quality of education is also found low. Students from different backgrounds and disabilities get admission with the hope of getting a formal education. Unfortunately, behind the doors of every classroom, a world of diversity is seen through these learners. Obstacles encountered, however, must be identified and overcome so that all learning can be incorporated into the education system. This study was entitled as Teaching Mathematics to Hearing Impaired Students in an Inclusive Classroom in Swat Pakistan. The primary objective of the study was to explore the effectiveness of teaching hearing impaired students and differentiate the learning outcomes of these learners using Total Communication Practice in an inclusive education classroom. This research was conducted using ABA as a single subject design. The study involved the student of Institute of Government Special Education Center for H.I.C Makan Bagh, Swat. The total number of students was 15 students out of which 08 students were randomly selected as the study sample. 10 different tests were first developed for the proposed study considering the previous 03 tests and taken as a pre-intervention test to assess the current understanding of the “hearing impaired” students when they received the relevant special education and instructed through sign language. 04 tests were scheduled for center phase intervention. During the intervention phase, selected students were trained through “total communication technique” and thereafter tests were conducted to assess the improvement of those trained through “total communication method”. After treatment/intervention, 03 post-intervention tests were administered as post-intervention tests. The collected data supports the findings of earlier published studies (Shepherd&West,2016) and it was found that the “total communication technique was effective” in the learning of “hearing impaired” students. The findings of the study are also in line with the study of Sullivan (2015) where the researcher found the “total communication” technique very effective to teach mathematics to the “hearing-impaired” students.

Recommendations

The study after summarizing, findings of the research drawn and exploring the conclusion, recommendations for the advance researches can be made

following as following.

1. Appropriate training programs of teachers who teach in the classroom of an inclusive education to implement total communication practice can contribute to better academic performance of hearing impaired students.
2. Appropriate workshops and numerous awareness sessions concerning persons with disabilities, the characteristics they possess and the needs they have may be held so that teachers teaching in general education and students with disabilities are made aware of the special educational needs of persons with special educational needs.
3. In the special education classroom and the general education classroom, several studies can be conducted to assess the low-level comprehension of students, especially students with hearing loss.

References

- Armstrong, T. (2017). Neurodiversity: The future of special education. *Educational Leadership*, 74(7), pp-10-16.
- Bartlett, R., Wright, T., Olarinde, T., Holmes, T., Beamon, E. R., & Wallace, D. (2017). Schools as sites for recruiting participants and implementing research. *Journal of Community Health Nursing*, 34(2), 80–88. <https://doi.org/10.1080/07370016.2017.1304146>
- Schools as sites for recruiting participants and implementing research. *Journal of Community Health Nursing*, 34(2), pp-80-88.
- Carrington, S., Pillay, H., Tones, M., Nickerson, J., Duke, J., Esibaea, B., Malefoasi A. & Fa’asala, C.J. (2017). A case study of culturally informed disability-inclusive education policy development in the Solomon Islands. *International Journal of Inclusive Education*, 21(5), pp-495-506. DOI: 10.1080/13603116.2016.1218952
- Dyson, A. (2014). A Response to Göransson and Nilholm. *European Journal of Special Effect of the child's disability and mother's educational level. European Journal of Psychology of Education*, XX. Pp-139- 153.
- Magnusson, G. (2019). An Amalgam of Ideals – Images of Inclusion in the Salamanca. *International Journal of Inclusive Education*, 23(7-8), 677–690. <https://doi.org/10.1080/13603116.2019.1622805>
- McKenna, J. W., Shin, M., & Ciullo, S. (2015). Evaluating reading and mathematics instruction for students with learning disabilities: A synthesis of observation research. *Learning Disability Quarterly*, 22(January), 1-13. doi: 10.1177/0731948714564576
- Rose, C., Simpson, C., Preast, J., & Green, A. (2015). Bullying and students with disabilities: Examination of disability status and educational placement. *School Psychology Review*, 44(4), pp-442-444.
- Seah, W. T., & Andersson, A. (2015). Valuing diversity in mathematics pedagogy through the volitional nature and alignment of values. In A. Bishop, H. Tan, & T. N. Barkatsas (Eds.), *Diversity in mathematics education: Towards inclusive practices* (pp. 167–183). Heidelberg,

Germany: Springer.

Shepherd, K. G., & West, J. E. (2016). Changing times: introduction to the special issue. Shortcomings –a critical analysis of research on inclusive education. *European Journal of Special Needs Education* 29 (3), 265–280. doi:10.1080/08856257.2014.933545.

Stosich, E. L. (2016). Joint inquiry: Teachers' collective learning about the Common Core in high-poverty urban schools. *American Educational Research Journal*, 53(6), 1698–1731.

Sullivan, P. (2015). Maximising opportunities in mathematics for all students: Addressing within school and within class differences. In A. Bishop, H. Tan, & T. N. Barkatsas (Eds.), *Diversity in mathematics education: Towards inclusive practices* (pp. 239–260). Heidelberg, Germany: Springer

Watson, S. (2018). Introduction to special education resource rooms. Retrieved from <https://www.thoughtco.com/special-education-resource-room-3110962>

Citation of this Article:

Sharif Ullah & Habib, M.(2022). Teaching Mathematics to hearing impaired students in an inclusive classroom in Swat Pakistan. *Journal of Science Education*, 4(1), 57-72.