

Analysis of Mathematics Curriculum for Children with Hearing Impairment: An Islamic Perspective

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Abstract

Present study was designed to analyze the content of mathematics curriculum made for grade 4 and 5 and comparing it to the curriculum which is taught to hearing students; to determine the target needs of hearing impaired students for learning mathematics and its compatibility with existing Islamic perspectives of teaching; and to explore the teacher's opinion about existing curriculum of mathematics offered to students with hearing impairment from grade 4-5. 100 students of grade 4 and 5 with a distribution of 50 hearing impaired and 50 hearing were compared on three different sets of tests with low, moderate, and high level of complexity. 10 teachers teaching mathematics at special education were also a part of study to explore their opinions and target needs of hearing impaired students. The tests prepared by Subject Matter Experts (SMEs) based on current curriculum with low, moderate, and high level of complexity consisting of 10 questions with 5 marks each and total score 50 were used as research tool. National Mathematics Curriculum Document published by Punjab Government for class IV and V and Mathematics Curriculum used in special school provided by Directorate General Special Education, was used to understand what curriculum is offered to the students with hearing impairment. A semi-structured interview guide was designed to interview teachers. Independent sample t-test was used to find the differences in scores achieved by hearing and hearing impaired students on 3 standard tests with low, moderate and high level of complexity. Results indicate that hearing students score high on all three mathematics test as compared to hearing impaired students. Content analysis indicates that present curriculum is not designed according to the needs of hearing impaired students. Modified curriculum was lacking in contents related to specific topics e.g Zakat & Usher, Islamic inheritance rules, Islamic economy (profit/loss). It contains the content that is beyond their cognitive abilities. Mathematics curriculum used in special schools for grade IV and V should be revised and updated according to the needs of hearing impaired students in perspective of Islam.

Keywords: Mathematics curriculum, hearing impaired students, Islamic perspective

Introduction

In everyday life understanding of mathematics enables us to manage time, money and handle everyday situations that involve numbers; as for example, to calculate the time we required getting to work, the amount of food we need in order to feed our families and cost of things of everyday use. Curriculum and instruction both are considered to bring change in educational process. “What to teach” and “how to teach” are important questions in the mind of Muslim teachers carrying responsibility of transfer of Islamic law and culture to next generations. Any change in education is confirmed from change in content and instructional strategies that the teachers opt to deliver the content. The schools face curriculum and instruction issues when teaching students with disabilities (Zawane¹ & Malale, 2018). They have to address the diversity among students. Meanwhile they are overwhelmed by the objective of training students to be sensitive towards Islamic financial values. Sometimes it become difficult to find the content related to the children with special needs especially when dealing with students lacking speech and hearing. These difficulties not only may arise with the content selection, nature of concepts to be taught but also with the organization of the content and aligning it with the activities and Islamic examples.

Hearing impaired children have proved to be just as capable intellectually as their hearing peer (Peterson² et.al., 2016). The question is which teaching technique or style to follow and how to design their curriculum to meet their requirements and fulfill their educational objectives. For teachers it is certainly a challenging task, especially in the teaching of mathematics, the science of numbers, Islamic economic system etc. Majority of the hearing impaired students have been struggling in the schools in learning mathematics (Marschark³, 2015). The reason may be lack of understanding,

¹ Zwane, S. L., & Malale. Investigating barriers teachers face in the implementation of inclusive education in high schools in Gege branch, Swaziland. *African journal of disability* M. M. (2018), 7(1),Pg 1-12.

² Peterson, C. C., O'Reilly, K., & Wellman. Deaf and hearing children's development of theory of mind, peer popularity, and leadership during middle childhood. *Journal of experimental child psychology*, H. M. (2016) 149, Pg 146-158.

³ Marschark, M., Shaver, D. M., Nagle, K. M., & Newman,. Predicting the academic achievement of deaf and hard-of-hearing students from individual, household,

inappropriate design of curriculum taught to them, inadequate content of the curriculum, weak teaching technique and strategies. All these factors develop frustration in the hearing impaired students leading towards repeated failure in the educational setup. Standard content and assessment is suggested for hearing impaired students. Individuals' perspectives of hearing loss influence what they think should be taught to students who are deaf or hard of hearing. Currently, there is general consensus that, to the greatest extent possible, the curriculum for students who are deaf or hard of hearing should be the same as that of hearing students NCSE⁴ (2011 & 2012).

National research council⁵ (1997) provides an over view of post school outcomes and curriculum and instructional issues for students with disabilities and their relationship to the prevailing standards. National research council discussed the implications of including students with disabilities in the expected outcomes, curriculum and instructions, standard based reforms and emphasized the alignment between standard based reform and special education in these important areas. State standard reviews and in-depth surveys in the areas of mathematics and science indicated that “recently developed state standards framework link maths and science content to classroom practices and require different methods of teaching, different material and more active role of students” (Blank and Pechman⁶, 1995; Schmidt⁷ et.al., 2005). The content documents in the areas of language, art, reading, mathematics and social studies

communication, and educational factors. *Exceptional children*, L. A. (2015) 81(3), Pg 350-369.

⁴National Council for Special Education. NCSE Main Achievements in 2011. (NCSE). (2012). Annual report 2011 Retrieved from https://ncse.ie/wp-content/uploads/2014/10/Annual_Report_accessible_version.pdf

⁵National Council for Special Education The education of deaf and hard of hearing children in Ireland. NCSE Policy Advice. (NCSE). (2011). Retrieved from <https://ncse.ie/wp-content/uploads/2014/09/DeafEducationReport.pdf>

⁶Blank, R. K., and Pechman, State Curriculum Frameworks in Mathematics and Science: How Are They Changing Across the States? Washington, D.C.: Council of Chief State School Officers, 1995. *National Council of Teachers of Mathematics*. Curriculum and Evaluation Standards for School Mathematics . E. M. (1995). Reston, Va.: NCTM, 1989.

⁷Schmidt, W. H., Wang, H. C., & McKnight. Curriculum coherence: An examination of US mathematics and science content standards from an international perspective. *Journal of curriculum studies*, C. C. (2005) 37(5), Pg 525-559.

must be closely looked into to see “whether they are generic or subject matter specific, what level of knowledge they demand, and how explicit they are about pedagogy”.

Different subjects are offered to students with hearing impairment and mathematics is one of them. In Pakistan students with hearing impairment are taught same curriculum that is offered to the hearing students, few concepts are deleted or omitted (Akram⁸ & Bashir, 2012). Mathematics is a tool that we use in our daily life. Researches indicate poor mathematical skills and more mathematical difficulties for students with hearing impairment compare to their normal counterparts. 17-18 year’s deaf child shows the performance of 10-12 year’s hearing child (NCSE, 2011; Gowramma.I⁹, 2014). 50% graduates deaf and hard of hearing students perform at just below a sixth grade level in computation and at only a fifth grade level in problem solving (Pagliaro¹⁰, 2012; Convertino¹¹ et.al., 2009). Hearing impaired students face mathematical problems due to: deficit in language and insufficient methods of instructions (Nordheimer¹², 2015) To improve the performance of students with hearing impairment there is need: to recognize the benefits of language particularly sign language in conceptual understanding of mathematics, use visual organizers, use of technology, critical thinking and mediating textbooks. Islam also emphasizes to learn mathematical concepts especially those topics related to Zakat, Ushar & inheritance. These topics depict the importance of learning mathematics for independency in practical life. It is clearly described in Quran as:

⁸ Akram, B., & Bashir, Special education and deaf children in Pakistan: an overview. R. (2012). *Journal of Elementary Education*, 22(2), 33-44.

⁹Gowramma,. Arithmetic difficulties of children with hearing impairment. In *The Routledge International Handbook of Dyscalculia and Mathematical Learning Difficulties*. I. P. (2014) Routledge. Pg 125-145

¹⁰ Pagliaro, Mathematics instruction and learning of deaf and hard-of-hearing students: What do we know? Where do we go? *The Oxford Handbook of Deaf Studies, Language, and Education*. <https://doi.org/10.1093/oxfordhb/9780195390032.013.0011> ,C. M. (2012).

¹¹ Convertino, C. M., Marschark, M., Sapere, P., Sarchet, T., & Zupan,. Predicting academic success among deaf college students. *Journal of deaf studies and deaf education*, M. (2009) 14(3), Pg 324-343.

¹² Nordheimer, S., & Brandl. Students with hearing impairment: Challenges facing the identification of mathematical giftedness. In *CERME 9-Ninth Congress of the European Society for Research in Mathematics Education* , M. 2015, February ,Pg 1032-1038

يُوصِيكُمُ اللَّهُ فِي أَوْلَادِكُمْ لِلَّذِ كَرِ مِثْلُ حَظِّ الْأُنثَيْنِ ۖ فَإِنْ كُنَّ نِسَاءً فَوْقَ اثْنَتَيْنِ فَلَهُنَّ ثُلُثَا مَا تَرَكَ ۖ وَإِنْ كَانَتْ وَاحِدَةً فَلَهَا النِّصْفُ ۚ وَلِأَبَوَيْهِ لِكُلِّ وَاحِدٍ مِّنْهُمَا السُّدُسُ مِمَّا تَرَكَ إِنْ كَانَ لَهُ وَلَدٌ ۚ فَإِنْ لَمْ يَكُنْ لَهُ وَلَدٌ وَوَرِثَتْهُ أَبَوَاهُ فَلِلْمُتَّكِئَةِ الثُّلُثُ ۚ فَإِنْ كَانَ لَهُ إِخْوَةٌ فَلِلْمُتَّكِئَةِ السُّدُسُ ۚ مِنْ بَعْدِ وَصِيَّةٍ يُوصِي بِهَا أَوْ دَيْنٍ ۗ وَأَبَاؤُكُمْ وَأَبْنَاؤُكُمْ لَا تَدْرُونَ أَيُّهُمْ أَقْرَبُ لَكُمْ نَفْعًا ۖ فَرِيضَةٌ مِنَ اللَّهِ ۚ إِنَّ اللَّهَ كَانَ عَلِيمًا حَكِيمًا

Translation: Allah commands you regarding your children: the share of the male will be twice that of the female. If you leave only two 'or more' females, their share is two-thirds of the estate. But if there is only one female, her share will be one-half. Each parent is entitled to one-sixth if you leave offspring. But if you are childless and your parents are the only heirs, then your mother will receive one-third. But if you leave siblings, then your mother will receive one-sixth' after the fulfillment of bequests and debts. 'Be fair to' your parents and children, as you do not 'fully' know who is more beneficial to you. This is an obligation from Allah. Surely Allah is All-Knowing, All-Wise (Al-Nisa¹³, Ayat:11).

On another occasion Quran says:

يَا أَيُّهَا الَّذِينَ ءَامَنُوا لَا يَجِزُ لَكُمُ أَنْ تَرِثُوا النِّسَاءَ كَرِهًا ۚ وَلَا تَعْضُلُوهُنَّ لِيَرْتَدَّ عَنْهُنَّ أُبُغْضٌ مَّا ءَاتَيْنَهُنَّ إِلَّا أَنْ يَأْتِيَنَّ بِفَحِشَةٍ مُّبَيِّنَةٍ ۚ وَعَاشِرُوهُنَّ بِالْمَعْرُوفِ ۚ فَإِنْ كَرِهْتُمُوهُنَّ فَعَسَى أَنْ تَكْرَهُوا شَيْئًا وَيَجْعَلَ اللَّهُ فِيهِ خَيْرًا كَثِيرًا

Translation: O believers! It is not permissible for you to inherit women against their will or mistreat them to make them return some of the dowry 'as a ransom for divorce'— unless they are found guilty of adultery. Treat them fairly. If you happen to dislike them, you may hate something which Allah turns into a great blessing (Al-Nisa¹⁴, Ayat:19).

Almost a decade ago, it was reported that the schools of hard of hearing youngsters in Pakistan are in reverse in their showing strategies and instructive framework. The schools are only unfit to prepare our hard of hearing nationals into certain and competent people and also these schools have bombed in the endeavors to make the hard of hearing students to build up their fullest potential to address the difficulties of hearing world. The main cause of deaf children lingering behind their listening ability peers appears to be a lack of provision of assistive devices and poor oral communication skills of the children (Nelson¹⁵ & Bruce, 2019. Information

¹³ Al-Quran 4 : 11

¹⁴ Al-Quran 4: 19

¹⁵ Nelson, C., & Bruce. Children who are deaf/hard of hearing with disabilities: Paths to language and literacy. Education Sciences, S. M. (2019) 9(2), Pg 134

provided by (Noor¹⁶ et.al,2020; Walker¹⁷ et.al., 2015) more than 80% of children with hearing impairment are not provided with hearing aid. Qi¹⁸ & Mitchell (2012) reported that despite latest developments and advancements in the education of hearing impaired students, their achievement are consistently behind their hearing peers', and many children with hearing impairment are not able to acquire the necessary knowledge and skills to reach their full potential.

Hearing impaired students frequently have difficulty in mathematics and other subjects. So there has been a need to make adaptations in curriculum of special need students. The curriculum is same but some adaptations are done in the syllabus by Directorate General of Special Education. The purpose of this study was to explore and analyze the content of mathematics curriculum of hearing impaired students at primary level and determine the target needs of the children in learning mathematics.

Objectives of the study

The study was intended to achieve the following objectives:

- To analyze the content of mathematics curriculum offered to Muslim students with hearing impaired in terms of course objectives.
- To determine the educational needs of Muslim hearing impaired students for learning mathematics and whether it has been achieved or not.
- To explore the teacher's opinion about Islamic perspective of existing curriculum of mathematics offered to students with hearing impaired from grade 4-5.

¹⁶Noor, H., Choudhary, F. R., & Javed, Teachers' report on status of communication with hearing impaired children in special schools of Punjab: An evaluation of current linguistic competence of HIC. Global Social Sciences Review, T. (2020). 5(2), Pg 370-381. [https://doi.org/10.31703/gssr.2020\(V-II\)](https://doi.org/10.31703/gssr.2020(V-II)). Pg 35

¹⁷ Walker, E. A., Holte, L., McCreery, R. W., Spratford, M., Page, T., & Moeller,. The influence of hearing aid use on outcomes of children with mild hearing loss. Journal of Speech, Language, and Hearing Research, M. P. (2015) 58(5), Pg 1611-1625.

¹⁸ Qi, S., & Mitchell, Large-scaled academic achievement testing of deaf and hard-of-hearing students: Past, present, and future. Journal of Deaf Studies and Deaf Education, R. E. (2012). 17(1), Pg 1–18.

Research Design

The design of the study was descriptive in nature. Standard Math Test and Interview Schedule were used to collect the data.

Population

- The population of this study comprised on all hearing impaired students, studying in the special education schools of district Faisalabad.
- All teachers teaching at Govt. Special Education schools for hearing impaired children of district Faisalabad were also included in the population of the study.
- The normal hearing students in public schools of district Faisalabad were taken as the population of the study

Sample of the study

In order to draw the sample size from the population, simple random sampling was used to draw the total sample of the study as depicted in table 1 and 2.

Sample was consisted of the following:

- 50 hearing impaired students studying at primary level were taken from 5 schools of special education with an age range of 8 to 10 years
- 50 normally hearing students studying at primary level were taken from 2 schools of Faisalabad with age range of 8 to 10 years.
- Equal number of male and female participants were taken into the sample.
- 10 teachers were taken from Govt. Special Education School for Hearing Impairment Faisalabad.

Table 1

School wise distribution of sample of hearing impaired children

Sr.#	Name of Institution	Sample
1.	Government Girls Higher Secondary school of Special Education for hearing impaired, Faisalabad.	10
2.	Government Boys Higher Secondary school of Special Education for hearing impaired, Faisalabad.	10
3.	Government Special Education center Layall-pur Town, Faisalabad.	10
4.	Government Special Education center Iqbal Town, Faisalabad.	10
7.	Government Special Education center Jaranwala, Faisalabad.	10
Total		50

On the other hand, 2 schools were selected having normal hearing population. Detail of these 2 schools is given below.

Table 2
School wise distribution of sample

Sr.#	Name of Institution	Sample
1.	Government Girls Higher Secondary school, Faisalabad	25
2.	Government Boys Higher Secondary school, Faisalabad.	25
Total		50

Instruments of research

The data was collected through:

- Desk Review
- Semi structured Interview Questionnaire
- Three Test of Mathematics

Desk review of Syllabus: Desk review of syllabus was conducted as a part of assessment by collecting, organizing, and synthesizing available information related to topic. There was a need to conduct the desk review because it would help in giving the research a better view and Islamic dimension. For this purpose, Mathematics curriculum recommended for students with hearing impairment was evaluated. The prescribed curriculum of mathematics subject at primary level for hearing students was studied to develop a foundation or criteria for the evaluation of curriculum for students with hearing impairment. On the basis of desk review 3 standard tests were designed with low, moderate, and high level of complexity. Moreover, desk review also helped in the development of semi structured interview schedule.

National Mathematics curriculum document: National Mathematics Curriculum Document by Punjab Government for hearing impaired children and normal children for class IV and V was used to understand what curriculum is offered to students.

Mathematics curriculum in special school system: Mathematics curriculum in special school system provided by Directorate General Special Education, was used to understand what curriculum is offered to students with hearing impairment.

The semi structured Interview Questionnaire: Questionnaire consisting of 8 semi structured questions, was developed with the help of literature review and Subject

Matter Experts (SMEs) to investigate the attitudes, perception, and opinions of the teachers about the existing curriculum of mathematics for hearing impaired children and its compatibility with the students learning and needs of mathematics in Islamic Perspective. Given below are the statements of semi-structured interview.

1. What are the problems faced by hearing impaired student regarding subject of Math at primary level?
2. Is the current curriculum of mathematics of primary level is according to the special educational needs of hearing impaired students in Islamic perspective?
3. Is the syllabus product oriented focusing on outcomes of learning or process oriented focusing on specifications of learning tasks and activities that students will undertake during the course?
4. How will you grade current curriculum on a scale of 1 to 10?
5. Which of the topics of mathematics would you like to add to the current curriculum of mathematics for children with hearing impaired?
6. Can students with deafness do calculations in daily life after studying curriculum of mathematics?
7. Do students with hearing impairments find mathematics interesting to study through activities or books?
8. Are refresher courses planned for educators who instruct pupils with hearing impairments in mathematics?

Three test of Mathematics: Hearing and hearing impaired students were evaluated with a gap of 1 month by their teachers on the tests prepared by SMEs based on their current curriculum with low, moderate, and high level of complexity. They were asked to solve the test in an hour. Test was consisted of 10 questions with 5 marks each and total score was 50. Tests were checked and evaluated by their respective teachers.

Results

Data was collected and analyzed in two phases.

Phase 1:

First of all, the selected students with normal hearing and hearing impairment were tested on three test of mathematics. The comparison of the performance of the children in test of basic mathematical skills was made shown in table given below.

Table 3

Mean, Standard Deviations, and t-values of mathematics test conducted by hearing and hearing impaired students (N = 100)

Hearing Category							
Scales	Hearing n = 50		Hearing Impaired n = 50		<i>t</i> (98)	95% <i>CI</i>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>		<i>LL</i>	<i>UL</i>
Test 1	41.32	3.91	27.28	4.90	15.85***	12.28	15.80
Test 2	37.74	4.40	23.48	2.31	16.37***	12.53	15.99
Test 3	34.94	4.52	17.80	4.55	18.96***	15.34	18.93

*** $p < .000$.

Note. Test 1= Test with low level of difficulty; Test 2= Test with moderate level of difficulty; Test 3= Test with high level of difficulty; CI = Confidence Interval; LL = Lower Limit; UL = Upper Limit

Table 3 indicates that there was a significant difference in the tests results of mathematics given to both hearing and hearing impaired students. Results also indicate that hearings students score high on all three mathematics test as compared to hearing impaired students.

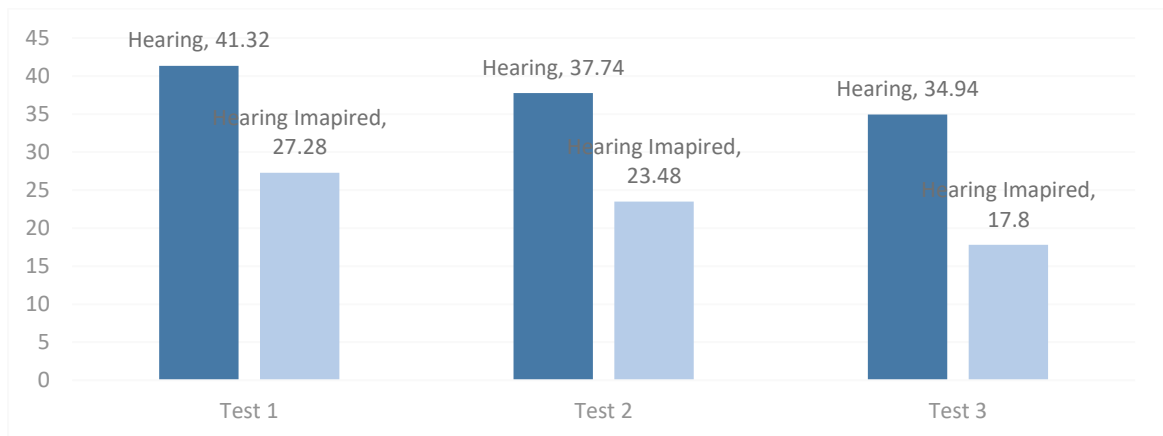


Figure 1: Graphical representation of data of mathematical test scores

The Graph indicates that hearing students score higher on all three mathematical tests as compared to hearing impaired students who score quite low on all three mathematical tests. Findings indicate that these tests were beyond the capacity of hearing impaired students.

Phase II

Phase II was consisted of semi-structured interview conducted by 10 teachers who were teaching hearing impaired students. After interviewing, the responses were analyzed with the help of thematic analysis. Several frequent trends formed, and the findings are presented below. Questions are provided, along with a detailed response.

What are the problems faced by hearing impaired student regarding subject of Math at primary level?

Hearing impaired children are lagging behind by their hearing peers at almost 2-3 years. So it is quite difficult for teachers to make such students understand the mathematical rules.

95% teachers pointed that hearing impaired students do not have auditory memory and find it difficult to keep things in short term memory, that is why they have slow response time in addition, subtraction, multiplication and other related tasks.

90% teachers reported that hearing impaired children have language delays. Hearing impaired students are less advantageous than their hearing peers as they need special supervision to understand a number of concepts, language, and problem solving skills.

70% teachers reported that hearing impaired children have delays in development of logical reasoning. Therefore, acoustics is a problem for hearing impaired students, they need visualization, and proper visual access is required for these students to make them understand. Some teachers reported that primary level students are not fully involved in lecture so keeping them attentive is an important but tiresome task that requires energy and special skills.

85% teachers reported that every student has different learning capabilities. Even if teachers give their best even then students having hearing impairment take different time to comprehend new knowledge. Even students of same age and studying in same class have academic gap and understand things differently.

90% teachers reported that hearing impaired students have difficulty in developing linguistic structures. Hearing impaired students have difficulty in comprehension of certain language structures. Some teachers reported that there are particular phrases, for example '*more than*' or '*less than*', '*HCF*', and '*LCM*' etc. that are quite challenging for hearing impaired students.

60% teachers pointed that difference in reading some problem of mathematics by hearing impaired students. They said that they understand individual words and pieces of mathematics word problems rather than understanding a more relational and holistic approach.

1. Is the current curriculum of mathematics of primary level is according to the special educational needs of hearing impaired students in Islamic perspective?

100% of special education teachers responded that The current curriculum does not meet the educational requirements of hearing-impaired students in Islam.

So, after receiving such an alarmingly high response from all the teachers, they were asked to point out the content of mathematics of class IV and V. The topics included in grade IV curriculum were addition, subtraction, multiplication, division, factorization (HCF, LCM), fractions, measurements, and geometry. On the other hand, topics included in grade V were arithmetic operations, LCM, HCF, fractions, percentages, unitary method, geometry, and area.

Teachers pointed out that it is quite difficult to teach students the concept related to factorization, fractions, and especially geometry. Teaching mathematics require special teaching skills as these students lack comprehension skills relative other hearing skills that have proper auditory memory.

One of the teachers responded that this curriculum seems to be quite unrelated to the Islamic needs of hearing impaired children who actually uses sign language to convey and understand everything. So there is no need to make them understand the difficult concepts of factorization and geometry at this level of their education.

Some teachers have pointed out that present curriculum contain real life problems although these problems are necessary for students to understand the concepts but for students with hearing impairment it is a challenge for teachers to teach as well as students to understand the latent meaning along with the abstraction of concepts. As students have differences in their comprehension so it takes a lot of time.

Another teacher pointed out that it is difficult for them to make students understand different words like '*divisible*', '*square root*', '*multiplier*', '*HCF*', '*LCM*', '*areas*' and '*angles*' etc.

Teachers who were teaching hearing impaired students were then asked to rank the current curriculum being taught at special education schools. The main purpose of obtaining this ranking was to have a better understanding of teachers' point of view who were in the field and were teaching mathematics to hearing impaired students.

Table 4**Teachers' Ranking of Curriculum Areas of grade IV by level of priority**

CURRICULUM AREAS	High		Medium		Low		Total	
	Priority (1-		Priority (4-		Priority			
	3)		6)		(7-9)			
	<i>f</i>	%	<i>f</i>	%	<i>F</i>	%	<i>F</i>	%
Addition, subtraction, multiplication, division, Factorization (HCF, LCM)	10	100	0	0	0	0	10	100
Fractions	3	30	4	40	3	30	10	100
Measurements	5	50	3	30	1	10	10	100
Geometry	8	80	2	20	0	0	10	100
	2	20	3	30	5	50	10	100

Table 5**Teachers' Ranking of Curriculum Areas of grade V by level of priority**

CURRICULUM AREAS	High		Medium		Low		Total	
	Priority (1-3)		Priority (4-6)		Priority (7-9)			
	<i>f</i>	%	<i>f</i>	%	<i>f</i>	%	<i>F</i>	%
Arithmetic Operations	10	100	0	0	0	0	10	100
HCF & LCM	4	40	4	40	2	20	10	100
Fractions	5	50	3	30	1	10	10	100
Decimals & Percentages	4	40	4	40	2	20	10	100
Distance, Time, & Temperature	8	80	2	20	0	0	10	100
Unitary Method	3	30	4	40	3	30	10	100
Geometry	3	30	4	40	3	30	10	100
Perimeter & Areas	2	20	3	30	5	50	10	100
Information Handling	2	20	3	30	5	50	10	100

30% teachers mentioned that they find it difficult to explain the semantic meaning of mathematical problems to students. It takes a lot of time to make them understand the questions and its Islamic perspective. Although hearing impaired

students are good in imitating the problems solved at board in class room yet they find it quite difficult to understand the holistic and semantic meaning of problem because of their own delays.

90% teachers reported difficulty in teaching mathematical rules to these primary level hearing impaired students because of their learning delays. As one of them said, it took him days to make his students understand the basics of some concepts and their relationship with the needs of a Muslim society..

80% teachers reported that their hearing impaired students do not find current curriculum interesting and do not pay any attention to what has been taught to them because of lack of link with the Islamic values of the society. Teachers further said that the main reason behind this is the difficulty level of current curriculum and educationists are not paying attention to to relate topics of percentage, ratio etc with Islamic laws of financial transactions, laws of inheritance etc.

A teacher pointed out that current mathematics curriculum has several has distinct mathematical language which further make it foreign and complex for hearing impaired students as there are some questions that include familiar words with precise meanings but they actually differ from their normal meanings. So interpreting the mathematical language with its ambiguous vocabulary is quite challenging. Linking concepts with the situation faced by these children and their families is important.

2. Is the syllabus product oriented focusing on outcomes of learning or process oriented focusing on specifications of learning tasks and activities that students will undertake during the course?

90% teachers reported that the present curriculum was product oriented as it only focuses on the formal assessment of students. They are even bound to do so because of current curriculum of mathematics. The demand of current curriculum is to focus only on the formal assessment to assess the knowledge of students. Even the real life problems mentioned in the mathematics books do not provide this opportunity.

A teacher reported that hearing impaired students perform better on problems that focus only on one dimension but problems having two or more dimensions are quite challenging for students. So that's why transfer of learning is difficult for these students.

70% teachers reported that present curriculum focuses on practice exercises rather than true problem-solving, therefore avoiding cognitively challenging aspects of word problem solving. Because of this, hearing impaired students found it difficult to be engaged in sufficiently challenging word problem situations.

A teacher reported that hearing impaired students were better able to show their mathematical strength and understanding when problems are presented in step-by-step procedure and lack mental calculations. But they are poor in interpreting this knowledge and even applying this knowledge in new arena.

3. How will you grade current curriculum on a scale of 1 to 10?

80% teachers ranked current curriculum on scale of 6. 10% teachers ranked it at 5 and remaining 10% ranked it at 4.

All of the teachers recommended to modify the current curriculum of mathematics that address more appropriately the needs of hearing impaired students. Most of the teachers responded that present curriculum exceeds the needs of hearing impaired students.

4. Which of the topics included in current curriculum of mathematics would you like to add to the current curriculum of mathematics for hearing impaired students?

70% teachers responded that there is no need to add more topics in the current curriculum of mathematics for hearing impaired students. All teachers rather suggested in modifying the current curriculum for mathematics by reducing it.

60% teachers responded that students have difficulty in understanding problems of HCF, LCM, geometry, and unitary method. 20% teachers reported that they find it difficult to make students understand the mathematical concepts related to factorization. As students have poor auditory memory therefore they rely on their visuospatial memory. And present curriculum does not provide this opportunity as it requires communicating these rules and strategies. Present curriculum needed to be more precise with less auditory memory requirement.

40% teachers reported that when they teach mathematical concepts ‘visually’ they are less complicated for hearing impaired students to understand. According to them hearing impaired students are visually-oriented so they find it easier to understand

concepts when presented in written form as they are more focused towards visual thing rather auditory things or lip reading. A teacher said that students are more likely to attempt, and understand, a mathematical rule and problem when they used hands-on, visually engaging mathematical activities and resources.

20% of teachers suggested that present curriculum require generalization of different mathematical concepts, application of given rules, problems related to ascending and descending order to be included in existing curriculum.

5. Can students with deafness do calculations in daily life after studying curriculum of mathematics?

All of the teachers responded that after studying current curriculum, students are able to do daily life simple calculations including addition, subtraction, multiplication, and division.

60% teachers also agreed that current curriculum is also helpful in doing calculations related to time. But 50% recommended that current curriculum should have monetary real life problems that can be helpful for daily life problems related to money.

70% teachers reported hearing impaired students are good in making categories of things that they have learnt through their curriculum.

90% teachers said that their main objective while teaching the current curriculum is to prepare these students to perform independently in daily life calculations.

6. Do hearing impairment student study mathematics with interest either through books or through activities?

All of the teachers reported that activities are better and develop great interest in hearing impaired students rather than mere books. 70% teachers also added that activities with visual aid involving drawings are helpful for these students. One of the teachers said that teaching mathematics through a visual manner in which students can experience the problem as purposeful and relate to it in a meaningful way is a successful way to understand mathematical concepts. A few teachers reported whenever they teach their students something through some activity it remains within their long term memory.

60% teachers also reported that as the present curriculum do not fit appropriately to the needs of hearing impaired students that's why majority of students don't have the conceptual clarity rather they learn the steps just by cramming them.

80% teachers added that they play activities, use real objects, and create simulated situations for their students while teaching them new mathematical concepts. On the other hand, 60% teachers reported that they involve their students in activities while teaching mathematics, as involving them has always helped. But all of the teachers suggested that curriculum should be activity based along with visual aids (diagrams).

7. Are refresher courses arranged for teachers, to teach Mathematics to hearing impaired students?

All of the teachers reported that refresher courses are not arranged regularly for special education teachers.

80% teachers suggested and demanded regular courses based on new strategies that will help them in teaching mathematics.

Conclusions

Following conclusions were draw on the basis of content analysis of current curriculum and interviews conducted by special education teachers:

1. Present curriculum on mathematics taught to hearing impaired students at primary level, was difficult in forming new concepts as they are beyond capability of these students as compared to that taught to hearing students.
2. Hearing impaired students have different target needs for mathematics that were not fulfilled by current curriculum.
3. Different linguistic capabilities require supervision by teachers and needs appropriate skills for understanding mathematics in Islamic perspective.
4. The hearing impaired students were learning mathematical concepts through cramming as reported by some teachers because they were not provided visual aids to clarify concepts or relating it with needs of a Muslim society.
5. Assessment and evaluation procedures used in mathematics need to be modified.
6. Practice exercises and relating it with Islamic Perspective with step by step procedures are absent in current curriculum of hearing impaired students.

7. Fewer training courses were being conducted to guide special education teachers to specifically teach mathematics at primary level to hearing impaired students.
8. Due to deficiency of hearing impaired students in language development, it had become difficult for mathematics teachers to teach statement questions.
9. Limited use of visual aid and practical examples drawn from Islamic society was creating problems for teachers in making foundation concepts clear to hearing impaired students.
10. Some specific chapters related to geometry, factorization, and measuring area were more difficult for students to understand concepts.
11. Current curriculum has less generalized concepts along with less applicability to real life. Topics related to ratio and percentage not taught in link with Islamic laws of Zakat, transaction and inheritance.
12. The mathematics curriculum for grade IV and V is in need of revision especially in terms of linking the basic concept with Islamic perspective.

Recommendations

Based on the study, the following recommendations can be made:

1. Adapted curriculum may be organized into visually appealing, bright, and activity-focused books to make teaching and learning easier for educators.
2. The mathematics curriculum may be changed or adapted to include all relevant chapters and subjects for pupils who are deaf. It is crucial to connect key ideas with Islamic principles and legal frameworks.
3. The prevention of math cramming can be achieved through the appointment of mathematics specialists and the provision of in-service training for math teachers to enhance their approach to teaching.
4. In order to prevent issues with maintaining discipline, the number of deaf students in a class shouldn't exceed the prescribed limit.
5. From an early age, it is important to provide deaf children's language development. Proper attention in order to reduce the difficulties when teaching mathematical topics which require for highly developed language abilities in the students.

6. It is important to make sure that teaching resources for mathematics are available.
7. In order to prevent teaching multiple grades, special education teachers in deaf schools maybe appointed on an emergent basis.
8. More math classes ought to be scheduled for kids who were admitted to school later than their peers and who consequently fall behind.
9. The national curriculum for mathematics can be taken into consideration while updating and revising the math curriculum for grades IV and V.
10. In service teacher training and refresher courses ought to tackle the idea of relating mathematics to Islamic principles and laws.



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