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SCIENCE EDUCATION FOR DEAF: REFLECTIONS OF TEACHERS

Abstract

The study aims to explore the perception of science teachers regarding learning of science among deaf students and problems faced by deaf students in science classrooms. This study was qualitative in nature and five science teachers of deaf were interviewed regarding their perception and classroom observations were made. The recorded interviews were transcribed and then thematic analysis was done by the researcher and observations were interpreted. It was concluded that teachers are not positive regarding science learning of deaf and their major focus is on content learning rather than inculcating interest and inquiry among students. However teachers are of the view that if equipment and facilities are provided in schools, deaf can learn science through hands on experiences. This study suggests teacher training programs focusing on expecting high goals for deaf and specific strategies to foster science learning among deaf.

Key words: science education, deaf, teachers

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Introduction

Science education for children with hearing impairment is limited to elementary level in Pakistan. Only vocational subjects are offered for deaf and hard of hearing students are available beyond elementary level but these students can't opt for subjects of science and technology despite of their interest. This difference is based on the false assumption that deaf students can't learn scientific concepts due to their inability to hear, although they don't have any intellectual deficiency.

Teachers play important role in learning of science by students. Teacher's expectations regarding abilities of deaf students in science classroom influence the use of teaching methods and hence achievement of students. Method for teaching science involves hands on experiences and discovery methods in combination with lecture method. Elefant (1980) observed high scores for deaf students who used hands on materials in science classrooms. Similar findings for experimental group were found by Wagner (1980) who used hands on activities for science learning. In another study 60 deaf students were assigned with four different printed science instructional formats. The study revealed higher gain scores of participants on posttest of the group who was taught through highly pictorial content (Diebold & Waldron, 1988). Quinsland (1986) reported significant effect of experiential learning for deaf on a three-day delayed test of factual knowledge when compared with lecture method. According to Lang and Steely (2003) well designed instructions and efficacious science programs developed for hearing students can be adapted for deaf students. Sufficient literature supports teaching of scientific concepts to deaf students with the use of variety of teaching methods.

Low expectations of teachers' lead to learned helplessness and poor academic achievement of students (Antia, Stinson & Gaustad, 2002). However when teachers are well aware of the needs of deaf students, they develop positive attitudes and high

expectations which ultimately lead to greater achievement (Jarvis & Iantaffi, 2006; Sari, 2007). Human capabilities are not restricted by their physical disabilities, it may change the human characteristics in the form of sensory or physical ability, but it does not restrict their capabilities. As far as children with hearing impairment are concerned they are facing a number of problems regarding their academic, intellectual, linguistic, social and emotional development in schools. Students with hearing impairment have many problems regarding curriculum adjustment and modification. Moreover there is a problem of interpreting sign language of the teachers and certain concept are not interpreted correctly , leading to academic lack and lag of the students with hearing impairment. In the specific context of science education for deaf in Pakistan, it is important to unfold the perceptions of teachers about learning of science among deaf students, and how these perceptions are related with their qualifications and experience.

The present study aims to explore the perceptions of science teachers regarding learning of science among deaf and problems of deaf students in learning science.

Objectives of the Study

1. Investigate the learning problems faced by students with hearing impairment in science classroom?
2. Unfold the perceptions of science teachers of deaf regarding learning of science?
3. Find out the factors affecting learning of science among children with hearing impairment

To meet the objectives of the study, following questions were formulated:

1. What are the learning problems faced by students with hearing impairment in science classroom?

2. What are the perceptions of science teachers of deaf regarding learning of science?
3. What are the impacts of teacher's perception on teaching and learning of deaf students in science classrooms?
4. How the teacher qualification and experience affect the science learning of students with hearing impairment?
5. How instructional methodology and instruction combined with material resources impacts students learning and participation in science classrooms?
6. What are the implications of curriculum adaptations and assessment on the learning of science of students with hearing impairment?

Research Design and Methodology

The research design employed observations and semi structured interviews. The purpose of observation was to critically observe the problems faced by deaf students in learning science. For this purpose science classes for thirty five minutes each were observed. The observation included; classroom environment, teaching methodology, instructional materials, assessments, interest and learning of student were observed. Observation protocol was developed by researcher which included description of participants, their roles, classroom setting physical environment and role of researcher.

The other instrument used for research was structured interviews. Researcher developed twenty questions after discussion with experts. These questions included both open ended and closed ended question. These questions were about teacher's beliefs, competencies, experiences, science curriculum, problems of deaf students in learning science and suggestions to improve science learning among deaf.

Researcher personally visited five science teachers for interviews. These interviews were initially recorded and then transcribed in written.

This research study includes validity checks. Triangulation results from the use of multiple data collection methods including interview, observations, and analysis. To enhance this external validity this study provides rich, thick descriptions so that transferability is possible by the interested reader.

Three institutions were selected on the basis of maximum strength of deaf students. Two schools were selected from government sector and one school was selected from private sector. Researcher selected elementary level section of school for observations. Five classes of grade 8 were selected from these three schools and five observations of each class were conducted. In addition, twenty two observations of thirty five minutes each were inspected. These observations helped to get in depth insight on the science classrooms of deaf student

Data Analysis and Interpretation

The three schools of deaf were coded as G-1, G-2 and P-3. From school 1G, two science classes of grade 8 of Teacher A and Teacher B were observed five times a week of thirty five minutes each. Similarly, the third school of private setting was coded as P-3 where two science classes of grade 8 of Teacher D and Teacher E were observed five times a week of thirty five minutes each. On the contrary, school coded as G-2 the researcher did five observations of one science class of grade 8 of Teacher C. All observations of teachers were coded in roman numbers i, ii, iii, iv, and v followed by O of observations. Detailed notes were taken during observations and later on were interpreted.

Interpretation of Classroom Observations

All teachers of different schools treated science as a subject which was very much of rote memorization for students with

hearing Impairment. Teaching methods were very teacher centered which did not allow or encourage student participation. Critical and analytical thinking skills which are the important aspect of science learning process were missing in their science classes. In all situations, teachers have inadequate content knowledge without proper sequencing. Research has proved that students with hearing Impairment best learn through visual presentations. Visual learning style is one of the best ways to enhance deaf students learning which missing aspect from the teaching content was. Teachers were poorly trained as in one of the highly qualified teacher was unable to convey the content in appropriate manner.

The quality of education was particular low due to insufficient material resources. Only one teacher used flashcard of Human Eye. The teachers were not creative in designing such activities and tasks which matched the science lessons to engage students in process-based learning. There was also lack of motivational techniques to increase student's interest, confidence, and competence in science at secondary level.

The adapted curriculum was not properly developed and certain linkages and sequences went missing among objectives and topics. It was very different from the regular curriculum while these students shared the same cognitive abilities as their regular counterparts.

There are multiple reasons contributing to students' failure to engage in meaningful learning in science classrooms. First of all they were no recall of prior knowledge of deaf students where one should build a new series of knowledge. The teachers did not use any remedial tactics and instructional strategies to engage deaf students in meaningful learning. These strategies include analogies, questioning, cues and probing, and prompting. The students' behavior clearly defined that they are least interested in science as they were no queries from their side. They just copied the content written on the whiteboard and rote memorizing it.

Unfortunately, the teachers were not familiar with the variety of challenges faced by students in in-depth learning of the subject matter. The teachers of deaf blindly followed the adapted curriculum. This adapted curriculum certainly skipped sequence among topics and activities with no aims and objectives stated to inbuilt among students.

Other resources such as science laboratory and materials like flashcards and models were not available for students with hearing impairment. Field-trips which are very necessary part of learning of students with hearing impairment were deliberately out of question due to extra effort on the side of teachers and school administration.

Fig: Finding based on observations of science classroom children with hearing impairment.

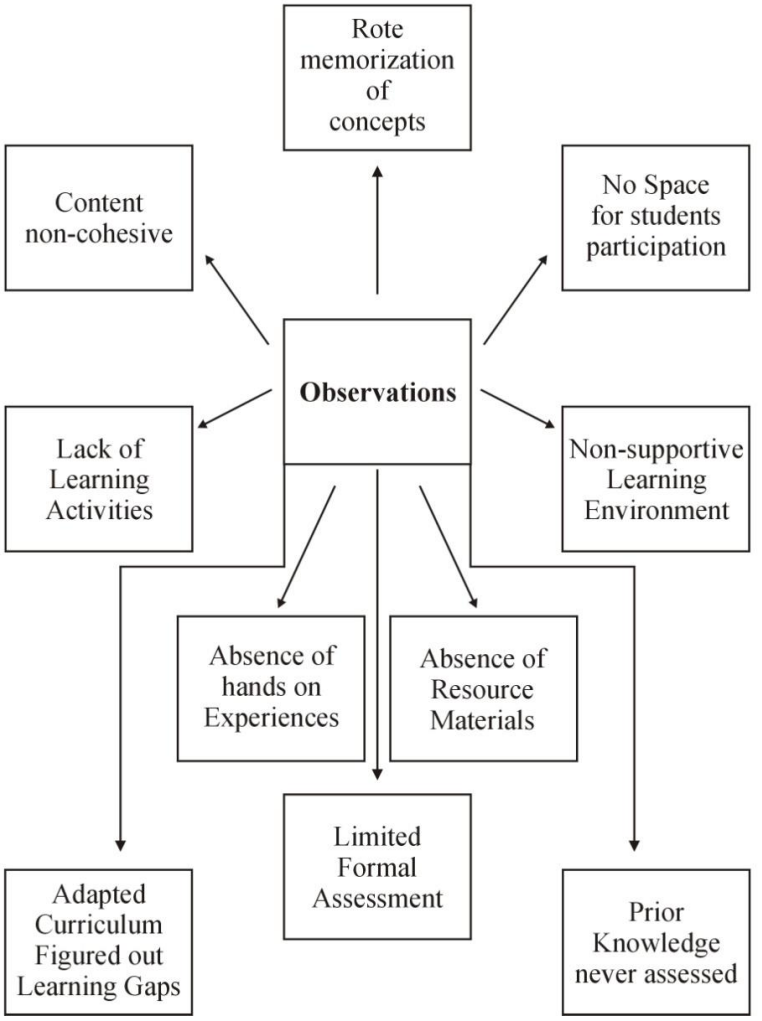


Fig. 1

Interviews

Five teachers from three selected schools were interviewed through semi structured questions. All these teachers were teaching science to children with hearing impairment. These interviews were recorded with the permission of teachers and later were transcribed in written form. Few themes were extracted from the reponses of teachers which are being discussed.

Teacher Qualification and Experience

Researcher included three questions to ask about qualification and experience regarding science teaching in response to "up to what grade have you taken science as a subject?" Teacher A of school G1 replied I have been studying science throughout my education. She was holding MSc degree in chemistry. Teacher B and D had studied science as subject up to intermediate level while teacher C and E studied up to matric level.

In response to the question "when did you develop interest in teaching of science in teaching of science subject?" Teacher B and D agreed that they are teaching science only for the reason that they are supposed to teach science as they are class teacher. Teacher C and E were of the view that they did not like science teaching in start but once they started they became habitual of it. However teacher A shared that she had interest in teaching science and for this she joined teaching profession.

Researcher asked the teachers to share the nature of their experience in science teaching and how it is different from teaching of other subjects to student with hearing in teaching impairment. All teachers agreed that overall their experience with deaf children was good. They shared that teaching science to these is easy as compared to other subjects. Teacher A stated "the content of science for these students is to the point and deaf children can learn science easily as compared to other subjects. For example if student learn atomic numbers he can easily get marks. So there is no need to explain the concepts". Similarly teacher E stated "these children

cannot learn lengthy question so science is very easy for them as they have to learn to the point". The responses of to this question indicated that science content selected for these children is very short.

Perception about Teaching Science to Children with Hearing Impairment

Regarding interest of children with hearing impairment in science teacher A and B agreed that these children show interest in science learning. Teacher C was undecided about the question and teacher D and E admitted that these are teachers who can develop interest in students in using appropriate classroom activities.

When teacher were asked about performance of students with hearing impairment as compared to other subjects, teacher A and C were of the view that these student perform better in science because content is short and there is no need to learn lengthy questions. Teacher B and E stated that those students who have good intellect perform well in all subjects including science.

According to teacher A, D and E children with hearing impairment like science subject and they wanted to pursue science discipline in next grades, however they are not provided with the option. Teacher B and C stated that these students never showed their interest in learning science beyond elementary level. However all the teachers except D agreed that these students should be provided with the option of studying science beyond elementary level? Teacher D strictly opposed the idea of teaching science beyond elementary level. Teacher C added "yes can be taught but only if content is kept short".

Teaching Methodology

All teachers responded that it is not possible to include experiments and hands on activities in each lesson. However they all were of the view that experiments and activities can increase science learning among deaf students. Teacher C responds "we do

not perform experiment in the classrooms. However if they are perform will definitely increase interest and learning of students.

All teachers shared that students with hearing impairment show interest and become very excited when teachers brings a new concept through A.V aids they do ask questions during activities. All teachers emphasized that science can be best learnt through experiments and activities. Teacher C was of the view that "content should be short to avoid anxiety among students". While teacher B strongly recommended "science should be practical. Rote learning should be minimized because students learn best through practical.

On the other hand, when these teachers were asked to share the strategies which they use in their science classrooms all of them stated lecturer method through total communication. Teacher D added that whenever I got time I use activities in classroom.

Curriculum Adaptation

Teachers shared that they follow the adapted curriculum provided by board of intermediate and secondary education (BISE) Lahore. This curriculum is adapted from general education curriculum and about 40 to 60% content is adapted. All teachers except D believed that this adaptation is according to individual's needs and abilities of students. Teacher D stated "there is too much adaptation similarly all teachers believed that shortening of content helps in learning science but teacher D stated "no, short content creates problems in learning".

Equipment and Facilities

None of the school has science lab. Teacher D and E of P3 School told that they have a resource material room in their school in which some A.V aids are available e.g., flesh cards, models etc. All teachers emphasized on building an up to dated laboratory to enhance practical learning of science among deaf students.

Assessment Techniques

When these teachers were asked about assessment techniques used to access science learning of deaf students, they shared that verbal questioning, writing responses on board, weekly tests and classroom discussion are used in the classroom.

Interpretation on Interviews

Schools are not hiring science teachers with the educational background of science. Only one teacher was holding MSc chemistry degree. All others have studied science only up to matric or intermediate level. This reflected in their class room teaching that they were lacking science content knowledge. This was a contributing factor in low motivation among teachers. They were teaching science not for their interest but only for the duty assigned to them as class teacher. All teachers did not find any difference in teaching science and other subjects. They were teaching just as other theoretical subjects are being taught. Instead they found science teaching comparatively easy for the reason of short content and no need of explanation. This creates a gap in learning science among students. As these teachers have no educational background of science, low motivation in science teaching and a perception that deaf students cannot learn lengthy questions, these factors influenced learning of science among students with hearing impairment.

All teachers agreed that deaf students show interest in science subject. Teachers shared that the performance of children with hearing impairment in science is not very different from other subjects. Teacher's views regarding option of learning science beyond elementary level were divided some of them opposed the idea while some agreed that science can be offered to them.

Teachers were reluctant in using extra resources to enhance the process of learning. However they all were agreed that active learning is the best technique for learning of science. However, they were not using available resources in lessons.

The curriculum provided by BISE is very short and for the sake of adaptation many concepts were either excluded from

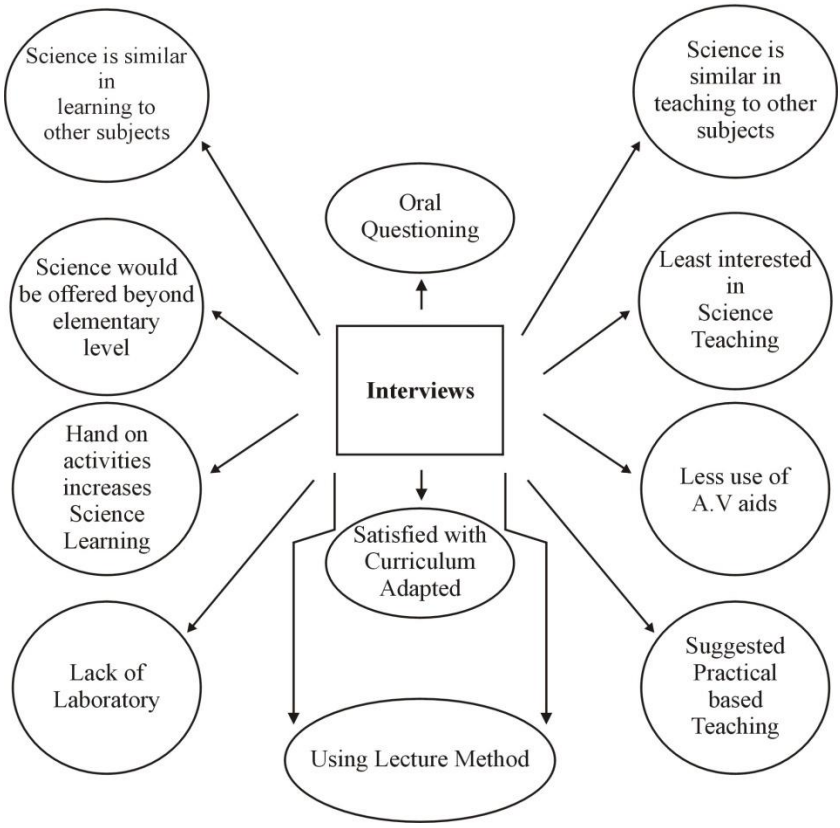
content or were only included in the form of objective. Teachers were not interested to explain the concept in detail and their only focus was to develop rote learning instead of developing concepts.

Schools have resource material room where some hands on material and flash cards are available and but teachers are not using that facility in fruitful manner. However they all demanded for up to dated laboratory to enhance practical learning of science among children with hearing impairment.

Teachers are not using assessment techniques in every lesson. They were only focusing on oral questioning during the class.

The discussion with teachers showed the mind set of teachers. They have belief that science cannot be taught to students with hearing impairment and they have set low profile for these students. See figure 2.

Fig: Finding based on interviews of science classroom children with hearing impairment.



Conclusions

Following are the conclusions of the study following the research questions

Question no. 1: What are the learning problems faced by students with hearing impairment in science classroom?

The intent of this research was to find out the problems faced by students with hearing impairment. This qualitative study

revealed many factors which were responsible for adequate science learning. The factors included teachers' perception, teaching methodology, science equipment and resources; lack of appropriate teacher's training; shortening of curriculum; and underestimating students with deaf abilities.

Question no. 2: What are the perceptions of science teachers of deaf regarding learning problems of deaf students in science classroom?

The perceptions of science teachers of deaf students were not positive about learning of science. During interviews the teacher's whole emphasis was on "to the point content" or very "short content". This perception and mindset clearly showed in their science instruction in science classrooms. As they only emphasized on rote learning. Students were not given any chance to discuss their understanding about the topic.

Question no. 3: How the teacher qualification and experience affect the science learning of students with hearing impairment?

The teacher's science qualification was very varied. The maximum was M.Phil. Chemistry and the minimum were around secondary level science qualification. Interestingly, this difference of qualification was not shown in their teaching and learning process. All these teachers whole heartily followed the rote learning process of learning for students with hearing impairment.

Question no. 4: What are the impacts of teacher's perception on teaching and learning of deaf students in science classrooms?

The teacher's impact of their perceptions on deaf students science learning was manifold. The most significant impact was lack of will among teacher's to try any new strategies and opportunities to enhance science learning of students with hearing impairment. The other significant impact was underestimating the cognitive abilities of deaf students in competition with their hearing counterparts. This perception leads to lack in creativity

which in return resulted in lack of enthusiasm and passion for learning environment.

Question no. 5: How instructional methodology and instruction combined with material resources impacts students learning and participation in science classrooms?

During observations of classrooms rote learning was very visible. Teachers promoted this way of learning as this lead to good grades among students with disabilities. However, in their interviews they did approve that the subject of science should be combined with practical and hands-on approach.

Question no. 6: What are the implications of curriculum adaptations and assessment on the learning of science of students with hearing impairment?

As a silent observer I witnessed adapted curriculum for students with deaf very confusing and unclear. I think the Board of Intermediate and Secondary Education need to agree and differentiate among the words "adaptation" and "shortening" the curriculum. They have chopped the content of the curriculum brutally without realizing what impact it will have on the learning of deaf students. Moreover, one of the teachers responded in the interview that chopping of the content creates problems in learning. Figure 3 presents overall problems faced by deaf students during learning of science.

Fig: Problems in learning science.

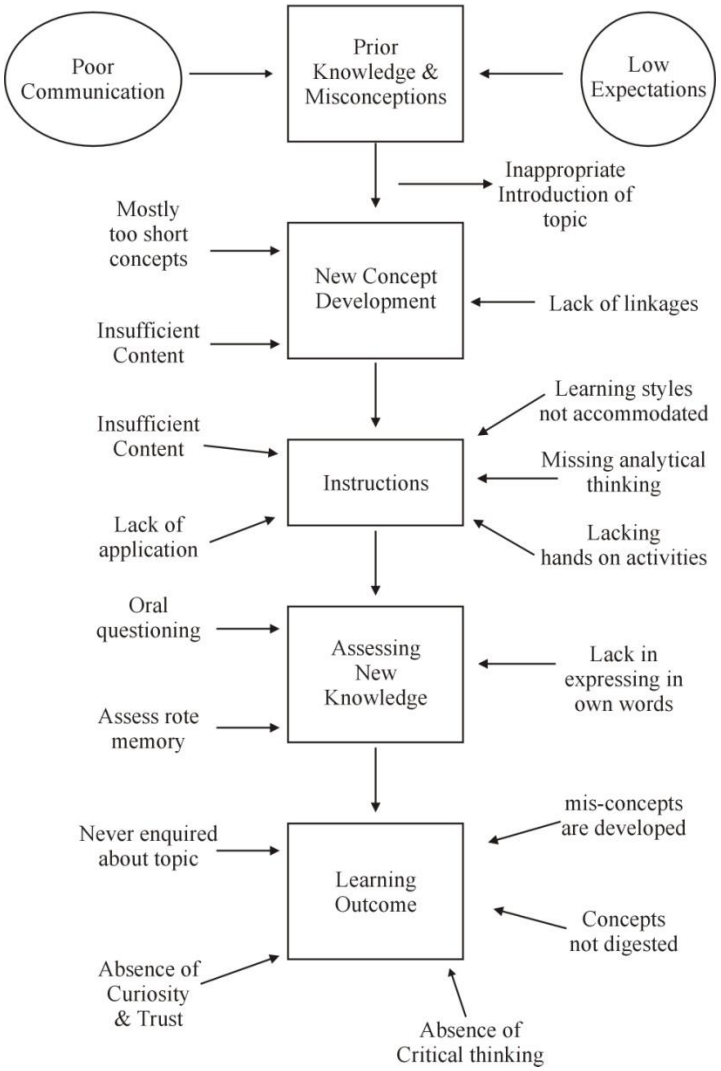


Fig. 3

Recommendations

The following recommendation emerged from the research are proposed by the researcher:

1. Board of intermediate and Secondary Education need to look at the adapted curriculum of students with hearing impairment and develop a well-connected adapted curriculum to bridge the learning gap faced by students with hearing impairment.
2. Plan immediate training plan for the teachers of deaf where focus should be giving equal opportunities to deaf students
3. School administration with the support of Government of Pakistan should provide necessary resources and materials for science labs

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