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**RESEARCH PAPER**

**Impact of Medium of Instruction on Conceptual Understanding of Students of Secondary Level in the Subject of General Science**

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**PAPER INFO**

**Received:**

October 30, 2020

**Accepted:**

December 05, 2020

**Online:**

December 31, 2020

**Keywords:**

Medium,  
Conceptual  
Understanding,  
General Science

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**ABSTRACT**

The present study analyzed the impact of medium of instruction of teachers on conceptual understanding of students of secondary level in the subject of General Science. It was descriptive study. The scope of the study limited to secondary schools of Karachi. Four major research questions formulated. The strategy of research was mix method research. The population of the study comprised of students and General science teachers in secondary schools of Karachi. Stratified random sampling design was adopted. Pre test and post test were conducted for students. Questionnaires and interview protocols were developed for teachers' and experts respectively. Data was collected from 245 and analyzed qualitatively and quantitatively. This study resulted that concepts of the students are not cleared due to using second language as a medium in teaching General Science. Teachers may use mother tongue or national language or bilingual as a medium of instruction during teaching General Science to make the students conceptual and creative.

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**Introduction**

Education is the only way to move forward and to compete with the modern world in this era of research and technology. It is a well-known fact that education is a rout to progress and prosperity but if the rout is unreliable there is no chance to reach the destination. The same is the case of Pakistan where even after 71 years of independence, education which can solve our major problems and drive us on the way of progress, is still a neglected area. General Science is very important subject. Its teaching is very important at school level. The present study strictly focused on the impact of medium of instruction of General Science on conceptual understanding of secondary school students. General Science at the Secondary school level is the stream of arts group. It has been observed that General Science is taught with the help of different languages in our schools. In elite class population the General Science is being taught in English medium, in normal class schools are teaching

General Science in Urdu medium and some of schools are teaching in Sindhi medium of instruction. Boylan, C. (1996) explored that English medium students not withstanding their advanced preliminary aptitude, were found to do much more badly than their mother tongue. Students were on the whole feeble in problems that evaluate understanding of theoretical concepts, the aptitude to differentiate between scientific terms and capability to relate scientific knowledge in practical situations.

The study was resulted that the students disabled in science learning by their low levels of English adeptness and course of English as a subject through the primary stages not enough to put in order them for complete English captivation set of courses in secondary schools. Hussain (2011) Investigated that to teach science and math; pre-service teachers were trained for reform of traditional system. The teachers had major problems of pronunciation, meaning of difficult words, understanding the scientific terms and need of correction in dictation. Yip (2003) Concluded that the teachers could not understand the religious book of English translated version. Pre-service teachers could not get their subject command even by getting training about reform plan. In spite of all these, teachers and students both learned easily in their local language. So it was declared that mother tongue is better medium of instruction rather than second language.

Webb (2004) explored that there were many disadvantages of English as a medium of instruction in non English speaking countries. For instance, he claimed that many students live in rural areas; they neither understand nor speak English. So the authority put the consideration that there was lack of English proficiency for formal learning. Nomlomo (2007) stated that the learner and teacher should be at the same page by speaking same language while teaching and learning process. He also concluded that the students were suffering emotionally, cognitively and academically as a result of getting education in a foreign language English. Memon (2007) affirmed that conceptual understanding refers to ways of contravention down misconceptions. Significant learning in science frequently requires learners to go through a method of conceptual modification. It means learners must be familiar with the disparity of their own theories and logical concepts and must make scientific concepts. Conceptual alteration involves Meta cognitive understanding where students have to distinguish their way of judgment in order to make suitable relation between their personal thoughts and scientific concepts. Students have to supervise and assess their existing understanding of assured concepts in order to make a significant link between previous and fresh knowledge. Shami (1994) named this situation Meta cognitive understanding. Nayyar (2016) explored that science education in Pakistan is inadequate. Teachers' attitude towards learners; is derisory due to traditional methodology, medium of instruction in second language and uninspiring way of teaching which disheartened the students and kill curiosity.

Ammar (2015) stated that the medium of instruction is a biggest problem for teaching science examinations demand memorization, so the students have no reason to understand and internalize the subject matter. Laboratory facilities are not

available expect in private elite schools as General Science students are not taken to the laboratories only science students (Physics, Chemistry, Biology) use the laboratory. This is also investigated in an analytical study of scientific attitude of science teachers in relation to scientific interest of students (Mittal, 2011). Mehmood (2010) explored that the principal conceptual frame for developing indicators has eight dimensions according to Crarvin framework concepts will be cleared after the evaluation of fuels through curriculum. Claudia (2002) investigated that there is only service providing but no quality control and check and balance for improvement. Given program not seen to be applicable conceptual understanding of the students is not cleared due to medium of instruction, Lack of laboratories and uninspiring teaches. Praveen (2014) investigated that choices, interests and concepts are developed at this stage but in spite of having great interest in the subject of their own choice, students are unable to achieve desire understanding and mental satisfaction. So the result of secondary and higher secondary level seems disappointing. Nelson (2006) proposed that the traditional methods of science teaching indulge students in several difficulties at different steps. All the stakeholders show dissatisfaction with regard to content, teaching methodologies and for lack of resources to teach general science effectively. Science education affects the society, like culture, spirituality, cleanliness, attitude, and relations. Society member becomes responsible and take an active part in society building. Our science education is not better have there is filth, smoke and non disciplinary condition.

Maria (2011) explored that parents and teachers do not provide guidance about science in their daily life. Lack of guidance is a big factor in adopting science and arts group.

Armstrong (1989) investigated the impact of science on our society; scientifically librated society play a great role in development of country, less educated people cannot adopt the scientific rules, so the members of society cannot walk pace to pace with the world. Science society (2017) explained that Pakistan can empower through Mathematics and Science education because these subjects makes the students intelligent, hard working and intellectual. Progress is conditional with science education.

Bano (2015) reported that science education is facing three current challenges. Medium of instruction, lack of facilities and poor trained teachers.

Tok (2010) explored in his text book evaluation the process of monitoring is poor and curriculum material is used for rote learning yet. Conceptual understanding is very poor.

Mukherjee (2016) investigated that scientific environment is not provided to the students in schools. All resources are not applied due to lack of time and expenditure conceptualization about the topic is clear among in science students. Medium of Instruction is not playing significant role in conceptualization.

Rehman (2004) also investigated the problems facing science students of secondary schools which are above mentioned in citation. They are only overburdened with many subjects. They have no career counseling at school or home. A specific policy by Pakistan-US (2015) investigated in technology program about the teachers training, medium of instruction, text book material, poor method of teaching environment provided to students has need so many improvements.

After the study, it is observed that such type of research is not conducted. Research has neglected this topic of immense significance due to the above mentioned reasons. The study will help to fill the gap in conceptualization of General Science curriculum among students of secondary school students.

### **Material and Methods**

The researcher provided the questionnaire to the respondents by himself and used other resources for distribution and collection. Test was conducted among the students. Interview protocols by the experts were also managed. The obtained data was put in the laptop for tabulation. Than data was analyzed with the help of SPSS-19

Data was analyzed qualitatively and statistically. The data was organized on tally sheets; tables were prepared regarding different variables. Two types of data analysis techniques were used. First, the content analysis (qualitative) of the interview protocols and check lists were made and the result was described in narrative for the analysis of questionnaire was quantitative which involve t test Chi-square test (for testing relationship), Independent sample t-test (used for two groups), ANOVAs test (used for more than two groups) and Paired sample test was used to analyze the student data

### **Results and Discussion**

**Table 1**  
**Teachers' response rate**

No. of Teachers	Frequency	Percent	Valid Percent	Cumulative Percent
236	236	100.0	100.0	100.0

**Table 2**  
**Medium of Instruction**

	Frequency	Percent	Valid Percent	Cumulative Percent
English medium	119	50.4	50.4	50.4
Urdu medium	117	49.6	49.6	100.0
Total	236	100.0	100.0	

Hypothesis 1 There is no significant difference between the medium of instruction and conceptual understanding of the students developed in the subject of General Science

**Table 3**  
**Group Statistics**

Medium of Instruction	N	Mean	Std. Deviation	Std. Error Mean
English medium	119	73.4874	3.20716	.29400
Urdu medium	117	76.0684	4.04655	.37410

**Table 4**  
**Independent Samples Test**

	Levene's Test for Equality of Variances		t-test for Equality of Means						
	F	Sig.	T	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
								Lower	Upper
Equal variances assumed	6.830	.010	-5.435	234	.000	-2.58098	.47488	-3.51657	-1.64539
Equal variances not assumed			-5.424	220.754	.000	-2.58098	.47580	-3.51868	-1.64328

The table shows that the significance value of 2 tailed tests is less than .05, so the null hypothesis rejected.

#### Analysis of the Student's Data

Hypothesis 2 There is no significant difference between the scores of the test of students taken on the traditional style (Pre-Test) and taken on the modern style (Post-Test).

**Table 5**  
**Paired Samples Statistics**

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Test-1	21.44	248	2.931	.186
	Test-2	4.83	248	2.161	.137

**Table 6**  
**Paired Samples Correlations**

		N	Correlation	Sig.
Pair 1	Test-1 & Test-2	248	.617	.000

**Table 7**  
**Paired Samples Test**

	Paired Differences				t	df	Sig. (2-tailed)
	Mean	Std. Dev	Std. Error Mean	95% Confidence Interval of the Difference			

					Lower	Upper			
Pair 1	Test-1 - Test-2	16.617	2.333	.148	16.325	16.909	112.157	247	.000

The table shows that value of P is less than .05 , so the null hypothesis is rejected

**Table 8  
Test-1**

	Frequency	Percent	Valid Percent	Cumulative Percent
	15	13	5.2	5.2
	16	4	1.6	6.9
	17	4	1.6	8.5
	18	22	8.9	17.3
	19	14	5.6	23.0
	20	48	19.4	42.3
Valid	21	15	6.0	48.4
	22	30	12.1	60.5
	23	10	4.0	64.5
	24	41	16.5	81.0
	25	42	16.9	98.0
	26	5	2.0	100.0
	Total	248	100.0	100.0

The table 8 describes that in traditional test 13 students which is 5.2% of designed sample got the score 15, 8 student (3.2%) got 16 score,22 students (8.9%) got 18 score,14 students(5.6%) got 19 score,48 students(19.4%) got score 20,15 students (6%) got the score 21 , 30 students (12.1%) got the score 22 , 10 respondents (4%) got the score 23 ,41 respondents (16.5%) got the score 24 , 42 respondents (16.9%) got the score 25 and 5 students (2%) got the score 26 out of total score 30. No student failed in pre test out of 248 students.

**Table 9  
Test-2**

	Frequency	Percent	Valid Percent	Cumulative Percent
	0	26	10.5	10.5
	2	7	2.8	13.3
	3	11	4.4	17.7
	4	30	12.1	29.8
	5	85	34.3	64.1
Valid	6	40	16.1	80.2
	7	34	13.7	94.0
	8	12	4.8	98.8
	9	1	.4	99.2
	10	1	.4	99.6
	12	1	.4	100.0

Total	248	100.0	100.0
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This table 9 explains that in up to date test 26 students which is 10.5% of designed sample got the score 0 , student (2.8%) got 2 score,11 students (4.4%) got 3 score,30 students(12.1%) got 4 score,85 students(34.3%) got score 5,40 students (16.1%) got the score 6 , 34 students (13.7%) got the score 7 , 12 respondents (4.8%) got the score 8 ,1 respondent (0.4%) got the score 9 , 1 respondent (0.4%) got the score 10 and 1 student (0.4%) got the score 12 out of total score 30. Only 2 students passed in post test out of 248 students.

### Findings Concerning to Teachers Questionnaire

There were one hundred nineteen male respondents and one hundred seventeen female respondents which were the 50.4 % and 49.6 % of the designed sample respectively.

Opinion of all the respondents (100%) is that existing system of science education is not producing conceptual understanding in General Science students. In case of Urdu medium and English medium schools, the value of P is 0.000 which is less than 0.005; it was inferred that there is significance difference between Urdu medium and English medium schools of Karachi.

### Findings Concerning to Students Pre-Test and Post-Test

This part of study consisted of findings achieved from pre-test and post-test

In case of pre-test and post-test, the value of P is 0.000 which is less than 0.005; it was inferred that there is significance difference between Urdu medium and English medium students

Majority of students 100% passed in Urdu medium test which was knowledge based and items of the test were taken from the prepared exercises.

Only 2 students 0.8 % of the designed sample failed in English medium test in which items were conceptual based and any question were not selected from given exercises in General Science textbook. The total score remained same. It means the concepts of the students are not cleared.

### Findings Concerning to Experts Questionnaire

1. Concepts of the students are not cleared due to using second language as a medium in teaching General Science.
2. Books are published in English but teachers teach it in other languages.
3. Only science group is available in most of public and private schools. Majority of schools terminated the arts group due to the lack of student's interest.

4. There is no relevance in bookish language and language of instruction.
5. The general trend is that most of students interested in science study not in arts group.

### **Conclusion**

Most of teachers, experts and students were unsatisfied by the existing system of Science Education that the system was not producing conceptual understanding among the General Science students.

Majority of teachers and head teachers explained that test paper conducted for the students' evaluation was not helpful in conceptualization of the General Science students at Secondary stage.

In case of medium of instructions there are two medium of instructions which are adopting our schools the students who are studying in Urdu medium schools have clearer learning concepts than those who are studying in English medium schools. This shows the effect of medium language but students have work twice as hard to make another language a medium of instructions. One is work for completing task and the other is to learn linguistics.

### **Recommendations**

1. Teacher should prepare lesson plan before teaching General Science
2. Teachers should focus on SMART objectives
3. General Science should be taught in the mother tongue
4. By language, Teacher and student should at the same page, the language spoken by the student should be adopted by the teacher for clearing conceptual understanding and better results.



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