A Study about use of Foreign Language in the Students' Assessment as a Barrier in Exact Evaluation of the Individual's Expertise of Material

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Abstract:

In this age of an information-based global education & economy, standards are strategically important as marketing tools and also required to interconnect such activities. Usually the flow of technology and latest information is usually from the west since last several decades. The under developed countries has to rely on that literature to keep them on the track of development. As a test case, Pakistan has no core engineering books written in Urdu so the medium of instruction and examination has to be the English for Engineering Education. Same is the case for other professions. So the medium of kindergarten, primary school education and etc has to be English in order to get along with such professional education programs. According to a brain study it takes multiple region of the brain in the language processing. Reading a scientific literature gets a doubly job for a reader when it's in the foreign language. Hence more focus is shifted to understand the language then understanding the concept explained. Countries like China & Japan are the good examples of economic and technology giants of today's world who started up the journey with translation of scientific books to their native language. A study is therefore designed to evaluate the role of language in the correct assessment and understanding of the concepts. The results are supporting the hypothesis since there is an obvious shift in GPA or grades towards positive side when they were examine in their own language. The unification or standardization of education is vital but should be content based and independent of language or medium of instruction.

Keywords: Education standardization, Assessment, language, scientific literature

Introduction:

The advancement in Information & Communication Technologies is bringing the world too close that every nation finds a clear need for greater attention to standards that are acceptable globally. The global standardization process should be supported and delay in this process will have detrimental effects. [1]. Standard education system is critical to the development of a global marketplace hence cannot be ignored. Before preparing a standard a review for need and significance must be done. The fundamental standard issues include historical perspectives, local demographic and dynamics, Governance, Economic Impact, Interoperability, existing national and international policies, Testing, Certification and Conformity Assessment procedures. On the other hand the strategic standard issues are health, safety, environment, sustainability, energy, intellectual property, trade & electronic commerce, ethics, competition & antitrust.

To realize the significance of information flow the Japanese history may be a good example. The Shogun government followed a policy of national isolation and banned foreign trade with Western countries, since 1635 [2]. Only the Nagasaki port with one single Dutchmen partner was kept open for trade. It was very thin channel yet substantial amounts of information of the outer world flowed in. In the year 1720, the import of nonreligious books was legalized. It opened the doors of the comprehensive study of Western science and technology [2]. To make this information readily understandable, the Japanese started translation of books in their local language. In 1770, the Gempaku Sugita translated a book on anatomy [3]. Translation of books was continuously done from all areas of science like astronomy, physics, chemistry, engineering, botany, geography, geology, and etc [4]. It was not aimed only for professionals but some of the translated books were to diffuse the knowledge of science among ordinary people; for example, Suijosen Setsu Ryaku (Fundamental The001 of Steam Ships) in 1848, Ensei Kiki Jutsu (Ingenious Mechanisms of the West) in 1854, explains the description of control mechanisms of a speed governor and a boiler.

This strategy of translating core science literature in local language worked magically and turns around the Japanese nation. In 1796, Yorinao Hosokawa published a book titled Karakuri Zui (Collection of Illustrations of Mechanisms). It shows the quick absorption of knowledge and concepts being in their own language so that in just 26 years Japanese got capable to produce such a scientifically descriptive indigenous literature. The quality of the illustrations and accuracy of information provided was such that, in 1967, S. Tachikawa, a specialist in the history of science and technology, could successfully construct and operate, without much tuning, one of the automata. It was believed that no such comprehensive book on automata was ever published in the contemporary Western world [4]. Fan Xiangtao [5] explains scientific translations & its social functions. China adopted this translation of scientific books strategy from 1900. In a decade many scientific textbooks for primary and secondary schools were translated into Chinese to introduce science education in China at school level. It had a great influence on the Chinese society. During the period of 1860-1894, the policy prevailing in China was “Chinese learning as the foundation and western learning for the application”. It was supportive for the purpose of introducing western technologies to China. However, the post war effects revealed the limitations of such a doctrine and the translation for “making the country rich and strong” was proved to be a prophetic hope [6]. Yan Fu (1854-1921), the great translator and enlightener in modern China,

proposed the well-known guiding principles for saving the Chinese nation: arousing strength from the people, inspiring wisdom within the people and refreshing the minds of the people [6]. The Chinese intellectuals, such as Kang Youwei, Liang Qichao and Yan Fu brought consensus for "saving the nation through science" and "saving the nation through education. 1902 Education System of the Chinese Qing government was revised and subjects in science were introduced in Chinese schools at various levels [7]. The realization of education on science was never possible without the abolition of the Imperial Examination System[1]. It was finally abolished in 1905[5]. As a consequence the modern science education in the new-style schools was popular at the beginning of the 20th century. Statistically the years between 1907 and 1909 primary schools approached to 210,000 with around 2.5million students, and high schools reached 1319 with 110,000 students. Translation activity was then stimulated which exerted an extensive influence. The translation work was carried out largely by Chinese students studying abroad or who had joined back and also by some voluntary public organizations. Scientific textbooks were translated mostly to meet the need of the newly-established schools. They were unequalled in number and were accepted with enthusiasm though their quality [8]. In addition, attention was paid to some extent to the unification of translated terms in Chinese in translated scientific textbooks. The number of translated scientific textbooks declined in 1909. The reason for that was the improvement in the ability of Chinese authors to edit textbooks independently. Du Yaquan, wrote in the preface of a translated scientific textbook that "textbooks can never adapt to the teaching work in this country unless they are compiled with new ideas" [5, 9].

These evidences motivated us to explore the role of language in the assessment process of the students. Since, they show great results in terms of innovation and economic progress when a person is given adequate information of the subject in the same language he or she "thinks". The role of the multiple regions that are activated in response to reading is studied by Leila Wehbe [10]. A network of regions involved in language processing includes regions from the left angular gyrus to the left temporal pole; multiple left IFG regions, and multiple right temporal regions. Most people struggle with word problems and one reason is that math word problem solving uses many parts of the brain. At times students answer a word problem by giving a wrong answer because it is not that what the question actually asked. The reason may be that the estimation involves non-language areas of the brain while exact arithmetic involves language areas [11]. Therefore the language processing may dominate the problem solving or analytical processing of the brain. A study was conducted with the major objective of determining how the amount of neural activation in a network of brain regions is modulated by the amount and type of processing that is required in a given condition. The results noticeably articulate the hypothesis [12].

It shows that brain activity have to be more efficient while handling problems given in foreign language with respect to the locally spoken language. This might be a reason that UNESCO is shifting the focus towards mother tongue based literacy programs to achieve quick success in this area of education and better penetration in the mass [13].

In countries like Pakistan where English is the preferred medium of instruction the students are unable to explain their imaginative ideas. They must have good understanding of the subject or the concept but they fail to explain it correctly in exams or assessments due to this language barrier. This language issue at times may play a destructive role in the personality grooming of a person as a confident professional. Due to lack of vocabulary one may be scared to float even a best idea or solution to the problem in the professional discussion at various forums. May not get the work published due to poor writing skills of certain language. A study was designed to evaluate the correctness of this hypothesis. The paper organization is as; the section II shall be describing the materials & methods, Section III shall provide the results & discussion and section IV shall give the conclusion and recommendations.

[1]The **imperial examination** was a civil service **examination system** in **Imperial** China to select candidates for the state bureaucracy.

Material & Methods:

The study is conducted at two different levels of education. First sample was taken from the middle school level and second from the engineering school undergraduate level. The participating middle school students were from class of grade 7& 8. The assessments were conducted for the subjects of Islamic Studies, Social Studies, General Science and Art. Whereas for engineering school students the assessment were carried out for Digital Logic Design, Communication Systems & Analysis of Algorithms course.

The all chosen schools are situated in Karachi, Pakistan. The choice of courses is done in such a way that they should be common in all school in the region and should have varying level of difficulty.

All of them are English Medium schools which mean that medium of instruction and examination is English. However the normal correspondence is in Urdu, the national language of Pakistan and mostly spoken language in Karachi. The four set of question papers for each course title were made. Two sets in each language respectively, Urdu and English; with the same level of difficulty but slightly different content. Contents are not revised to avoid the impact of re-attempting the same problems in the variation of grades. It was a four day activity in each school. A group of 20 students, with an average academic merit, for each course title were asked to solve the papers. Each group got the four attempts as given in table 1;

Table 1: Medium of Q&A per attempt

No. of Attempt	Language of Question paper	Language of given answers
1.	English	English
2.	English	Urdu
3.	Urdu	English
4.	Urdu	Urdu

The duration of exam is as per standard of the chosen school that is 3 hours. The invigilators were asked to write at the top of the answer sheet the start time upon giving and the finishing time upon receiving the sheet. The respective teachers for the said courses were asked to assess and score the answer sheets. The assessing human resource had no information about the hypothesis tested. It was kept blind to eliminate any bias in the scoring process. The grading method for Middle school students is the percentage whereas it's a Grade Point Average (GPA) for Engineering School students. The Table 2 and 3 describes the grading scheme followed by the participating schools for middle and engineering studies respectively.

Table 2: Grading scheme for Middle school students

Percentage	GPA	Letter Grade
<40	0.0	F
40-49	1.0-1.9	D
50-59	2.0-2.4	C
60-69	2.5-2.9	C+
70-79	3.0-3.3	B
80-84	3.4-3.6	B+
85-89	3.7-3.9	A-
90-100	4.0	A

Table 3: Grading scheme for engineering school students

Percentage (%)	Letter Grade
80-100	A+
70-79	A-
60-69	B
50-59	C
40-49	D
<40	F

After the last attempt all students were given a questionnaire to fill. The questionnaire was designed to investigate the role of language in changing the degree of difficulty of the exam in terms of understanding the question and the language translation required for understanding. The timings' information provided in the result section has been calculated from the answer of the questionnaire.

Results & Discussion:

The first set of results is acquired from the data collected from the middle school. Table 4, 5, 6 and 7 are showing the average statistics of each attempt for each course title.

Table 4: Middle School Students' statistics for English Q&A

Subject	Avg. Total Time taken to solve the paper	Avg. Score	Letter Grade	Avg. time taken for understanding language per question	Avg. Time taken for understanding question
Islamic Studies	2.75hrs	57	C	7-10min	1-2min
Social Studies	2.5hrs	69	B	3-5min	3-5min
General Science	2.5hrs	77	A	3-5min	4-6min
Art	3hrs	59	C	7-10min	1-2min

Table 5: Middle School Students' statistics for English Q & Urdu Answers

Subject	Avg. Total Time taken to solve the paper	Avg. Score	Letter Grade	Avg. time taken for understanding language per question	Avg. Time taken for understanding question
Islamic Studies	2 hrs	68	B	7-10min	1-2min
Social Studies	2.25hrs	79	A	3-5min	3-5min
General Science	2.5hrs	78	A	3-5min	4-6min
Art	3hrs	59	C	7-10min	1-2min

Table 6: Middle School Students' statistics for Urdu Q & English Answers

Subject	Avg. Total Time taken to solve the paper	Avg. Score	Letter Grade	Avg. time taken for understanding language per question	Avg. Time taken for understanding question
Islamic Studies	2.25 hrs	61	B	0min	1-2min
Social Studies	2.5hrs	76	A	1min	3-5min
General Science	2.25hrs	79	A	1-2min	4-6min
Art	3hrs	88	A+	0min	1-2min

Table 7: Middle School Students' statistics for Urdu Q & A

Subject	Avg. Total Time taken to solve the paper	Avg. Score	Letter Grade	Avg. time taken for understanding language per question	Avg. Time taken for understanding question
Islamic Studies	2.5 hrs	87	A+	0min	1-2min
Social Studies	2.5hrs	83	A+	1min	3-5min
General Science	2hrs	90	A+	1-2min	4-6min
Art	3hrs	88	A+	0min	1-2min

The following second set of results is acquired from the data collected from the engineering school. Table 8, 9, 10 and 11 are showing the average statistics of each attempt for each course title. Fig.1 shows the bar chart comparison of the presented scores in given four attempts.

Table 8: Engineering School Students' statistics for English Q&A

Subject	Avg. Total Time taken to solve the paper	Avg. Score	Letter Grade & GPA	Avg. time taken for understanding language per question	Avg. Time taken for understanding question
Digital Logic Design	3hrs	56	C/2.2	5-7min	6-8min
Communication Systems	3hrs	60	C+/2.5	3-5min	4-6min
Analysis of Algorithms	2.5hrs	57	C/2.2	7-10min	5-7min

Table 9: Engineering School Students' statistics for English Q & Urdu Answers

Subject	Avg. Total Time taken to solve the paper	Avg. Score	Letter Grade & GPA	Avg. time taken for understanding language per question	Avg. Time taken for understanding question
Digital Logic Design	3hrs	60	C+/2.5	5-7min	6-8min
Communication Systems	3hrs	71	B/2.5	3-5min	4-6min
Analysis of Algorithms	2.5hrs	65	C/2.6	7-10min	5-7min

Table10: Engineering School Students' statistics for Urdu Q & English Answers

Subject	Avg. Total Time taken to solve the paper	Avg. Score	Letter Grade & GPA	Avg. time taken for understanding language per question	Avg. Time taken for understanding question
Digital Logic Design	2.75 hrs	78	B/3.3	1min	4-5min
Communication Systems	2.5hrs	76	B/3.2	1-2min	3-4min
Analysis of Algorithms	2.5hrs	79	B/3.3	1-2min	3-5min

Table 11: Engineering School Students' statistics for Urdu Q & A

Subject	Avg. Total Time taken to solve the paper	Avg. Score	Letter Grade & GPA	Avg. time taken for understanding language per question	Avg. Time taken for understanding question
Digital Logic Design	2.75 hrs	78	B/3.3	1min	4-5min
Communication Systems	2.5hrs	81	B+/3.4	1-2min	3-4min
Analysis of Algorithms	2.5hrs	86	A-/3.7	1-2min	3-5min

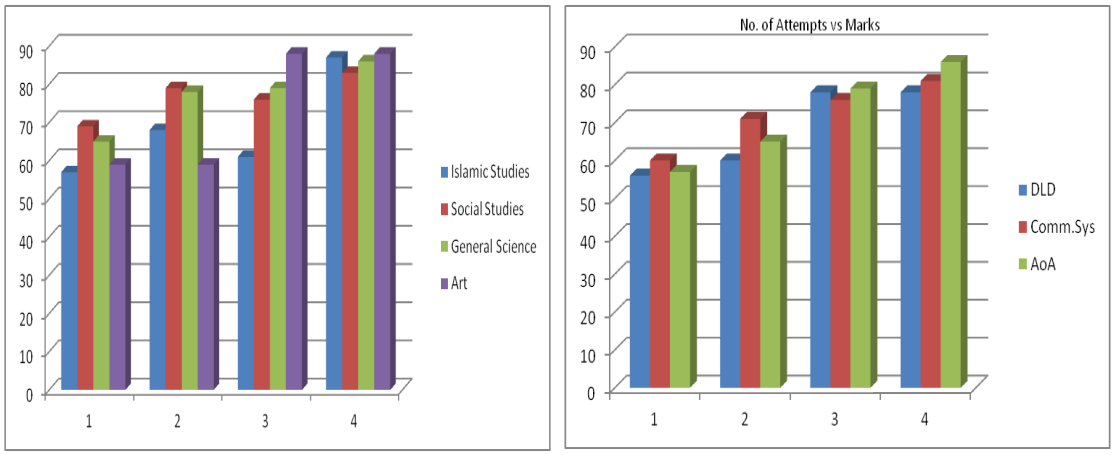

Fig.1: Avg. Marks obtained per course with language variation in assessment papers

The above results indicate a clear shift in the performance of the student with the variation in the language of assessment papers and answering the questions. The students performed well when they were assessed in their local language which is Urdu in this case. The mean value of average marks obtained in all four courses for school students is 62.32 for the case when the medium of assessment is English but it alleviated to 85.98 when the medium is changed to Urdu. The mean values for mixed language assessment approach are 70.51(EQ & UA) and 75.35 (UQ & EA) respectively. It shows that when the question/problem is understood well by the student the answer or solutions provided are accurate and to the point. Due to the fact for the case of Urdu Questions the mean score is higher than that of English Questions. The same trend is observed with the engineering students but with larger shift in mean values with the language variation. The mean value of average marks obtained in all three courses for engineering students is 57.64 for the case when the medium of assessment is English but it rose to 81.60 when the medium is changed to Urdu. The mean values for mixed language assessment approach are 65.18(EQ & UA) and 77.66 (UQ & EA) respectively. If the individual mean values of the courses are seen that it is observed that scenario based question papers like Analysis of Algorithms, Digital Logic Design, Art and General Science showed greater deviation with the change of language.

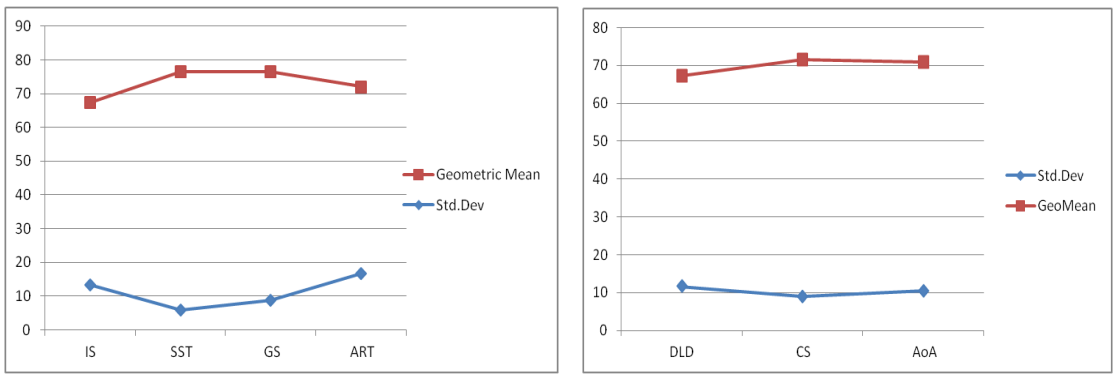

Fig.2: Standard deviation & Mean marks obtained by students in each attempt per course.

Fig.2 shows the geometric means and standard deviations for both set of results and all the considered cases. The highest deviation can be seen in Art [SD= 13.3 marks] for the first set and in Digital Logic Design [SD= 11.6 marks] for the second set.

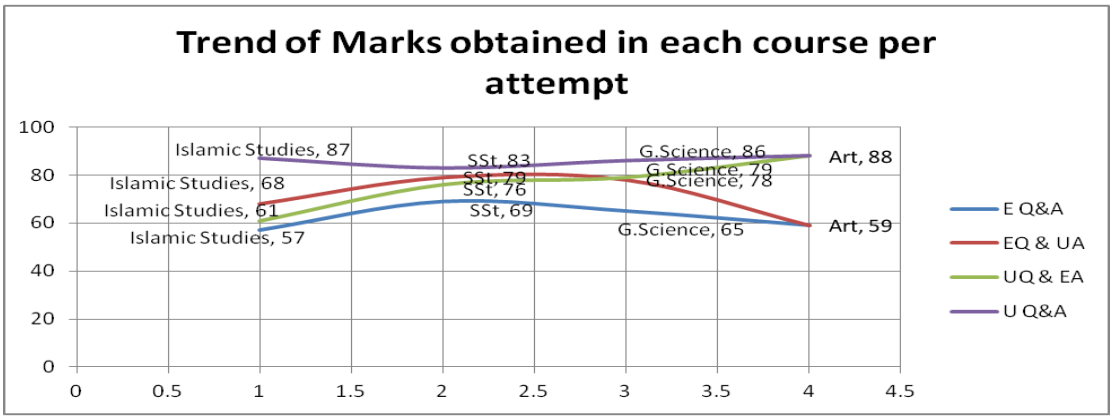

Fig.3: Trend of Avg. marks obtained by students in each course with language variation

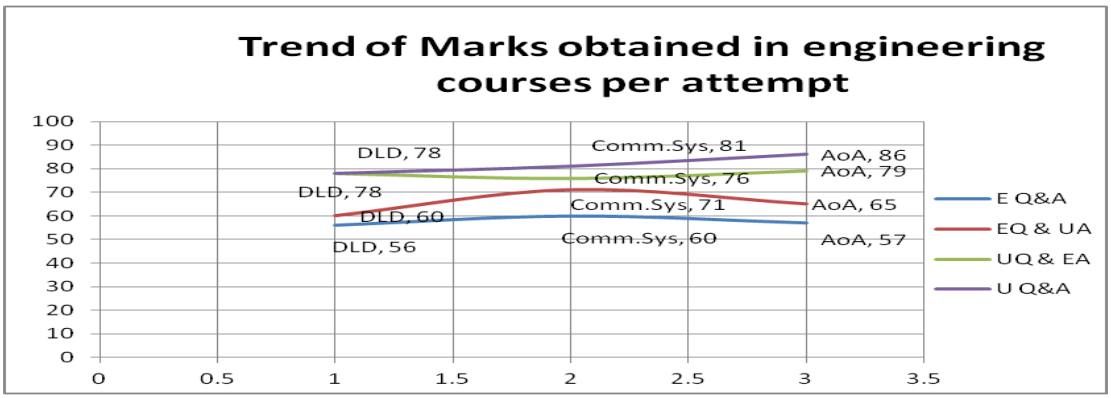

Fig.4: Trend of Avg. marks obtained by engineering students in each course with language variation

Fig.3 and Fig.4 are showing the trend of change in mean scores per attempt. The colored lines are the mode of assessment having respective course's average scores in each attempt. The Y axis is the score value whereas the X axis showing the number of attempts. It's an obvious lift in the scores with the language change. But it is interesting to see the varying trend of marks in both set of results for mixed language approach. Since the set of questions for both courses were very demanding in terms of understanding the given problem or scenario. Art has nothing to do with the language when it comes to solve the problem but it highly depends on understanding of what is asked to draw or sketch. The minute details should be understood to create or paint the exact required scene. As a matter of fact the change of score in the case of Art can only be seen when the language of question paper is changed from English to Urdu. Similarly the Digital Logic Design is more related to symbols and Boolean algebra which has very less connection with the language but the language becomes important to solve the given word problem since it is believed that understanding the question is part of

examination. On the other hand if the General science & Communication systems scores are compared then it can be observed that students are more comfortable in answering the questions in English. The reason they state for that in the questionnaire that they are more use to of science and communication terminologies in English than Urdu being an English Medium school students. The Science questions were more about definitions and processes which they memorized and can write "quote and quote" even without understanding. The same reason is valid for the Islamic studies course's score analysis. The gradual positive change can be seen when the mode of assessment is shifted to complete Urdu language. To statistically test the effect of language on the performance of student a paired t-test was conducted. The p-value for full English assessment versus full Urdu assessment is found to be 0.00411 with confidence interval of 95%. The test was repeated for mixed language assessment approach and paired cases were made on the basis of language of questions. The p-value is still 0.00306. Not just this statistical test but if the change of grade is considered then students from both samples improved their grades and GPA.

Conclusion & Recommendations:

The global standardization of the education is the need of time. The countries which adopted the strategy of translating information in their own language excel scientifically and now are the leaders & innovators of the technology. Being in global village a common language is important and English is internationally accepted medium of correspondence. Learning the language should be the part of curricula but scientific courses should be taught in the local language for better understanding and absorption of the concept. Study presented in this paper clearly showed that the assessments conducted in foreign languages are not providing the correct intellectual quotient or the level of expertise of the student in a respective course. Hence the grading or decisions, about disqualification of an individual, made this way are not accurate. The spoken language as a medium of instruction and assessment helps students to express their imaginative thoughts comfortably which they probably unable to communicate due to language barrier. This barrier is not only bothering students but also prohibiting new ideas to flow that may lead to big innovations and scientific contributions in future. A recommendation that can be made here is that unification of curricula is required to bring everybody at the same level of understanding and opening global opportunities but this unification or standardization should be content based and independent of language or medium of instruction.

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