

Investigation of Students' Achievement Level on Advanced level Chemistry in Sri Lanka

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Abstract—General Certificate of Education Advanced Level (G.C.E.A/L) examination is the most competitive examination in secondary education of Sri Lanka because it is the university entrance examination. There is only a written test with different question types to test Cognitive, Effective and Psychomotor domains. But there is no practical tests. Therefore checking the skill are not happening properly. Pass rate of the chemistry subject in G.C.E (A/L) examination rises year by year. Results of Multiple Choice Questions (MCQ) questions of this examination has been analyzed from 2012-2016 and shows the pass rate rise from approximately 61% to 67%. Though the pass rate stands around 67%, actual marks scored by students always below 41 marks were always above 50%. According to the analysis the “Trend of facility Indices of main five streams” showed the lowest to Physical Chemistry. Conceptual development of Physical chemistry of the syllabus always showed the decline in every year comparing to the other streams was always 8- 16%.

Keywords— Cognitive, Effective, Facility Indices, Multiple Choice Questions, Physical Chemistry, Psychomotor

I. INTRODUCTION

Seventy two years after the independence, Sri Lanka is still a developing country. Though our education system and curriculum also have gone through several reforms and changes, the initially established Examination (Assessment and Evaluation) system is still there for decades without facing much change. Though this is a collective result of several factors like lack of capital, unequal distribution of resources, negligence, lack of knowledge, poor administration, un-necessary political interference etc. it has caused a very disturbing situation in country's socioeconomic and political system.

All students have been put into a race where only intention is to get through G.C.E. (A/L) to enter the university because it is the only path. Neither analytical nor innovative skill development is necessary to pass the A/L or to enter the university. Being a mechanically trained “parrot” by answering as much as past papers to memorized and re-write one-to-one copy which learnt in the classroom is the one and only requirement for the purpose.

This weakness of assessment and evaluation method has caused the whole education system stagnates at a certain level. Now we experience the adverse effect of this as development of the country also has reached to a certain level and struggling there unable to go beyond. This situation has made the country's education system totally upside down. After

Ordinary Level examination, students are automatically being pushed into the “race of A/L”.

As there is no proper monitoring system and lack of trained teachers to enhance the reliability of school based assessment marks produced by schools through continuous assessment-system and has no contribution for final result of the examination. Reinforced learning goals inhibit the development of using value of knowledge. Furthermore clearly defined standards, benchmark and performance indicators for A/L chemistry assessment and evaluation system has not been introduced.

Enforced demand arises year by year for chemistry as it is a main subject in science stream to enter medical and engineering faculties. As a result students develop their memorizing power than application and conceptual understanding.

To address the above burning effects should have to get the clear idea about the actual achievement level of students and the subject areas which they felt as difficult. Therefore the trends of pass rate of the Advanced Level chemistry papers were analyzed under five streams: Inorganic, Organic Physical, General and Industrial and Environmental Pollution. MCQ questions cover most of the subject matter within fifty questions and that was the reason to choose MCQs to analyze. This comparative observation of all five streams highlight that conceptual development, practical knowledge and analyzing ability is more required for Physical Chemistry. Immediate change of the final examination was suggested by the Teachers, Students, Marking examiners, Paper setting panel and other stake holders through Unstructured interviews.

II. METHODOLOGY

Quantitative as well as qualitative data collection was done in this research. Mixed method research methodology has used and this method increases the accuracy of data , providing more complete picture of the phenomenon under study than that would be yielded by a single approach. Thereby, overcoming the weaknesses and biases of single approach, enable to develop the analysis based on the original data and aid sampling which has suggested by Denscombe (2008). Data has been collected by using secondary as well as primary sources. Secondary sources of data collection was done by using documents and evaluation reports published by Department of Examinations (2012, 2013, 2014, 2015, 2016), Sri Lanka. Primary source of data collection was done by

Unstructured interviews and qualitative data was gathered by school teachers, students, marking examiners, paper setting panel and other stake holders. Data was analyzed to get the idea about actual marks and to identify the weak areas of subject in them.

III. RESULT AND DISCUSSION

TABLE I TREND OF OVERALL PASS-RATE

Year	Total no of candidates	Total Pass	% of Total Pass	Total Fail	% of Total Fail	Total Marks < 41	% of Total <41
2012	54,217	33,036	60.93 %	21,181	39.07 %	30,962	57.11 %
2013	70,698	36,101	51.06 %	34,597	48.94 %	39,109	55.32 %
2014	76,754	39,332	51.24 %	37,422	48.76 %	40,668	52.98 %
2015	79,174	52,195	65.92 %	26,979	34.08 %	40,511	51.17 %
2016	80629	54563	67.67 %	26066	32.32 %	42162	52.29 %

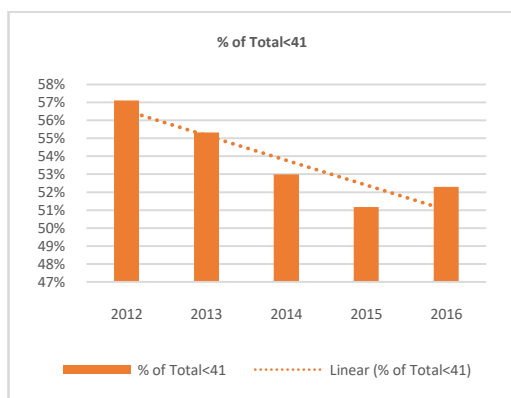


Fig.1 Percentage of students that gained total marks <41

A. Trend of Pass rate

From 2012 to 2016, total number of candidates has increased continuously as well the total pass-rate. Percentage of total pass rate has increased from 60.93 to 67.67 % within this period. Percentage of total failure rate has been declined accordingly. The alarming outcome of this analysis was, more than 50% of the total candidates have been scored 40 and below. For each year it is more than half the total candidates.

TABLE II

TREND OF FACILITY INDICES OF MAIN FIVE STREAMS

Year	Number of Questions fall into the 10-Lowest Facility Indices Range				
	Inorganic	General	Organic	Physical	Industrial & Environmental
2012	4	2	4	5	1
2013	1	2	1	8	1

2014	2	3	2	5	0
2015	1	2	2	7	0
2016	2	2	2	4	0

Year	Detail of 10-Lowest Facility indices received				
	Inorganic	General	Organic	Physical	Industrial & Environmental
2012	8%	4%	8%	10%	2%
2013	2%	4%	2%	16%	2%
2014	4%	6%	4%	8%	0.00%
2015	2%	4%	4%	14%	0.00%
2016	4%	4%	4%	8%	0.00%

TREND OF FACILITY INDICES OF MAIN 5-STREAMS

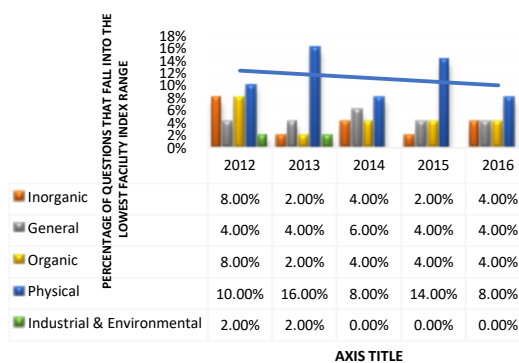


Fig. 2 Analysis of ten lowest facility indices for the main five streams

B. Trend of Facility Indices for main five streams

In "Table II", Number of questions fall into the 10-lowest "Facility index" range was tabulated here under the main five streams as above.

Grasping of Inorganic Chemistry and Organic Chemistry are better when comparing with the Physical Chemistry.

The relevant trend-lines of above both are heading below indicating the student's grasp of the area. General Chemistry shows that students are slowly losing their grasp in the area. But compared to Physical chemistry, this area is much better.

The analysis revealed the "Physical Chemistry" part as comparatively the most difficult area. The Trend line of this particular area is continuously heading upward demanding immediate attention. Students have scored easily in Industrial and Environmental Chemistry.

This comparative observation of all five streams highlights that Conceptual-development, Practical-knowledge and Analyzing-ability are more required for physical-chemistry.

According to the unstructured interviews the ideas of paper setting panel, teachers and other stake holders are summarized below.

Students getting knowledge from schools as well as from tuition classes, neither develop Analytical-thinking nor Practical-skills through the current Teaching-learning process and school-based assessment process showing how the current system fails. Reliability of school based assessment system is very low and no validity is being given to the marks of them in the final examination. Therefore both teachers and students pay lack attention to school based assessment system. If the questions are based on concepts, most of the students are failed to do them because their conceptual development is low. Main focus of teachers and students is to get pass through the examination rather than developing skills and attitudes.

IV. CONCLUSIONS

Though the pass rate increases, immediate change of the examination system is required a good evaluating system with chemistry practical tests. Further teaching methods of

Physical chemistry should be changed to establish concepts well in students. Lack of attention is being given to the School Based Assessments. Utilizing technology in teaching will help students to understand the abstract concepts very well.

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