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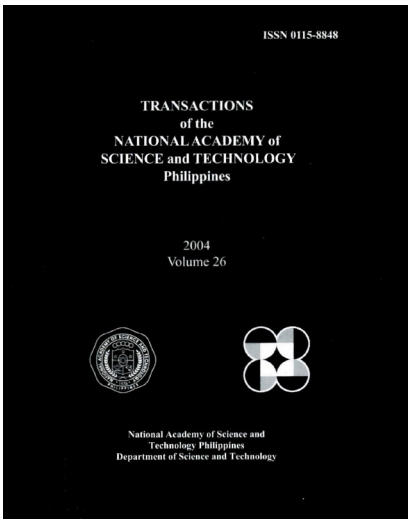

SCIENCE CULTURE AND EDUCATION FOR CHANGE
Part I: Innovative Strategies for Secondary Education in the Philippines

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SCIENCE CULTURE AND EDUCATION FOR CHANGE
Part I: Innovative Strategies for Secondary Education in the Philippines.

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Abstract

The current situation of Philippine education presents problems and challenges of staggering proportions. With old paradigms deemed insufficient, we present investigations of new structures that could boost effectiveness of the Philippine educational system. These apply the key observation that, Money is not the problem. Culture is the problem. In particular, we address the questions: What programs can foster the highest levels of learning, creativity, and productivity while overcoming severe constraints of poverty, low standards of living, substandard learning conditions, and formidable cultural barriers? What programs can generate higher levels of human development for a country by the cultivation of a healthy, cultured, and socially responsible citizenship?

We present an innovative, differentiated, and target-oriented program for high-impact multi-disciplinary learning in the High School. Essential features include (1) Parallel Learning Groups (Modified Jigsaw Strategy), (2) Activity-based Multi-domain Learning, (3) In-school Comprehensive Student Portfolio, and (4) Strategic Study and Rest Periods. The program, implemented since school year 2002-2003 in a rural private high school in Bohol, proves to be a robust workable scheme even in its initial stages. It is student-teacher-administrator friendly and can easily be modified and adapted to different levels of affluence (or poverty) of public and private high schools. Although implemented with the 2002 Basic Education Curriculum (BEC), the program is compatible with other curricula. The program has resulted in the progressive enhancement of

cognitive and affective learning of students, with each year's graduates, on the average, exceeding performance levels of the previous year. This is shown by external checks of performance such as the number of students who pass the University of the Philippines College Admission Test (UPCAT).

Keywords: multidisciplinary learning, innovative strategies, secondary education

Introduction

Globalization has come upon us, stunning in its swiftness and breadth of scope. The full impact of the phenomenon cannot even be seen yet. Nations brace against, or take advantage of, global market forces, rapidly increasing flux of intercontinental migration of human resources and transport of goods, waxing and waning of population in different parts of the world. Rich and poor, young and old, have quick and easy access to information — important or trivial, useful or harmful. Now, more than ever, every nation is forced to adapt to new conditions with the whole world in dynamic transition.

New standards of quality. With globalization, standards of quality of human resources, products, and services are pegged with those of the most advanced nations. *Today, there is much less tolerance for mediocrity*. Nations that rise to the challenge of quality performance and quality services march on to higher levels of development. Nations that waver get mired in backwardness, deteriorating standards of living, and humiliation in the international community. No amount of excuses and blame throwing can sugarcoat images of underdevelopment flashed on television and computer screens all over the world.

Education: A key factor. Education is universally acknowledged as a singular factor affecting the quality of a nation's human resources, products, and services. Members of the European Union and Japan, among other advanced countries, have recently introduced significant reforms in their educational system to respond to the needs of new and rapidly changing economic and socio-political conditions. Universities in Germany, aside from the traditional university *Diploma* and German doctorate, now offer baccalaureate, masteral, and doctoral degree courses similar to the shorter educational track of the USA. In April 2002, Japan cut down from a 6-day to the 5-day school week common in the USA and Europe.

In the race to produce highly skilled manpower for global needs, there is additional pressure. There are highly publicized international standardized tests and measures of performance such as the Programme for International Student Assessment (PISA) of the Organization for Economic Cooperation and Development (OECD) and the Trends in International Mathematics and Science Study (TIMSS). These tests are administered every three years to 15-year-old and 13-year-old schoolchildren, respectively, in participating countries. Moreover, aside from these international tests, there is publication on-line of the scores of all team members in elite international competitions

such as the International Mathematics Olympiad (IMO). These reflect the quality of a country's youth development programs.

It is clear, therefore, that no nation, advanced or underdeveloped, can afford to be lethargic or insensitive to the demands of the present times for quality in all aspects of human endeavor.

Coping with the new challenges of the 21st century, especially for underdeveloped countries, is daunting. With old paradigms seen to be insufficient, it is a formidable task to find new structures that could boost human development. What educational programs can develop a nation's human potential to the utmost? What programs can promote fullest growth, development, creativity, and productivity for the youth? What programs can generate higher levels of development for a country by the cultivation of a healthy, cultured, and socially responsible citizenship? How can educational programs take advantage of the powerful methods and tools of the social and physical sciences, engineering, and high technology now so easily accessible? How can an underdeveloped nation overcome severe constraints of poverty, low standards of living, and formidable cultural barriers?

Innovative strategies. We talk about some innovative strategies for developing science culture and education in the Philippines. Because these encompass multi-dimensional problems that would require volumes for proper presentation, here, we shall focus on small but significant parts for which we have come up with modest but real and workable solutions.

Background Study

Present conditions in the Philippines

The current situation of Philippine education presents problems and challenges of staggering proportions. It is clear that the educational system of the Philippines has failed to advance human development and improve living conditions. On an international scale based on the 1999 Human Development Report published by the United Nations Development Programme (UNDP) [*1*], no province or region in the Philippines, not even Metro Manila, may be regarded as having high human development. Two provinces, Lanao del Sur and Sulu, fall in the category of low human development, all the others are in the medium category[1]. In the area of basic education, the Philippine Human Development Report (PHDR) 2000 [2] notes that, despite the country's high literacy rate of 94.6% , the Philippines manifests low levels of student achievement both in standardized international tests and national assessments:

[1] Measures of human development are given in terms of the Human Development Index (HDI). Computations of the HDI include life expectancy, literacy and enrolment, and real per capita income [2].

- The Philippines ranked 39th out of 42 participating nations in the Third International Mathematics and Science Study (TIMSS) released in 1996. In the test, Singapore, South Korea, Japan, and Hongkong were the top scorers. Highly industrialized countries such as the USA, the United Kingdom, France and Germany were near the median grade. The Philippines' Southeast Asian neighbor, Thailand, ranked just above the USA.

- In the TIMSS-Repeat released in 2000, the Philippines ranked 36th of 38 in both Science and Mathematics.

- In the IMO 2003, the Philippines placed 79th out of 82 participating countries, with a Team Score of 9 points out of a possible Team Score of 252 points (*3*).

- In the National Elementary Achievement Test (NEAT) and the National Secondary Achievement Test (NSAT) administered since 1994[2], on the average, Grade VI pupils and senior high school students gave correct answers to less than 50 %of the given questions. In the 1996 NSAT, if 50% is used as the passing mark, only 8.3% of public school students in Metro Manila passed the test.

What are the immediate causes of the low achievement of Filipino schoolchildren? Studies indicate the factors that affect the quality of education in the Philippines.

1. **Teachers are ill prepared in both subject matter and pedagogical skills.** "The poor quality of basic education is merely a downward transmission of the mediocrity pervading the country's entire university system, which is the ultimate source of elementary and high school teachers [2]." The 1998 results of the Licensure Examination for Teachers (LET) showed mean scores of only 38% for elementary, and 43% for high school teachers [2]. Furthermore, a 1998 study of the Science Education Institute (SEI), Department of Science and Technology

[2] Prior to the NSAT, there was the National College Entrance Examination (NCEE) from 1973 to 1993 and abolished by Republic Act 7731 in 1994.

[3] www.sei.dost.gov.ph/survey/pdf. The government has undertaken stronger measures to improve teacher quality especially in the basic sciences and mathematics. DOST gives special scholarships to those taking Bachelor of Secondary Education major in Physics, Chemistry, and Biology. There is also Project RISE (Rescue Initiatives for Science Education) for implementation in 1998 - 2003, due in part to the poor performance in the TIMSS. However, the poor performance in the TIMSS-Repeat was again a disappointment. It is also worthwhile to mention here a troublesome point. In the 2002 LET, the field of specialization of the physical sciences included physics, chemistry, *and* general science. With such a mix of broad subject areas such as physics and chemistry, most questions could not be otherwise but rote-style. One of the authors of this paper (MVCB), as a physicist and 2002 LET examinee, noted that passing the physical sciences area may not mean being qualified to teach *either physics or chemistry.*

(DOST) found only 80% of math, 34% of chemistry, 27% of physics, 44% of biology, and 42% of general science teachers qualified to teach (with a full undergraduate education/science major) [*4*][3].

2. **Classes in public schools are fairly large**, with an *average* class size of 50 in high schools [*2*]. Some classes have over 70 and even a hundred students [*5*].

3. **There is a serious lack of textbooks, instructional materials, and laboratory equipment**. In 1999, in elementary schools the per pupil book ratio was 0.33 (or one book per three pupils) in Science. For the high school, the ratio was 0.13 in Science, 0.11 in English, 0.15 in Mathematics [*2*].

4. **In many areas of the Philippines, poor living and learning conditions prevail** (lack of electricity and running water, poor hygiene, and lack of, or substandard, classrooms in rural areas) [*2*].

5. **An overloaded curriculum** is seen as a major factor affecting achievement levels of schoolchildren. For example, the Philippine science syllabus contains more topics than the syllabi of high-performing nations in the TIMSS. Too many topics are covered at the expense of mastery of skills and greater concept understanding [*6*].

6. **The medium of instruction is seen as a problem** [*2*]. There is the dilemma in the Philippines at present of, on one hand, facilitating learning by using the national language, Filipino, or the local regional languages, for instruction and, on the other hand, fostering mastery of English as the emergent world *lingua franca*. Article IV, Section 6 of the 1987 Philippine Constitution mandates Filipino to be the medium of instruction. However, present educational programs follow the 1974 Bi-lingual Education Policy stipulating the medium of instruction as English for Mathematics, Science, and Communication Arts and, for all other subjects, Filipino is the medium of instruction. A newly released 2003 Department of Education (DepEd) Order now advocates use of English in all subjects except Filipino after noting the poor English skills of graduates of the whole educational system. However, compliance with this new order may not be immediate.

The PHDR 2000 shows the hierarchy of quality of schools: private sectarian, followed by private non-sectarian, then the public schools. Some private sectarian schools offer quality education comparable with the best schools in the world. There are, however, top-performing special public schools with science-oriented curricula. These are the science high schools established by national and city governments. These have larger budgets than regular public schools, and enrolment is limited and highly selective. These schools generally follow the curriculum of the Philippine

Science High School and produce high achievers. In Bohol, for example, the Tagbilaran City Science High School, established only in 1996, ranked first in the province in the 2000 and 2001 NSAT.

It is evident that there are excellent schools in the Philippines. There are schools whose graduates go on to good universities in the country and abroad. Several graduates of the Philippine Science High School have gone on to Princeton University, Harvard University, and other top universities in the USA. There are students who get medals in international mathematics competitions, science and technology fairs, debates, musical and art competitions. However, "the problem of basic education is not really about developing an elite that can be showcased: it is about improving the lives of many who, for better or worse, are relegated to the public school system" [2]. This is especially urgent inasmuch as the distribution of enrolment in public and private schools, according to level, are 90% in public and 10% in private elementary schools, 60% in public and 40% in private high schools, 15% in public and 85% in private colleges and universities.

The Philippines faces the grim scenario of an ineffective basic education system, producing every year thousands of young people with low levels of competence, functional literacy, and social responsibility. For example, consider the fourth year level, of homogeneous grouping, in a sample high school. If there are four sections of 40 students each, the present state of basic education may give a generous estimate[4] of 35 of the honor section, 20 of the second, 15 of the third, and 10 of the last section, becoming functionally literate when they finish high school. This leaves 50% or 80 students graduated at low levels of proficiency. Considering that a 1998/99 census gives 5 million high school students [2], a rough estimate gives 625,000 students graduated each year who may not be functionally literate, and at worse, may be a burden to society. In four years, 1999 - 2003, neglecting yearly rise in enrolment, the number accumulates to 2.5 million underdeveloped low productivity graduates. And these numbers will continue to increase if there is no reform of the system.

Major Reforms in Philippine Basic Education.

For decades, the Philippines had been continually confronted by the problem of basic education and the development of its human resources. How shall the country attain the fullest possible growth and development of its youth? How can its educational system produce graduates who can contribute in real terms to the country's progress and development? More specifically, questions asked before and still asked now are: "What kind of Filipino do we want to develop? Are we going to educate the masses or pour our resources on the few intellectual elite who will become leaders? Shall we educate for the individual's sake or for society? [7]" There is a follow-

[4] Note, this is a generous extimate since, one could extrapolate from the 8.3% in Metro Manila passing the 1996 NSAT with scores 50% and above.

up question: *Have we poured out our resources to train our intellectual elite only to have them migrate and use their training in the advanced countries*? (Compare the per pupil operating cost of P 36,899 for the Philippine Science High School at Diliman, Quezon City, and P 1,396 for regular public schools in 1996 [2].) These questions are difficult to answer and are broad in scope. In the Philippine context, they must also be solved in a country burdened with poverty, underdevelopment, and billions of dollars in debts.

In *Philippine basic education 1999-2004: Analysis, recommendations, and plans*, an essay in the PHDR 2000, A. Gonzalez notes the poor pupil performance in national assessments and the "failure to get out of the groove (of almost three decades now) of achievement at the 50 percent level (half of what is taught in the prescribed syllabus)[2]." This is despite the fact that, in this period of *thirty years*, there is no dearth of measures undertaken by the Philippine government to reform or revitalize basic education in the country. The Educational Decree of 1972 reorganized the country's educational system based on findings of the Presidential Commission to Survey Philippine Education (PCSPE). Ten years later, the Education Act (EA) of 1982 gave a blueprint for achieving national goals through a reformed educational system. The New Elementary School Curriculum (NESC) was implemented in 1983. Then the change in government in 1986 and subsequent ratification of a new constitution, the 1987 Constitution, redefined the goals of education and emphasized values formation. The NESC was maintained, while a New Secondary Education Curriculum (NSEC), following objectives set in the EA of 1982, was implemented in 1989. At present, the NESC and the NSEC are being scrapped. Attention is on the 2002 Basic Education Curriculum (BEC) implemented in public schools in the School Year (SY) 2002-2003. The 2002 BEC, perceived to differ radically compared with the NESC and NSEC, responds to recommendations of the Presidential Commission on Educational Reform (PCER) in its report, *Philippine Agenda for Educational Reform*, published in 2000 [6].

Clearly, the measures taken so far by the Philippine government, in the period of thirty years mentioned above, have been remarkably inadequate or ineffective. In fact, instead of improvement, a continuing retrogression is perceived. The PHDR 2000, in offering policy recommendations, paints a bleak picture of having "to pull basic education out of the deepening rut of mediocrity in which it finds itself [2]." At present, the 2002 BEC claims to contribute toward a better solution to the many-faceted problem. However, it remains controversial and the private schools are slow to implement the new curriculum. There is confusion over the new curriculum exacerbated by the DepEd itself. After a year of implementation of the 2002 BEC in the public schools, already the DepEd has changed the implementing guidelines for the SY 2003-2004, on short notice, with significant changes of time allotment and grading system compared to the SY 2002-2003 version [8]. The perceived instability casts more doubt on the efficacy of the reform.

The dismal situation of Philippine basic education could remain for many more years. In 1999 there were 12 million elementary school pupils and 5 million high school students, and the numbers are increasing every year. Public education costs exceed available funds from government and foreign aid at mind-boggling amounts. With this come problems of shortage of classrooms and instructional materials. Moreover, poor quality graduates of the basic education system and the mediocre performance of tertiary level schools add yearly to the numbers of ill prepared teachers.

Cultural Factors

Poverty of a nation leads to lack of quality human and physical resources that, in turn, leads to low quality education, which leads back to poverty. Can this vicious cycle be broken? Is it a matter of *money*? One way commonly subscribed to by governments is to get massive foreign loans. However, in the Philippines, as in many other poor countries, this has failed to bring about desired results. Indeed, these countries have only found themselves without significant economic improvement and deeply mired in foreign debt.

Are there hidden factors? An examination of the series of national programs for reform of the Philippine educational system in the past thirty years reveals laudable efforts of the government, *on paper*. In terms of conceptualization, design, target outcomes, and implementation schemes, the steps taken by the Philippine government, whether in curriculum reform or education budget allocation and finance, seem not only reasonable but also workable. However, the dismal results are always contrary to expectations. Has the effect of socio-cultural factors been grossly underestimated? What specifically are these socio-cultural factors? Are there attitudes and preferences uniquely Filipino that hinder the efficacy of educational systems and teaching methods developed in the West? The Philippine Department of Education (DepEd) has received, and continues to receive, substantial foreign aid and loans from the USA, the European Economic Community, Japan, and Australia [2]. Aid usually comes with recommendations for adoption of certain pedagogical strategies, and training of Philippine educators in the methods, used in the donor countries. Are these methods suitably adapted to the situation of schools and students in an underdeveloped Third World country such as the Philippines?

Money is not the problem; culture is the problem. With the successive failure of measures taken by the Philippine government, it is indeed urgent to look into the Philippine people themselves, for the government and the bureaucracy reflect in a significant way the behavior of the people. In the final analysis, the breakdown of implementation may be traced from the top to the bottom of the delivery system from the President, to the Department Secretary, to the rank and file of the Department, to the simple teacher in a simple classroom in some far-flung area. Then, too, the communities in which the schools are situated form a strongly influencing factor as the immediate social milieu.

In an analysis of the intellectual development of Voltaire, it is noted that, for Voltaire [9] (underscoring ours),

> to get to know the inhabitants of a country, the critic must work in the same way. He must first analyze the *nature of their thought*, the *quality of their action*, the *goal which their action is designed to achieve*, and the *modifications which are introduced into their manners, their arts, their institutions, their science*; then he must reduce their intellectual activities with their creative results to some sort of common denominator.

In the Philippines, such an undertaking would be very useful. It is important, and urgent, to look at the effect of cultural factors in considering any educational reform. It is not easy, and may be offensive to the Philippine people themselves, but it is necessary if real change for progress is to be achieved. In any case, it should be a consolation to know that *a new culture can be developed*, assimilating the good parts of the old, while generating new attitudes and behavior to cope with new conditions. Here we mention examples of values and attitudes of Filipinos in general which may also manifest in DepEd officials and personnel, school administrators, teachers, and students. We highlight them singly for emphasis even if the attitudes are related.

- **Culture of dependence.** Several generations of Filipinos grew up, and are growing up, aware of massive government loans to finance the development of the country. Large-scale infrastructure development such as highway networks are built by foreign construction companies even as the country produces hundreds of civil engineers and road-building is, by now, ancient technology which should be done by a nation's own engineers. Many government buildings are constructed from foreign aid or loans granted by countries such as Japan and the USA. Schools and universities run by international religious orders get substantial aid from their respective Mother Houses in the advanced countries. There may be too many nice buildings around with plaques indicating grants from JICA, USAID, among others. Although it is well to appreciate such foreign aid, several generations of Filipinos may have grown with the mendicant attitude of seeing *progress made possible only with foreign loans and grants.*

  On a smaller scale, habits and preferences of different social classes (especially the middle classes) in the Philippines are quite different compared with that of advanced countries. For the former, parents, siblings, or even maids may do the child's homework or school projects *to help the child.* In the advanced countries, children are naturally encouraged to be independent, *to do their own work and to do it well.*

- **Underdeveloped virtue of honesty.** There is rampant cheating in schoolwork, examinations, evaluations, and thesis work. The most recent high-profile case of cheating is leakage in the 2003 Bar examinations for lawyers. There is also anecdotal evidence that a number of school reports and data, required for school permits and DepEd evaluation, are unreliable. Moreover, the Philippines is "blacklisted" with rampant piracy and violations of international intellectual property laws. There is also the widespread production, sale, and purchase of fake merchandise assuming internationally well-known brand names.

- **Low standards of quality.** This has been referred to as the *puwede na yan* attitude. There is a lack of importance given to a job well done according to external objective standards. In the education sector, textbooks and instructional materials are generally of low quality. An interesting example of low quality instructional tools came up in an actual laboratory lesson given by one of the authors (MVCB) on precision and accuracy of scientific measurements. We discovered that many rulers sold in stores differ in measurements sometimes by as much as two millimeters.

- **Skewed priorities.** In considering *the goals which the Filipinos' actions are designed to achieve*, we observe importance placed on *personal or filial advancement over national progress and development.* There is an observed lack of motivation for good citizenship,obedience to the law and diligent fulfillment of duties and responsibilities for the general welfare of the entire nation.
  There is emphasis *on immediate returns over solid long-term benefits.* The anticipation of finished products and "turn-key" infrastructure overshadows the important part of the step-by-step *process* of preparation, construction, testing, and improvement. This is true not only for infrastructure and government programs but also for scholarly work. For example, it is common knowledge that the sale of ready made theses and dissertations is a thriving business.

- **Poor concept of time and discipline in keeping schedules.** "Filipino time," "whole-day" meetings, drama rehearsals, and music practices (with much time spent on interpersonal catching-up and gossip), class periods consumed in homilies and stories are commonly observed.

Such values and attitudes that lead to dysfunctional behavior in the Philippines have to be considered for an effective educational reform. Teachers and students exposed daily to shoddy workmanship and non-professional behavior generally think this is the norm. The matter of skewed priorities could very well be the reason for rampant graft and corruption in government and the bureaucracy (including the

Department of Education), and fraud and dishonesty in the country's business sectors (including those involved in the manufacture, publishing, and sale of educational materials). Dependence and parasitism are also encouraged by tolerance of cheating, and low levels of honesty, even of school officials and teachers in times of local and national testing and evaluation such as the NCEE or the later version, the NSAT. There is anecdotal evidence that various gimmicks are resorted to in order to increase school or division scores. These include allowing only selected students to take the exam, or encouraging "sharing" of answers by honor students with slower ones.

Checks and inhibitors should be integrated with any program for educational reform if it is not to break down just like all the other programs given in the earlier part of this paper. An obvious historical analogy is the system of check and balance in the US government system comprised by the executive, legislative and judicial branches. This system incorporates the assumption of natural human weaknesses.

CVIF Dynamic Learning Program: A Low-cost Viable Solution

Considering the present conditions in the Philippines, is it possible to have a low-budget yet effective educational program that:

- Is suitable for large classes common in the Philippines?
- Requires a smaller number of textbooks?
- Requires less science equipment?
- Reduces teaching personnel requirements?
- Is less dependent on the abilities and personalities of teachers?
- Has built-in checks of dysfunctional behavior observed in Filipinos?

It is possible. In the following sections, as a micro-level prototype and springboard for larger scale solutions, we describe some salient features of a new learning program implemented since SY 2002-2003 in a rural private high school, the Central Visayan Institute Foundation (CVIF), formerly the Central Visayan Institute. We emphasize, however, that with the magnitude of the problem of education, solutions are naturally multi-dimensional and what we present here can only be a fraction of what we are actually doing. In particular, we focus on strategies to improve scholastic achievements in a progressive manner withno short cuts. Many cultural factors and development of new attitudes are intrinsically integrated with the strategies for academic work. For brevity, we shall mention these attitudes whenever applicable and not in a separate section.

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[5] As distinguished from schools accredited by the Philippine Accrediting Association of Schools, colleges and Universities (PAASCU) which enjoy a certain degree of autonomy from the Department of Education.

The CVIF is located in Jagna, a town with a population of about 24,000, in the province of Bohol, 63 kilometers southeast from the only city of the province, Tagbilaran City. The CVIF is among the private schools under the supervision of the DepEd, Division of Bohol[5], which in turn is under the direct supervision of the Regional Office for Region VII (Central Visayas Region) in Cebu City. In 1999, the CVIF was nearing closure and suffered from all the problems mentioned in the PHDR 2000. These include large classes, lack of updated textbooks and instructional materials, teachers lacking proficiency in subject matter and pedagogical skills, poor learning and living conditions in a rural community, and lack of funds (tuition fees were P 2,400 *per year*). At the CVIF, seemingly overwhelming difficulties had to be tackled one by one, in a difficult-case scenario, until positive results could be observed. In SY 2002-2003, in an effort to fast-track improvements, the CVIF joined the public schools in implementing the 2002 BEC. However, new features were introduced at CVIF so that the whole scheme, which we call, for brevity, the CVIF Program, could address multi-pronged problems in a more effective way.

The CVIF Program developed out of our actual observations and firsthand experiences for more than four years as principal, consultant, and/or classroom teacher handling General Science, Chemistry, Physics, and Geometry in several sections in the first, third, and fourth year levels. The program makes use of many ideas of classical and modern pedagogical theories while maintaining a pragmatic approach. The theories were adapted, developed, and used with real classroom problems in a non-urban Philippine setting, reflecting the conditions and cultural factors described in earlier sections. For example, we worked subject to the constraint typical in rural settings: low educational levels of parents. (For SY 2003-2004, with 439 CVIF student respondents, the highest educational level reached by *at least one parent or guardian* showed 52.84% post-high-school, 38.95% high school, and 8.20% pre-high-school.) This factor is important in the school's program for enhancing language learning abilities of the students.

After its second year of implementation in SY 2003-2004, the CVIF Program has proven to be a robust workable scheme. Since most classroom problems we encountered, and offered solutions to, are also present in public schools, the program may find application there, perhaps with suitable modifications. On the other hand, affluent private schools, with bigger budgets and more access to high technology, can easily enhance the model for marked gains in performance[6]. Moreover, although the CVIF program was implemented with the 2002 BEC, the program is simply a platform that can

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[6] It may be of interest to the reader that the authors considered distinguished physicists and mathematicians as models of effective self-learning and sophisticated abstract thinking when they were in the high school stage. Examples are Richard Feynman and Freeman Dyson. We studied their learning styles for application in the education of gifted children in our school.
[7] We do not, however, exclude application, in a suitably modified form, to elementary schools.

accommodate different curricula such as the 1989 NSEC and special science curricula for science high schools.

Initial focus on the high school. The CVIF Program was developed and applied in the high school[7]. In the Philippines, high school covers the ages 13 to 17 years old. This is the adolescent stage characterized by significant physiological changes and achievement of mental maturity. The high school stage coincides with Jean Piaget's last stage in development theory - the *formal operations stage* [*10*]. During this stage, the young person typically develops complex logical thought processes and is capable of abstract thinking. As he reaches the later adolescent stage, most of the additional mental structures necessary for logical, mathematical, and scientific reasoning are completed. In the affective learning domain, it is during this period that the young adolescent especially anticipates adulthood and professional life.

Limited efficacy of traditional schemes. Present conditions in the Philippines severely diminish the efficacy of traditional teaching methods developed in the West because:

- Classes are simply too large. In advanced countries, there are 15 to 25 students per class. Most private schools in Philippine urban areas typically have 30+ or even 40+ students in each high school class. Public schools, as mentioned earlier, have even larger numbers. It would be very difficult, even for excellent teachers, to monitor the progress of all the students in a large class. In general, the fast learners, or high profile, self-confident students dominate in large classes handled in traditional ways.

- Traditional teacher-centered methods generally boil down to the lecture style in day-to-day practice during the school year. This fosters passive learning that is too dependent on the abilities of the teacher. Moreover, teachers unprepared with the lessons for the day, or faced with unruly students in large classes, resort to homilies or stories. Moreover, noting the number of unqualified or poorly prepared teachers, the heavy concentration of lectures and speaking on the part of the teacher boosts the transmission of wrong ways of thinking and poor language skills.

- In a country where there is a culture of dependence, students are more prone to depend on the teacher, classmates, and relatives for their learning. There is a diminished motivation to analyze problems on their own, and do deep thinking on important topics.

Traditional schedules of classes are constrained by the number of sections and available teachers to have science and math classes towards noontime or in the afternoon. These are non-peak hours for learning when students may be hungry, tired,

and generally restless, especially in a tropical country such as the Philippines. [See the prototype class schedule for public schools given by the DepEd on the following page.] We now introduce the important components of the CVIF Program for Dynamic Learning. Some features are not entirely new in the sense that they have similarities with the Individual Instruction method or Personalized Education Program implemented in schools such as St. Scholastica's College [*11*] and the Poveda Learning Center [*12*] in Metro Manila, respectively. This is also true for schools applying the Montessori method. However, such programs are known to be expensive due to the cost of special instructional materials and modules. Indeed, tuition and other fees may reach up to P 60,000 and P 80,000 per year in these schools. In contrast, the CVIF Program has been observed to raise achievement levels of students even as they paid tuition and other fees of P 5,795 for the whole school year 2003-2004. This is why we propose the Program, or suitable modifications thereof, as a low-budget alternative.

Table 1. Prototype class schedule showing the increast in the teaching time in Science I to III.

Time	Subject
6:40–7:40	MAPEH
7:40–8:40	English
8:40–9:40	Math
9:40–9:55	Recess
9:55–10:55	TLE
10:55–11:55	Science
11:55–12:55	Lunch Break
12:55–1:55	Filipino/EP
1:55–2:55	AP

Total number of hours: 8 h
From: DEP ED Order No. 37, s. 2003: Revised Implementing Guidelings of the 2002 Secondary Education Curriculum Effective School Year 2003-2004.

The essential components of the program given here are (i) Parallel learning groups, (ii) Activity-based multi-domain learning, (iii) In-school comprehensive student portfolio, and (iv) Strategic study/rest periods.

Parallel Learning Groups (Modified Jigsaw Strategy)

A very important component of the CVIF Program is the *parallel learning groups*. This means that three sections of a given year level have the same subject all at the same time. (See the sample Class Program (Table 2) on the following page.) The

immediate question would be how one teacher could handle all the science classes if they are conducted at the same time. This is where the *Expert Teacher/Facilitator* (Figure 1) set-up comes in:

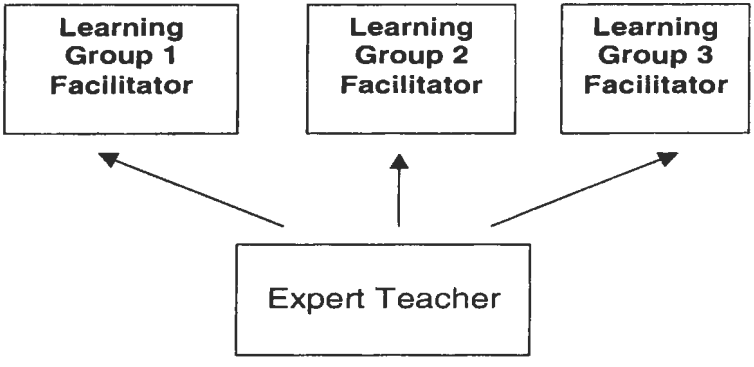

Figure 1. Expert teacher/facilitator set-up of the CVIF program.

The expert teacher is responsible for a particular subject. He/She prepares the concept notes and exercises, and is responsible for grading activities, quizzes, and exams. During the allotted time for the subject, the expert teacher chooses the Learning Group (or section) where a lecture or discussion will be conducted. Since the expert teacher should not lecture for more than twenty minutes, on the average, other sections can be visited while the students are doing activities during the rest of the period. The activities may be in the form of drills, exercises, taking of concept notes, drawing, and learning stations, among others. While the students are doing their activities, the facilitators (who are also licensed and expert teachers of other subjects) take charge of the class. The facilitators *do not discuss nor interfere with the activities of the students.* They merely make sure that the students are doing the activities for the day, and classroom conditions are conducive to learning. Questions on the subject matter are forwarded to the expert teacher. The students are thus constrained to work independently. This leads to Bruner's development of the independent learner "in which instruction aims to help the learner be a self-sufficient problem-solver. This means that the learner must not be permanently dependent on his teacher's correction of errors, but must be able to take over the corrective function. This self-monitoring behavior is a goal of cognitive learning [*13*]."

The idea for the Parallel Learning Groups was inspired by the Jigsaw Strategy devised by Professor Elliot Aronson in 1971 in Austin, Texas, U.S.A. [*14*]. In the original Jigsaw Strategy, students were grouped into so-called home groups and expert groups.

Table 2. Sample Program of CVIF

CENTRAL VISAYAN INSTITUTE FOUNDATION

Jagna, Bohol

CLASS PROGRAM

SCHOOL YEAR 2003-2004

MONDAY

	Mins.	IA R-201	IB R-202	IC R-203	IA R-209	IB R-208	IC R-210	IA R-105	IB R-106	IC R-207	IA R-301	IB R-302
7:30-7:40	10	F L A G C E R E M O N Y										
7:40-8:55	75	SCIENCE I	SCIENCE I	SCIENCE I	SCIENCE II	SCIENCE II	SCIENCE II	MATH III	MATH III	MATH III	MATH IV	MATH IV
8:55-9:15	20	R E C E S S										
9:15-10:30	75	MATH I	MATH I	MATH I	MATH II	MATH II	MATH II	SCIENCE III	SCIENCE III	SCIENCE III	SCIENCE IV	SCIENCE IV
10:30-11:45	75	ENGLISH I	ENGLISH I	ENGLISH I	FILIPINO II	FILIPINO II	FILIPINO II	FILIPINO III	FILIPINO III	FILIPINO III	ENGLISH IV	ENGLISH IV
		N O O N I N T E R M I S S I O N										
1:30-2:45	75	FILIPINO I	FILIPINO I	FILIPINO I	ENGLISH II	ENGLISH II	ENGLISH II	ENGLISH III	ENGLISH III	ENGLISH III	FILIPINO IV	FILIPINO IV
2:45-4:00	75	Makabayan (E.P. I)	Makabayan (E.P. I)	Makabayan (E.P. I)	Makabayan (Aral. Pan. II)	Makabayan (Aral. Pan. II)	Makabayan (Aral. Pan. II)	Makabayan (Aral. Pan. III)	Makabayan (Aral. Pan. III)	Makabayan (Aral. Pan. III)	Makabayan (Aral. Pan.	Makabayan (Aral. Pan.
4:00-5:00	60	Makabayan (TEPP I)	Makabayan (TEPP I)	Makabayan (TEPP I)	Makabayan (TEPP II)	Makabayan (TEPP II)	Makabayan (TEPP II)	Makabayan (TEPP III)	Makabayan (TEPP III)	Makabayan (TEPP III)	Makabayan (TEPP IV)	Makabayan (TEPP IV)

It is called Jigsaw because each student's part, as they move from the expert groups to their particular home groups, is essential for the successful achievement of objectives.

In the CVIF adapted form, we reversed the procedure. Instead of students, the expert teachers and facilitators cooperate to facilitate the learning process.

The parallel learning groups are very important to maintain the effectiveness of the other component that is the Activity-based Multi-domain Learning. Once the expert teachers stay for whole periods with their classes, the tendency is to revert to the traditional teaching methods such as lectures and repeated explanations of the same topic[8]. There is also the tendency for the teacher to move on to the next topic when fast learners in the class give the impression that they are ready to move on. This is because quiet students are generally observed to acquiesce to the dominant mood set by high-profile students whether or not they have learned the subject matter well. In contrast, the parallel classes scheme allows more students to have more time for absorption and mastery of lessons. The set-up also constrains the expert teachers to prepare good activities for the periods when they are not within the classes and students have to learn independently.

There are other advantages of the CVIF Program's parallel learning groups. It is robust against teacher absences. It promotes higher interaction between teachers. Poor performing teachers are pushed to better performance as they move from one class to another as facilitators or expert teachers and are exposed to the activities given by good teachers. The facilitators also learn teaching strategies used in other subject areas.

Activity-based multi-domain Learning

It is said, "the most effective learning takes place where there is a maximum of mental activity [*13*]. Activity-based learning, combined with the parallel learning groups scheme fosters Kohlerian insight learning % the students gain insight as they independently go through the "gradual process of exploring, analyzing, and restructuring perceptions until a solution is arrived at [*13*]" This enhances critical thinking, mastery of basic principles, and deep understanding of lessons. This contrasts with rote learning or simple-minded accumulation of disjoint information, trivial or non-trivial, which can be accessed through the Internet or traditional libraries.

Problem-based learning. Strategies recommended include problem-based or inquiry-based learning and the discovery approach. For example, in class, the expert teacher gives an activity on a new topic. The students work on this activity for a whole period *without* a lecture, discussion, or demonstration from the teacher. The facilitator

[8] In the words of an Assistant Schools Division Superintendent, "We let teachers attend many seminars and training programs on teaching strategies. However, when we go around, we find them resorting to the traditional lecture style."

takes care of classroom management during the period. By the time the expert teacher visits the class, the students already have particular questions or problems in mind. They are then able to give directed questions that have direct bearing on the problems they tried to solve earlier. The flash of insight or understanding is more often observed than in traditional situations where the teacher introduces the topic, lectures, explains, and gives examples, before the students work on the lessons. With the CVIF program, many students are able to solve problems and exercises, such as physics problems, even without prior explanation of the topic. The expert teacher simply reinforces correct understanding, points out common errors, or compares the merits of different approaches and solutions.

Learning stations. Part of the activity-based learning program is the maximal use of learning stations in laboratories. This is recommended especially for schools with limited facilities. Even with only one or two available set-ups for one science experiment, learning stations for different experiments can be set up so students can go from one learning station to another. At the CVIF, learning stations have also been set up for math classes. Examples are exercises in making accurate measurements and converting units.

At the CVIF, students normally work in pairs at a learning station. The maximum number in a group is three. This avoids large dysfunctional groups commonly observed in many schools in the Philippines, where classes of 40 or more students are divided into eight or ten groups depending on available laboratory equipment. Considering the culture of dependence of Filipinos, for groups of more than three members, there will be non-functioning members who will rely on the others. The learning process is superficial in this case.

The discovery approach in which the students independently try to understand instructions posted at the learning stations also enhance language learning abilities. The association of verbal expressions with activities and equipment they can touch and manipulate provide potent stimuli for language learning.

Multi-domain learning. Activities are designed to enhance cognitive, affective, and psychomotor learning of students. For cognitive learning, emphasis is on problem solving, analysis, evaluation, synthesis, and creation. In the affective domain, learning is reinforced by the different components of the CVIF program. Attitudes and behavior such as self-discipline, thoroughness, diligence, accuracy, neatness, honesty, stamina, perseverance, patience, and attentiveness have been enhanced. Psychomotor abilities are used to reinforce cognitive and affective learning in an integrated manner. Students do a lot of drawing, graphing, cutting out of geometric figures, coloring, measuring, tracing, and creating attractive figures for their portfolios.

Less dependence on textbooks. Also, we observed less dependence on textbooks. At the CVIF, because of typographical and conceptual errors and confusing notation seen in many math textbooks, we did not recommend any math textbooks to the students. The teachers, guided by the principal, referred to several books and often designed their own activities for the students. It was clear, therefore, that the number

CENTRAL VISAYAN INSTITUTE FOUNDATION
Jagna, Bohol 6308

ACTIVITY SHEET

Name:_____ **Grade / Score:** _____
Year and Section: _____ **Date:** _____

Please check the box for the type of activity.

Concept Notes				**Drawing/Art**	
Skills / Excercises				**Computer Education**	
Math	☐	**General Science**	☐	**Translation Exercise**	☐
Vocabulary	☐	**Biology**	☐	**Theme: Formal**	☐
Talasalitaan	☐	**Chemistry**	☐	**Informal**	☐
Spelling	☐	**Physics**	☐	**Music**	☐
Laboratory Report	☐		☐	**Others:** _____	☐
	☐				☐

Activity Title: _____
Learning Targets:_____
Reference:
Title _____
Author _____ **Page Numbers** _____

Figure 2. Sample activity sheet of CVIF

of textbooks required can be minimized in the program. A good set of reference books for the expert teachers would be sufficient.

Flow State. It is now a common line at the CVIF to talk about the so-called "flow state" or "state of total absorption in a challenging activity." Young people quickly reach this state when working or playing on the computer [*15*]. This creates the problem of having classroom educational experiences that could compete in engaging the minds of students. It has become an important problem of education, especially nowadays, to help adolescent students achieve this flow state in classroom educational experiences that would give way to their full creative and problem-solving abilities. At the CVIF, however, teachers have remarked on *how difficult it is to take out students from their flow state while they are absorbed in their individual activity* even when the expert teacher comes in to check on the progress of their work.

The In-school Comprehensive Student Portfolio

In the CVIF Program, ordinary notebooks are optional. What the students have are color-coded in-school comprehensive student portfolios, one each for the different subject areas – Science (yellow), Math (white), English (blue), Filipino (green), and Makabayan (red). All activities are done *in school* and compiled in the portfolio. It is comprehensive because all activities, including quizzes and exams, are compiled in the portfolio.

The activity sheet. Activities such as concept notes, exercises, drills, drawings, themes and essays are done on the CVIF Activity Sheet (Figure 2) used by students of all year levels. Notice the features of the Activity Sheet.

(i) In analogy to the concept map, the student is given a full perspective of the four-year stay in high school and the formal areas of learning he shall encounter as he selects the type of activity he is to do, whether in biology, chemistry or physics, or the languages. This is important for the students' goal setting for his stay in High School. (ii) To develop intellectual honesty and introduce the methods of research, the student is asked to indicate the reference used for the activity. (iii) The Activity Sheet is not ruled. This develops discipline and creativity paradoxically *at the same time*. (iv) Clear and specific Learning Targets are written. (Note, the word *target* has more direct meaning for Filipino students, rather than the word *objective*. In the same way, '*velocity*' has more direct meaning to an Italian student because the word '*veloce*' is used in everyday life to mean 'quickly.') This focuses the mind of the student on the immediate objective of the activity or learning task.

In-school portfolio policy. With the CVIF Program, the portfolios cannot be brought home. Also all activities and projects are done in school and filed in the portfolio after each class period. This ensures that the students learn independence in doing their own work. How do parents check on their children's learning? In principle, parents are welcome to visit the school to see the progress of their children's

work. In practice, most parents look at the portfolios during the open classrooms after the quarterly evaluation and distribution of Report Cards.

An important question raised regarding the in-school portfolio policy was how students can study after school when they do not have notebooks with them. The answer to this is the importance of enhancement of high-impact learning and storage of knowledge in the students' long-term memory. It is *precisely* the fact that the students do not have their notes with them that they are forced to *think through* the concepts, problems, questions, and ideas they encountered in their school activities. This process of thinking without notes and books is found to enhance learning. According to Bruner's theory of learning: "Learning at its best is thinking, and thinking is the process whereby one makes sense of a hodge-podge of perceived facts through a process called either conceptualization or categorization [*12*]." This particular way of churning a problem or idea in one's mind without referring to notes or books has been observed in scientists. Indeed, physicists have been heard to remark on visualization "without books, pen and paper; such that if one is stranded on an island, he should be able to reconstruct the fundamental principles of physics."

This observation is now being applied in tests to measure aptitudes in science and math. An example is the DOST-SEI 2004 scholarship examinations [*16*]. A part of the battery is the tests of working memory or the ability to hold in the memory as many parts of a complex figure at a given time. The tests measure aptitude in the scientific cognitive abilities such as concept formation, logical reasoning, and pattern recognition. It is precisely these cognitive abilities that the *in-school* portfolio policy aims to enhance.

Cumulative scholarship. Starting with a single Activity Sheet on day 1 of the academic year, the activities are accumulated gradually. Then at the end of the school year, the student has a relatively thick portfolio for each subject containing *his/her work* for one school year. The portfolio reflects the output of the young scholars. Indeed, it is easy to see the similarity between a university professor writing a scholarly monograph, starting with a single page, and the young high school student accumulating his own scholarly work bound in the portfolio. Students have been observed to manifest a strong sense of accomplishment while bringing home their portfolios at the end of the school year. Even parents have remarked on this. Moreover, there is a marked contrast between, on one hand, the neatly written notes and colorfully drawn figures in portfolios and, on the other hand, traditional notebooks filled or half-filled with a mixture of notes, informal scribbles, doodles or even cartoons.

Supervisor-friendly. In traditional schemes, the principal may every now and then observe classes to monitor teacher performance. However, it is to be expected that teachers wittingly or unwittingly show their best when the supervisor or principal is around. Thus, there is no guarantee that professional performance of duties is carried out every day of the school year. In contrast, with the comprehensive student

portfolios, the principal is able to easily monitor the progress of student learning. The portfolios clearly reflect the correlation between the teachers' lesson plans and what have actually been accomplished in class.

Strategic Study/Rest Periods

MSEPP Day. To maximize learning time and allow more room for different focusing time of students, the CVIF class program has longer periods for the academic subjects. Academic subjects like Science, Math, English and Filipino, and some components of Makabayan are scheduled on Mondays, Tuesdays, Thursdays, and Fridays. Wednesdays are MSEPP (*Musika, Sining, at Edukasyong, Pangkatawan at Pangkalusugan)* days. This scheme solves the problem of having students tired and sweating after games and exercises when they report for the academic subjects.

No-homework policy. The no-homework policy of the CVIF program is not new. The "Father of Modern Education," Johann Amos Comenius, emphasized relaxation after study periods. Michel de Montaigne also promoted the enjoyment of leisure hours to enhance creativity and productivity. Subscribing to this philosophy, CVIF students do not have homework so they can enjoy wholesome leisure and family time and sleep early (by 8 or 9 p.m.). They can then be fresh and energized for the next day's schoolwork. This also takes into account modern day findings of health experts that young persons need eight hours of sleep and an additional one-fourth hour for every year of age under 18 years old.

Continuous Evaluation and Differentiated Approach

Continuous evaluation. Monitoring of performance and achievement levels is important in any new program. This is especially true when base line scholastic achievement levels are low. At the CVIF, the administration conducts regular in-school academic evaluations in addition to examination of student and teacher portfolios. The administration also monitors the performance of students from different year levels in similar learning activities. So far, progressive improvement has been observed.

In the absence of the NSAT, we have noted the performance of students in the UPCAT as a necessary external check. Five CVIF students passed the 2003 UPCAT while four passed the 2002 UPCAT. This came after a period of eight years without any passers. The last time was when four students passed the 1995 UPCAT, the highest record then for the school. Prior to this, just like other rural high schools in the country, one or two students passed every other year or so (generally the top honor students). The relatively good number of passers for the two *consecutive* years, 2002 and 2003, is suggestive of improvements in the school's academic program.

Another external check is the participation of CVIF students in the Mathematical Challenge for Filipino Kids Training Program conducted by the Mathematics Trainers

Guild (MTG) of the Philippines. For SY 2003-2004, eight students qualified for the training program. Only four participated in the 12-Saturday training program conducted in Tagbilaran City (63 km away from Jagna) from July 2003 till February 2004. Two CVIF students ranked second and third overall after the program, outscoring students from the Tagbilaran City Science High School and the Bohol Wisdom School, both prestigious schools in Tagbilaran City.

Differentiated approach. With the CVIF program, progressive improvement in scholastic performance is aimed at, and has been observed. It is, therefore, important that learning activities are designed in a differentiated approach, based on observed performance and potentials of the different year levels. Currently available commercial instructional modules fixed or pegged at predetermined scholastic levels may not be appropriate in this case. At the CVIF, the principal works with the expert teachers to make sure the levels of learning activities are suited to the abilities and academic background of the students. For example, in Math, which is a sequential subject, gaps in students' understanding of basic concepts have to be filled out first before they take on other topics. For SY 2003-2004, because of insufficient skills in algebra, third year students were taught Geometry in a way that patches up deficiencies in algebra and number theory. In the next school year, 2004 – 2005, with incoming third year students having a better background in algebra, the approach in teaching geometry will be accordingly adjusted and modified. This is also why continuous evaluation and monitoring of performance is important.

Other Recommendations

In the evaluation of the conditions that led to the implementation of the CVIF program, we are also led to *strongly recommend* the following:

1. **Immediate abolition of the course leading to the degree of Bachelor of Secondary Education (BSEd).** Instead, we propose a regular B.S. or A.B. degree in the field of specialization, with 18 credits of professional education courses. This policy is implemented in Scandinavian countries (which do well in the PISA) and other advanced countries. The foremost reason is that high school students, being in the Piagetian formal operations stage, are capable of formal abstract sophisticated thought processes. Clear expertise in the subject matter manifested by a teacher is of utmost importance in this case. The narrow intellectual gap between high school students and Philippine BSEd graduates generates pedagogical and didactic problems, including the widespread rote-style teaching and learning process especially in the science subjects.

   As stated earlier in this paper, the poor LET performance of teachers is a cause of concern. Although still to be confirmed with studies, LET results seem to indicate that B.S. / A.B. graduates with education credits

do better than BSEd graduates. Actual classroom observations made by the authors have validated this especially in math and science classes. It would be an expensive and risky effort to simply try to improve the BSEd curriculum and/or retrain teachers. Indeed, again as mentioned earlier, mediocrity of classroom instruction has spiraled down from mediocre teacher preparation in universities and colleges. It is difficult to expect better BSEd graduates in the succeeding years.

2. **Separation of Physics, Chemistry and General Science as major subject areas in the LET.** The present 3-in-1 combination of Physics, Chemistry, and General Science as a single part (Physical Sciences) of the LET may produce teachers not competent enough to teach Physics, nor Chemistry, nor General Science.

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