CVIF Dynamic Learning Program: A Systems Approach to Process-Induced Learning

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We report on a learning program where teacher intervention is constrained to only about 20% of the subject period, with 80% for independent work of students on teacher-designed learning activities. The program includes purposeful in-classroom protocols that induce focus and sustain attention. Annual assessments of student performance show accelerated progressive enhancement of cognitive and affective learning, with each batch of graduates, on average, exceeding performance levels of the previous year, for high school students of the Central Visayan Institute Foundation (CVIF) in the Philippines. The program, first implemented by the CVIF in 2002, is being adopted by an increasing number of schools in the Philippines. It is also the springboard for the Learning Physics as One Nation Project piloted in 2008 and now being expanded to over 200 schools in the Philippines.

Keywords: CVIF, Process-induced learning, Controlled teacher intervention

Introduction

Results of much education research, often of limited domain of application, are open to varying interpretations and in situ breakdown of school programs invoking such research. We note that in situ conditions can often mean conditions of infrastructure and academic programs that are far from ideal, such as oppressive heat, abject poverty and horrendous learning conditions, as well as severe lack of competent teachers. From personal experience in real classroom situations, we have also observed a number of absurdities and inconsistencies where dominant pedagogical theories and practices do not agree with what is observed. An example is the present claim on increasingly short attention span of high school students. In our school, we have observed sustained complete absorption or on-task behavior of a large number of students while they do their learning activities. This extended attention span has long been observed by Maria Montessori (Montessori, 1970). The question really is: *What catches the attention of the young?* More important for secondary school, *what sustains the attention of adolescents?* Not knowing the answers could be among the factors for the observed decline in student interest and performance in science and mathematics in many countries despite big-budget measures and intervention programs.

The CVIF Dynamic Learning Program (DLP) was initially developed and applied in the high school (covering 13-16 year-old students) in the Philippines (Carpio-Bernido & Bernido, 2004). This paper presents the essential features of the CVIF-DLP as a differentiated and target-oriented program for effective learning under multiple socio-economic and cultural constraints. It was designed based on our experiences as physicists immersed in daily work in a secondary school, the first author being Principal and science/math teacher, and the second author being Research Director, respectively. Adopting the systems approach (Bertalanffy, 1968), the CVIF-DLP puts premium on the design and control of the total school learning environment, with all elements in a coherent framework purposefully designed to induce sustained learning, even in situations where there is a lack of mature and competent teachers. The program adopts the perspective of progressively knowing "what students learn and how they really learn" over "what to teach and how to teach".

Program Components

The major components of the program are: (1) Parallel Classes, (2) Activity-based Multi-domain Learning, (3) In-school Comprehensive Student Portfolios (instead of notebooks), and (4) Strategic Study/Rest Periods.

Parallel Classes Scheme: Controlling Teacher Intervention

The parallel classes scheme has *all sections of each year level having the same subject at the same time* (See Table 1 for a sample program). The number of students per section ranges from 35 to 55 students, typical of schools in the Philippine setting. The total number of minutes for each subject conforms to the national basic education curriculum prescribed by the country's Department of Education.

Time	Minutes	First Year (3 sections)	Second Year (3 sections)	Third Year (2 sections)	Fourth Year (2 sections)
7:30- 7:40	10	*Morning Prayers and Flag Ceremony*			
7:40- 9:10	90	Science		Math and Computer Science	
9:10- 9:30	20	*R E C E S S*			
9:30- 11:00	90	Math and Computer Science		Science	
11:00-12:00	60	Technology and Livelihood Education / Language Laboratory			
12:00-1:30	90	*L U N C H*		*B R E A K*	
1:30- 2:30	60	Language Studies			
2:30-3:30	60	Language Studies			
3:30-5:00	90	Social Studies and Values Education			

Table 1: Sample Academic Day Class Program, (For Monday, Tuesday, Thursday and Friday)

Note that the scheme takes advantage of natural biological cycles. As a teacher, among others, remarked in the program evaluation after its first year of implementation, "I highly agree with the simultaneous scheduling of subject areas because physics and math are the most difficult subjects and these were given first and second periods in the morning when the students still have a fresh mind." This is in contrast to more common schedules with science and math classes towards noontime or in the afternoon. At these hours in a tropical country like the Philippines, restlessness could compound problems encountered in learning hard subjects such as science and math. For example, it has been observed that "students have serious difficulty in learning physics" (Scheiter, 2004).

The key question on a school schedule with parallel classes is how one teacher can handle more than one science class if these are conducted at the same time. This is where the *Expert Teacher/Facilitator* set-up comes in (Figure 1). This peculiar component of the CVIF Program was inspired by the Aronson Jigsaw Strategy (Aronson, Blaney, Stephin, Sikes, & Snapp, 1978) in which students are grouped into so-called "home groups" and "expert groups". The model is called "Jigsaw" because each student's part, as they move from the expert groups to their home groups, is essential for the successful achievement of objectives. In the CVIF-DLP model, we inverted the entire procedure. Instead of students, the "expert teachers" and "facilitators" cooperate for achievement of targets.

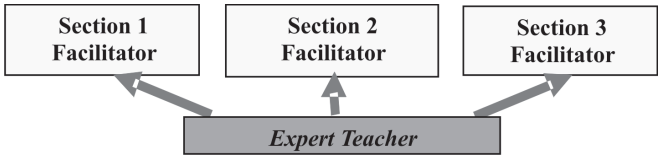

Figure 1: Expert teacher-facilitator scheme for parallel classes

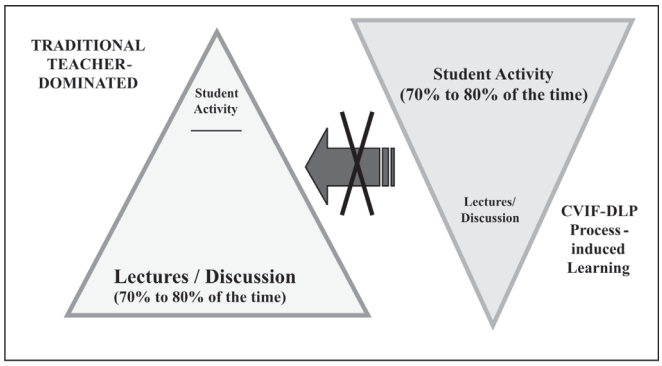

Figure 2: The parallel classes scheme provides an impenetrable barrier to prevent sliding from process-induced learning in the CVIF DLP back to traditional teacher-dominated strategies in the course of the school year

The "expert teacher," who is a regular classroom teacher, is responsible for a particular subject, the design and preparation of daily learning activities, evaluation and assessment of student performance in that subject. During the subject period, she/he chooses the section where a lecture or discussion will be conducted. In practice, with long periods during academic days, different sections may be visited while students are doing drills, projects, concept notes, or drawing. While the expert teacher is not with a class, a facilitator (who is an expert teacher of a different subject, allowed by the parallel classes program) takes care of classroom management. *The facilitators do not discuss nor interfere with the activities of the students, but* merely check classroom conditions and make sure students are doing the activities for the day.

The pedagogical basis for the parallel classes scheme is the need for controlling teacher intervention so as to give students time to work independently in school on meaningful tasks, and not postpone for homework. This is done by limiting the

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ACTIVITY SHEET

Name: _____ **Score:** _____

Year and Section: _____ **Date:** _____

Please check the appropriate box.

Subject

☐ Religion/Values Ed. ☐ Chemistry ☐ English ☐ TLE / IT

☐ General Science ☐ Physics ☐ Filipino ☐ MAP EH

☐ Biology ☐ Math ☐ Araling Panlipunan ☐ CAdT

Type of Activity

☐ Concept Notes ☐ Laboratory Report ☐ Formal Theme ☐ Others: _____

☐ Skills / Exercise / Drill ☐ Drawing / Art ☐ Informal Theme

Activity Title: The Graph of an Exponential Function for b > 1

Learning Target: To plot and describe the graph of an exponential function for b > 1.

References: Title http://www.purplemath.com/modules/expofcns.htm
http://oregonstate.edu/instruct/mth251/cq/FieldGuide/exponential/lesson.html

Author: _____ Page Numbers: _____

Graph the exponential function $f(x) = b^x$ for b = 3. Have as sample values for the domain the values $-5 < x < 5$. Then extrapolate or extend the graph to smaller and bigger values of x. Note, use the rules for negative exponents for negative values of x.

Describe the graph by answering the following:
(1) Is the graph a straight line or is it curved?
(2) Is the function increasing or decreasing with the increasing x?
(3) Is there a y-intercept? If yes, give the point. If not, state the reason why.

(Prepared by V. B. Galbizo, CVIF Math Teacher, with M. V. Carpio-Bernido.)

teacher's direct-interaction time with the students. The scheme then serves as an *intrinsic inhibitor* preventing the slide back to teacher-centered strategies, and thus fostering process-induced learning instead of teacher-induced learning (Figure 2). Indeed this is crucial to the Brunerian 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" (Bustos & Espiritu, 1996).

Moreover, the simultaneous classes with the jigsaw of teachers and facilitators promote higher interaction between teachers and cross-fertilization of ideas. Poor performing teachers are pushed to better performance since, as facilitators in other subjects, they are exposed to activities given by good teachers. For example, in the early days of program implementation, a teacher thought of having a "Quarterly Table of Contents" done by the students after each quarter to help student's consolidation and review of learning activities accomplished. Exposed to this as they did facilitator duties, all teachers decided to adopt the practice. Moreover, teachers have daily opportunities to discuss with each other on the formulation of learning targets and concept notes, framing of questions, and rubrics for projects, which they see given to the different classes. This way, too, teacher apprentices can train on the job while serving as assistant expert teachers.

In-Classroom Protocols For Sustained Independent Learning

Applying strategies for problem-based or inquiry-based learning and the discovery approach, the CVIF-DLP students follow set daily procedures that foster habit formation for focused and sustained learning. For example, a class begins with the expert teacher writing on the board (or flashing with a projector) a learning activity on a new topic. Activities such as concept notes, exercises, drills, drawings, themes and essays are handwritten by the students on the CVIF Activity Sheet used by students of all year levels (See Sample Activity Sheet). The activity sheet includes the activity title which encapsulates the main idea to be learned. This is followed by one or two learning targets. These are similar to the objectives written in lesson plans and follow the same principles in writing of instructional objectives (simple, clear, specific, behavioral and attainable), but are phrased from the point of view of the student. *(Example for Biology: To differentiate between plant and animal cells).* References used by the teacher are also indicated on the activity sheet. The learning activity follows the classical format starting with brief concept notes (introduction, background, concept or main idea to be learned). This is followed by one or two illustrative examples, and then the questions, exercises, graphs, drawings and other tasks.

The students work on the activity for most of the class period *without* a prior lecture, discussion, or demonstration from the expert teacher. This is why, by the time the expert teacher visits the class, 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 expert teacher simply reinforces correct understanding, points out common errors, or compares the merits of different approaches and solutions. 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.

All daily activities, including quizzes and exams, are compiled in the in-school *comprehensive* student portfolios. In terms of numerical marks for assessment of student learning as prescribed by the Department of Education, the CVIF has included the comprehensive student portfolio with other components of the student grade such as periodical long examinations, quizzes, projects, lab work and class participation (e.g., component percentage weights of 15%, 25%, 10%, 15%, 25% and 10%, respectively. Weights vary depending on subject areas). However, the comprehensive portfolio, going beyond the more common supplementary portfolio for exemplars or best works of the student, presents a fuller documentation of the learning process " how each student's responses to various questions develop as he or she matures. The reflective teacher and administrator can thus make use of the comprehensive portfolio as a highly effective evaluative tool for continuing enhancement of learning processes. On the other hand, students manifest reflective and self-evaluative behavior when filing and organizing activities in their portfolios.

Strategic Rest: Mid-week Non-academic Day and No-homework Policy

In the CVIF-DLP, four days of the week – Monday, Tuesday, Thursday and Friday – are for academic work, while Wednesday is for Music, Arts, Physical Education and Health (MAPEH), and Citizenship Advancement Training (CAT). There are no classes on Wednesday afternoons for freshmen and sophomores. Remedial work, faculty and club meetings, training and rehearsals are also done on Wednesdays. Close adherence to this schedule has developed in students a strong sense of time management for their different activities. This is especially good for adolescents since psychologists identify this as the stage for forming both behavioral and intellectual habits.

The no-homework policy of the CVIF-DLP is a return to classical wisdom that interestingly coincides with recent results of neuroscientific research. 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. CVIF students do not have homework so they can enjoy wholesome leisure and family time and sleep by 8 or 9 in the evening. 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.

A debatable issue for the no-homework policy is the development of study habits. As it turns out, however, the intensity of activity-based school work during academic days has fostered good learning and study habits in the CVIF students in spite of the no-homework policy. When they are in school and doing their learning activities, they are generally focused, attentive and reflective. When it is leisure time, they relax and have fun. What is thus acquired here is the habit of "study during study time, and play during play time." Tracking of students in post-high school studies and work also indicate the acquisition of good study habits and work ethic.

Performance Indicators

The CVIF selection process for entering first year students is very liberal. The school is also located in the fourth class municipality in a small island province in the southern part of the Philippines. Most students come from low-income families of farm workers, fishermen, vendors and labourers. The student profile shows a wide range of student abilities from slow learners to bright students.

One gauge, among others, in assessing the effectiveness of the CVIF-DLP is the government administered National Career Assessment Examination (NCAE) which all students nationwide have to take in the early part of their fourth year in high school. In the 2009 NCAE, 27 of the 115 CVIF senior students obtained an overall General Scholastic Aptitude score in the range of 90-99 percentile rank. This means that 23 % of the CVIF-DLP students belong to the top 10 % in the country. Of these, two students got a percentile rank of 99 and three 98. This is a far cry from the single student who scored in the 90-up percentile range in the national exam in 2001. For the different categories in the NCAE, there were 26 CVIF-DLP students (out of 115) who got a percentile rank of 90-99 in Science, 21 students in Mathematics, and 26 in Reading Comprehension. These numbers are remarkable considering the profile of CVIF students. Moreover, the students are given lectures/discussions only 1/4 or even 1/5 of the allotted classroom time, and were not given homework in their four years of high school.

Based on available data, we note that in the NCAE 2007, the CVIF mean percentage score (mps) for general scholastic aptitude (GSA) was 8.7 points above the GSA mps of schools similarly situated in that year. In the NCAE 2009, the GSA mps of CVIF was 23 points above the national mean which has remained relatively stationary (with fluctuations d" ±5) for years.

Conclusion

The CVIF-DLP has proven to be effective in enhancing learning and scholastic performance of high school students. Performance distribution graphs that were heavily skewed towards low performance scores in 2001, by 2007 approached an almost bell-shaped curve. Since 2008, the graphs are now more skewed towards high performance levels. With nationwide attention on the program, there are now schools and universities implementing, or planning implementation and adaptation of, the CVIF-DLP starting at the elementary level (age 6 to 12) up to the tertiary level.

The CVIF-DLP model has been the basis of the Philippine Learning Physics as One Nation Project piloted in 2008, and now being expanded to over 200 schools in the country. The project is designed to bypass the severe lack of physics teachers in the Philippines, and can be adapted for the other science and math disciplines.

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