

Baseline, Formative, and Summative Evaluation of the Philippine Science Centrum Educational Pathways Project

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Introduction

This study is a baseline, formative and summative evaluation of the Philippine Science Centrum Educational Pathways (PSCEP) of the Philippine Foundation for Science and Technology, sponsored by the Lucent Technologies Foundation. Conducted from February 2001 to March 2002, this research aimed to determine the effectiveness of PSCEP interventions on students' scores in science and mathematics achievement tests, science process skills, science creativity skills, science and mathematics literacy, and attitude towards science, mathematics, and Information Technology. The PSCEP interventions consisted of the PSCEP-enriched curriculum, teacher training on teaching science through interactive approaches, teacher mentoring, equipment donation, team development of lesson plans, student training on science communication and science and technology livelihood training, and science investigatory/fair projects.

Research methods

The pilot school was Don Jose Ynares Sr. Memorial National High School in Tayuman, Binangonan, Rizal. For the baseline evaluation, two classes—one second year and one third year—were observed. Interviewed were 6 second year students and 12 third year students, one mathematics teacher, two science teachers, the school's teacher-in-charge, division superintendent, three Parent-Teacher Association (PTA) officers, and the Binangonan administrator.

The formative and summative evaluation sample consisted of an experimental class (52 students, 52% male) and control class (48 students, 54% female) in third year, both taught by one mathematics teacher and one science teacher. The experimental class received the PSCEP interventions. Five other third year teachers (one per subject) of Technology and Home Economics, Social Studies, Filipino, English, and Values Education participated for the integration of science and mathematics competencies in teaching their subject areas. Each of the seven teachers had a mentor from the Rizal Science National High School.

Nineteen instruments were used: Science and Technology III Achievement Test, Mathematics III Achievement Test, Science Process Skill Test, Science Creativity Test, Science Literacy Test, Mathematics Literacy Test, Science Attitude Scale, Mathematics Attitude Scale, Learning Competencies in Science III Checklists for Students and Teachers, Learning Competencies in Mathematics III Checklists for Students and Teachers, interview guides for students, teachers, mentors, local officials, and PTA officials; classroom observation guide, and narrative report form on mentoring.

Research findings

The conclusions of the study are:

1. The percent mean scores of students in science and mathematics literacy and attitudinal tests mostly exceeded 75%, while the percent mean scores in science and mathematics achievement, science process skills and science creativity skills were below 50%, ranging from 22% to 40%.
2. The experimental class obtained significantly higher mean scores than the control class in seven out of eight tests, as follows:

- Science Achievement Test
- Science Process Skills Test
- Science Creativity Skills Test
- Science Literacy Test
- Science Attitudinal Test
- Mathematics Literacy Test
- Mathematics Attitudinal Test

In the mathematics achievement test, there was no significant difference in the mean scores of the experimental and control class

3. The experimental class obtained the highest percent gain in science literacy (25.5%) and the lowest percent gain in mathematics achievement (1.4%).
4. The experimental class obtained the highest percentage performance in the Science Literacy test (86%) and lowest percentage performance in the Mathematics Achievement test (26.2%).
5. According to the teacher, the highest integration of science competencies, next to mathematics, was in social studies. For the students, it was in Technology and Home Economics (THE).
6. According to the teacher, the highest integration of mathematics competencies, next to science, was in Technology and Home Economics (THE). For students, it was in Social Studies.
7. For students, most frequently cited as other sources of information in science were peer discussion and research, while in mathematics, it was Science Club activities.
8. For the students, the computer was most useful for research and encoding reports for the newsletter. For the teacher, the computer was most helpful for research, encoding and computing grades.
9. The students in the experimental class became more confident and gained a more positive attitude towards science, mathematics and information technology than those in the control class.

Recommendations

The recommendations of the study are:

1. The PSCEP interventions given to the experimental class need to be extended to all third year classes, given the significantly higher mean scores of the experimental class over the control class.
2. The significant gains of the experimental class need to be sustained and enhanced by further teacher mentoring and close instructional supervision by the school head, division supervisors, and mentors from the science high school.
3. The students' low performance in the tests on science achievement, science process skills and science creativity skills needs to be studied for additional interventions to improve their performance in a given time frame to at least 75%.
4. The non-significant difference in performance in mathematics achievement of the experimental and control classes requires further study on the underlying reasons and the difference in the nature of teaching strategies and content given to the two classes.

5. Since the lowest performance was in mathematics, the achievement test results can be utilized to diagnose weaknesses of students in specific mathematics competencies and lesson plans can be redesigned with close supervision of their implementation in the classroom.
6. Classroom observation of the integration of science and mathematics competencies in other subjects can be done to validate checklist responses of teachers. Achievement tests in science and mathematics or in other subject areas can include items integrating science and mathematics competencies in other subject area topics.
7. Similar PSCEP interventions can be tried out with fourth year students to determine the two-year cumulative effect of the interventions on the students' performance in the eight tests.
8. Teachers can be trained to use the computer to teach science and mathematics. Provisions of the internet cards can be included as part of the school's maintenance and operating fund.

The success of the PSCEP interventions suggests their extensions and testing with the first year and second year students. Finally, the interventions can be replicated in other schools similar to the pilot school.