DEVELOPMENT AND EVALUATION OF SUPPLEMENTARY LESSONS IN TEACHING SCIENCE INTEGRATING CAI MATERIALS FOR HIGH SCHOOL HEARING-IMPAIRED

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Abstract: *This study was undertaken to develop and evaluate Supplementary Lessons in Teaching Science Integrating Computer-Assisted Instructions design for Paaralang Pag-ibig at Pag-asa students. This is a response to the dearth of curriculum materials in science for the hearing-impaired high school students. Specifically, the study intended to identify the content of CAI materials in science for hearing-impaired. Prepare activities in science integrating CAI materials. Try-out the lessons to get information regarding its suitability, clearness of directions and adequacy of time allotment. Evaluate it according to practicality, skills learned, vocabulary, subject content and guidance needed.Designing lessons in science integrating CAI materials will positively enable the teachers to teach a certain degree of success in the conduct of activities which might be the starting point of more encouraging performance.The study focused on the development and evaluation of Supplementary Lessons in Teaching Science Integrating CAI Materials for High School Hearing-Impaired. It follows four stages of development, namely: Stage I- Planning, Stage II- Writing, Stage III- Carry-out stage, and Stage IV- Evaluation.Based on the result, the developed supplementary lessons integrating CAI material are able to meet the needs of the students. The material used in the lessons is readily available, interesting, varied and provide clear directions. It also give abundant skills that are useful in their daily living. Students with low abilities may improve their performance.The following recommendations are made wherein the supplementary lessons in teaching science integrating CAI materials be used as teaching aid for the hearing impaired. Finally, extensive research should be made to determine the effectiveness of the developed materials. All the developed materials should be tried out.*

INTRODUCTION

Science serves as a catalyst in bringing about improvement in the three basic needs of man; food, shelter and clothing. Many discoveries affect our daily lives. There are new cures to diseases, new ways to save energy new techniques in growing foods and effective processes for keeping food fresher for a longer period of time. Indeed, the need to study science is very important if we want to have a "quality life."

The science curriculum for the deaf has always been patterned after that of the normally hearing, because it is believed that the goals of special education are basically the same as those in general education. Section 1 of article V (Policies and Guidelines for Special Education) states that "The curriculum for special education shall be based on the curriculum prescribed for the regular school by the Department of Education, Culture and Sports."

Historically, handicapped students have been denied of the opportunity to study science. It was felt that handicapped students cannot manipulate science activities (Piper, 1980). The opposite is true. Not only can handicapped students manipulate science material and participate in science activities, but also it becomes important that he/she be given privilege alongside other students. Batas Pambansa Bilang 232 (Education Act 1982) state that "The state shall promote the right of every individual to relevant quality education regardless of sex, age, breed, socio-economic status, physical and mental conditions, social and ethnic origin, political and affiliations. The state shall therefore promote and maintain equality of access to education as well as enjoyment of the benefits of education by all its citizens."

Both hearing and deaf students have a desire to explore. The deaf need more opportunities to explore and manipulate because of their difficulty in language due to his/her handicap.

In science, the hearing impaired students have the same fundamental need as other individuals although the means by which his/her needs can be met are necessarily somewhat different (Connor, 1972). Processes of science are rather complex and involve several levels of understanding and skill for adequate control. But the deaf students frequently does not know how to ask question due to his/her handicap.

The conditions under which he/she acquires language are unparalleled in difficulty and complexity. He/She is dependent on his/her teachers for the exact description of linguistic environment. Language is always a barrier in the teaching of science to deaf. Science demands as much auditory training as English does.

The teaching of science students to children who are deaf or hard of hearing is a complex process. Appropriate placements, mode through which they learn best depend on reliable information (Malinda Eccarius, 1977). It is very difficult to determine common strategies for the students who are deaf. They are not deficient. Instead of being auditory learners, they are visual learners. They need supplement on their lessons not just pictures, but a more realistic one. Today, the option for support from technology are exciting.

Computers definitely affect education and daily life to an ever-increasing degree. Computer-assisted instructional materials or CAI materials in teaching (science) biology to high school hearing impaired will definitely help increase literacy and greater academic achievement. Students using CAI materials will increase self-esteem and confidence due to the healthy view of deaf children, acceptance of who they are as human beings.

Over the past two decades, more and more students who are deaf are receiving instructions in general education environment (ERIC Digest E557). Would this really help deaf students to be educated using instructions in general education? How can be the use of new innovation like computers in the classrooms will make its lessons in science be interesting and more effective to deaf students?

The teacher of deaf students is free to test and adopt measures, which has been proven successful. She needs to search for many ways on how teaching of science should be effective. Similarly, she should make every effort to make science more enjoyable and interesting through the prepared materials/activities (Del Rosario, 1996).

The significance of the science program for the deaf is similar to the hearing, that is to help students learn to think critically and develop scientific attitudes; develop effective and scientific methods; develop further interest as well as awareness and appreciation for the contributions of science and technology; develop social attitudes and to enable students to learn basic science concepts that will help understand, interpret and utilize their environment intelligently (Salandanan, 1985).

Scarcity of curriculum materials and teaching instruments in science has added much constraint to the teachers of deaf. Content materials, guides and resources available are divided mostly for the regular classroom students and not for the hearing impaired.

Concerning the education of the deaf, S.R. Silverman states that, "rational attitude points to the recognition that deafness imposes certain unavoidable limitation that must be accepted". One unavoidable limitation is the fact that instructional programs created for regular school classes do not completely satisfy the needs of the deaf students. Therefore, there is a need for some specialized instructional materials for use in schools for the deaf to provide teachers with focus and guideline (Cunningham, 1970). Education Act of 1982 states that "The education of persons who are physically, emotionally, mentally, socially or culturally different from the so called "normal" individual that they require modification of school practices/services to develop from their maximum capacity."

The model, (Fig. 1: A proposed model of science teaching using CAI materials). Viewed from the fact that science played a significant role in our lives and concerning the education of the deaf, it is proven that appropriate teaching procedure like supplementary lessons with computer assisted instructional materials or CAI could be successful in helping the hearing impaired to observe, relate variable, give explanation, and develop principles of science around the personal experience of the students and their friends (Deauna, 1990) which are learner-centered.

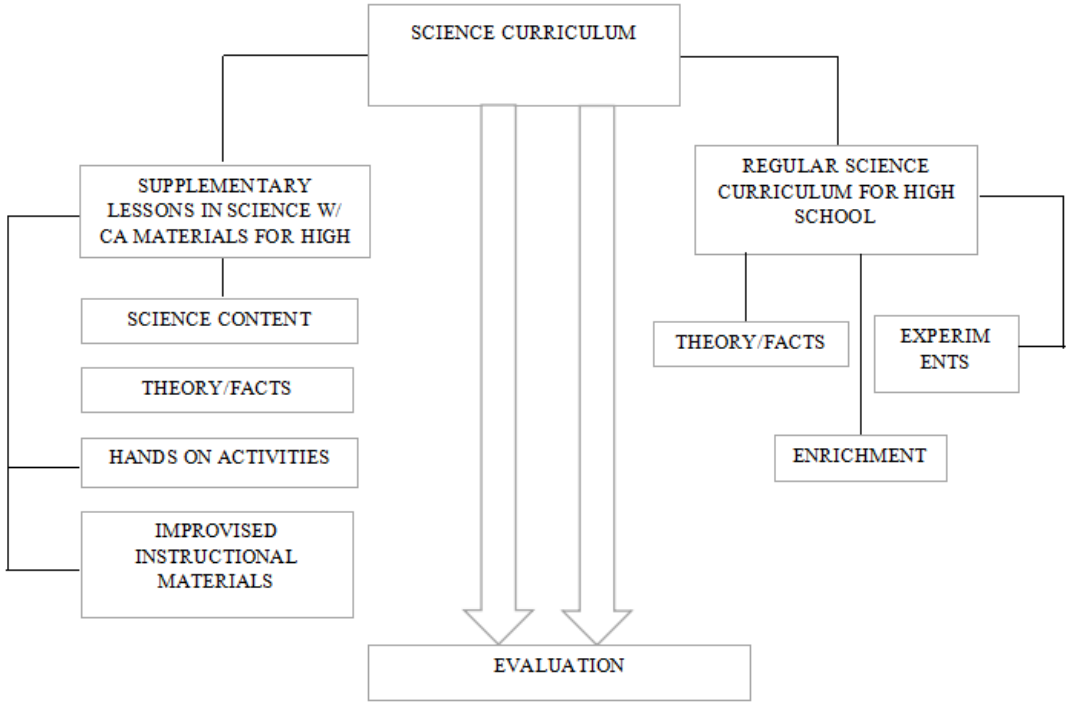

Figure 1: proposed model of Science teaching using supplementary lessons with CAI materials

To achieve science competence, the teacher should see to it that the lessons utilized in the classroom are developed for the purpose of learning and meeting the unique needs of high school hearing impaired students and providing them more enjoyable learning and exciting science activities that will regard the study of science as a challenging adventure.

The materials use in each lesson should be readily available, especially the CAI. The activities/experiments should be of different kinds to motivate the students to learn. CAI should also develop the skills that address the students' unique needs. A more suitable vocabulary, shorter sentences and a lesser volume of reading materials should be prepared within the ability level of the students. It should not be a hindrance to the students' learning. Furthermore, the topic and content must be appropriate to the background of the students', pattern should be in order of the simplest to the most complicated. The directions should also be simple and there should be a clear explanations on how to use the materials.

Through continuous practice, meaningful learning activity will give them confidence to deal with the simplest bases of life and in general, they tackle life in all its forms – plants, animals, and humans.

This study was sought to develop and evaluate Supplementary Lessons in Teaching Science Integrating Computer-Assisted Instructional materials designed for Paaralang Pag-ibig at Pag-asa second year high school hearing impaired. Every lesson aimed to provide the students a holistic view of man and the other living systems interrelation with environment as well as the impact of the environment toward its living and non-living components through the understanding of fundamental characteristics and functions of living systems.

Specially, the study intended to: identify the content of CAI materials in science for second year high school hearing impaired; prepare activities in science integrating CAI materials; try-out the lessons to get information regarding its: a.) suitability of vocabulary, b.) clearness of directions, c.) adequacy of time allotment; evaluate the lessons according to the following components a.) practical considerations, b.) experiments / exercises, c.) skills learning, d.) vocabulary, e.) subject and content and f.) guidance needed.

This study was an attempt to provide hearing-impaired students lesson in science that will enhance their learning further influence development of interactions with others and to make sense out of the world and to have eased of acquiring science skills. Thus, this chapter contains the researches in teaching/learning science process.

A survey of available literature in science had given enlightenment in the preparation of this research. It seemed that no studies had been conducted on the teaching of science for high school hearing-impaired integrating CAI materials.

Deaf students, eventhough deprived of their hearing still continue to ask questions seek answers and to make sense out of the blooming buzzing confusions of the world into which they lived. They should be given more opportunities to learn, to be able to observe, make measurements, relate variables, give explanations, draw conclusions and make predictions.

In science for high school, it is what the students actually learned that is important. The deaf students or the normally hearing should be taught of the basic needs of students in science information so that they will be aware of significant issues and modern biological issues.

METHODOLOGY

Science is more than the detailed organization of minute fact and complicated theories which layman so often believed it to be. The misconception that science is facts and theories arise from the kind of education which the laymen received. The textbooks have often been crammed with scientific information. They structured end products of science, a distillation of labors of generations of scientist who have developed their lives to "The Search for Truth" (Lenth, 1965).

Textbooks are tools in themselves; they are not necessarily narrow or limiting. Instruction in science is many faceted and the skilled teacher who recognizes the facts of science into a meaningful, integrated body of knowledge inevitably enlarges the beginning students understanding of science and the place of science in modern society (Kuslam and Store, 1987).

Shamos (1990) in this article "Scientific Literacy Where It Counts" stated that in the education process, regardless of subject matter, students are evaluated on their immediate mastery of the subject. He noted that the problem in school performance does not reliably measure an individuals future involvement in or interest in science related matters; the "staying power" of formal course works in science notoriously poor. He suggested that general education in science should ultimately strive to develop a literate adult population, rather than merely good school performance. Most educated adults are illiterate in science chiefly because average individual in our society finds no pressing need to be literate in science, or believe that his or her understanding of science is adequate for normal needs.

He further stated that the "out of sight, out of mind" axiom is not limited to science, but special case might be made for science simply because it plays such a prominent albeit, indirect role in the lines of most individuals yet is so poorly understood by the vast majority of the public.

Most science educators today would agree that high school students learn science by being actively in process investigation. Students who are given frequent opportunities to sensorially interact with their environment find that science can be an on going process in which to discover knowledge.

Capco and Yang (1990) in their book, You and Your World cited that to make students feel they are a part of every topic discussed students should be made actively participate in the learning experience. They are asked to think, analyze, compare, recall previous experience, or mentally answer some questions encountered while they are going through the lesson.

Deaf students really lack of vocabulary and simple syntax knowledge, work using pictures and picture symbol to support speech and/or signs has proven beneficial (Chalk, 1990). The use of improvised instructional material in science will definitely help deaf students meet their "unique needs", to communicate with understanding.

Proponents of bilingual-bicultural approach believed that the deaf children are not deficient. Instead of being auditory learners, they are visual learners. Deaf students do not need remedial teaching strategies because, it there is an improvised instructional material like CAI, which will provide a unique visual vocabulary, cultural and social need are met. Improvised instructional materials like CAI should be given a try, because of the promises that it presents.

Computer – Assisted Instruction

Learning is best achieved through computers as emphasized in the Eduquest Summer Training Camp sponsored by Asia Pacific College and IBM, Philippines in April 1996. They called "TLC – Teaching and Learning with Computers" which is a teacher support material. It promoted "doing makes meaning" more than "practice makes perfect". It was given emphasis that TLC is a good opportunity not only because it is a teaching/learning tool that provides different learning styles and preferences but also because it makes connections to real world events and issues. Today the option for support from technology is exciting.

Moreover, some habits of computer use at East Side Elementary School were cited in the said Summer Camp. Some of which were improved behavior, increased attendance and computer literacy, increased mind on task (students become more attentive), improved high order thinking skills, and increased enthusiasm for learning and teaching.

Computer as most expert sum up, man's fear of computers as addiction and dependency. Fortunately, educators now are more challenged than discourage by such concerns. As computer expert believe than man is still master over the machine. Computer will never replace teachers, but they will certainly help teachers and learners take advantage of the many ways learning can take place. CAI frees the learners to learn, trainers to train and teachers to teach. Briefly, they can be summarized as "use of computers will improve the quality of teaching and learning" (Sorreta, 1990).

Solis (1997) in his thesis, The Ateneo de Manila Grade 6 Computer Education Program of SY 1996 – 1997: An Evaluation, directed out that computer education is one of the attractions of any college or university.

For its appeal, it is now becoming the career of the 90's, the "in thing in Philippine Education.

The study focused on the development and evaluation of Supplementary Lessons in Teaching Science Integrating CAI Materials for High School Hearing-Impaired. It follows four stages of development, namely: Stage I – Planning, Stage II – Writing, Stage III – Carry-out, and Stage IV – Evaluation.

In Planning, related literature in science for regular school were reviewed and examined, through this the table of specifications were prepared and the course outline was designed. Production of lessons was designed in stage II. The try-out of the materials was designed on the carry-out stage. Students and teachers evaluation and the final copy of paper were prepared on this stage.

Stage I – Planning	Stage II – Writing	Stage III – Carry-Out	Stage IV – Evaluation
1. Examination of related literature in science for regular school children. 2. Preparation of course outline. 3. Criteria in content validation.	Designing the criteria for evaluation. Production of lessons.	Try-out	Students evaluation Teachers evaluation Writing of the final copy

A flow-chat Illustrating the Procedure in the Development and Evaluation of Supplementary Lessons in Teaching Science Integration CAI Materials for High School Hearing-Impaired.

SUMMARY OF THE RESULT OF THE TEST OF PAARALANG PAG-IBIG AT PAG-ASA 2nd YEAR HIGH SCHOOL STUDENTS USING LECTURING/TEXTBOOK (X_1) AND SUPPLEMENTARY LESSONS INTEGRATING CAI MATERIALS (X_2)

LESSON	X_1	X_1	X_2	X_2	D	D_2	t-test	INTERPRETATION
1	188	15.67	245	20.42	57	335	6.81	Significant
2	169	14.08	2.44	20.33	75	527	9.41	Significant
3	79	6.58	129	10.75	60	310	18.18	Significant
4	91	7.58	113	9.42	22	56	5.56	Significant
5	100	8.33	134	11.17	34	114	7.74	Significant
6	103	8.58	139	11.58	36	118	10.9	Significant
7	92	7.67	113	9.42	21	47	8.29	Significant
8	72	6	114	9.5	42	158	12.12	Significant
9	107	8.92	139	11.58	32	104	7.41	Significant
10	106	8.83	136	11.33	30	100	5.74	Significant

Analyzing the mean of the lecturing / textbook and the mean of supplementary lesson Integrating CAI materials , it shows that Supplementary Lessons Integrating CAI is more Effective in teaching Biology than lecturing / textbook.

SUMMARY OF THE MEANS IN THE EVALUATION OF MATERIALS BY ITEM

Item	Teachers' Mean	Interpretation	Students' Mean	Interpretation
1	4.59	Strongly Agree	4.19	Agree
2	4.81	Strongly Agree	4.5	Strongly Agree
3	2.47	Disagree	2.16	Disagree
4	4.34	Agree	4.41	Agree
5	4.41	Agree	4.46	Strongly Agree
6	NA	NA	1.9	Disagree
7	2.56	Undecided	2.03	Disagree
8	4.69	Strongly Agree	4.57	Strongly Agree
9	3.94	Agree	3.80	Agree

10	4.41	Agree	4.23	Agree
11	2.5	Undecided	1.97	Disagree
12	4.47	Strongly Agree	4.22	Agree
13	4.56	Strongly Agree	4.40	Agree
14	4.22	Agree	4.26	Agree
15	4.41	Agree	4.27	Agree
16	4.59	Strongly Agree	4.28	Agree
17	2.5	Undecided	2.24	Disagree
Overall	3.97	Agree	3.64	Agree

SUMMARY OF THE EVALUATION OF THE MATERIALS BY THE TEACHERS AND THE STUDENTS

Lesson	Teachers'	Students'	Difference	SD	SD	T-test	Interpretation
2	4.8	3.85	.95	.72	.88	2.16	Not Significant
3	4.7	3.75	.95	.74	.82	2.16	Not Significant
4	4.7	3.7	1	.76	.92	2.17	Not Significant
5	4.61	3.81	.8	.6	.63	2.28	Not Significant
6	4.7	3.6	1.1	.86	.83	2.24	Not Significant
7	4.7	3.7	1	.76	.9	2.17	Not Significant
9	4.16	3.16	1	.95	1	1.79	Significant
10	4.54	3.24	1.3	.95	1	2.32	Not Significant

CONCLUSION AND RECOMMENDATIONS

The following conclusion came about as a result of the study. Based on the result of the mean (of all items, the developed supplementary lessons in teaching science integrating CAI materials are able to meet the science needs of the students. Paaralang Pag-ibig at Pag-asa second year high school students and teachers found the materials used in the lessons readily available, interesting, varied, related to CAI lessons, and provide clear guidance / directions. They also found out that the lessons give abundant skills that are useful in daily interaction at home, in school and other places. The developed supplementary lessons are useful not only to the teachers but all the hearing impaired students. Hearing impaired students with low abilities may improve their performance in school through developed lessons with CAI materials and activities suited to the students' abilities and interest.

Based on the findings and the conclusions of the study, it is recommended that: the supplementary lessons in teaching science

integrating CAI materials be used as teaching aid for the hearing impaired students in special education school; The science teachers may regard the guidelines followed by the researcher in using the developed lessons; comparable lessons to be used by hearing impaired maybe developed; ahearing impaired class in science using the materials is proposed to PPP; another study should be conducted to develop materials for other subject using the same method; the teachers of hearing impaired students should see to it that students were really able to explore and express their needs in science, a lesson or topic in science that needed more explanation should be included in the CAI; finally, extensive research should be made to determine the effectiveness of the developed materials. All the developed materials should be tried-out.

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