

# **ESOL Students and their use of CAI (Computer Assisted Instruction) For Content AND Language Learning in Year 10 Science**

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## **ABSTRACT**

The use of CAI (Computer Assisted Instruction) for providing opportunities to develop content and language learning strategies in a computer room environment is investigated in this study. Teachers' and students' perceptions on the use of CAI are examined. The study reports on the gains that may be achieved from the use of CAI and expands teachers' perspectives on "learning without a teacher". It highlights how the computer room environment might offer students real opportunities for developing communication strategies. The study suggests that, appropriately implemented, CAI can consolidate learning in the ESOL and mainstream classroom and encourage learner autonomy. The insights gained through this research provide an option for science teachers and ESOL teachers to utilise emerging technology and work together to support ESOL students in the mainstream curriculum.

## **PURPOSE**

Over the previous five years a number of intervention programmes have been carried out at the secondary school in which I teach to assist ESOL students from Years 9 to 13 achieve in mainstream subject areas. Two areas of controversy have surrounded the implementation of these programmes. Firstly, the "dumbing down" of the language, and secondly, the time required from teachers to develop additional resources and assist students complete activities and tasks. With the use of computers across all curriculum areas, the science department, in conjunction with the ESOL department, trialled a computer assisted instruction programme to examine its usefulness for developing language and study skills alongside content learning in science. The purpose of the study was twofold. Firstly, to gain insight into teacher and student perceptions of using computer assisted instruction programmes as a tool for accessing the language needed for science, and secondly, to measure to what extent the programme would affect student achievement. The research questions were elaborated on as the investigation was carried out and consisted of:

- How useful did teachers and students perceive the programme to be?
- In what ways did the programme contribute to student learning?
- To what extent did the programme affect student achievement?

As the research developed, the main focus of the study shifted from a focus on the learners' end results to teacher and student perceptions of the use of CAI through their participation in the programme.

## **DEFINITIONS**

There is an increasing amount of literature reviewing the use of computers as a tool for teaching and learning. Most of this literature makes reference to a number of terms. CAI (Computer Assisted Instruction) describes computer programmes

developed to teach and instruct students in particular areas of study, NBLT (Network-Based Language Teaching) involves the students having free access to information on the web, and CALL (Computer Assisted Language Learning) are language learning programmes that aim to increase the students' level of language proficiency, as is common with ESL software in language schools. For the purpose of this paper, CAI will describe the science programme used throughout the study.

## SETTING

The participants in the study were a group of male ESOL students in Year 10 science. The students were chosen at random, although only students who expressed a willingness to be involved in the programme were selected. The students were from a range of nationalities and had been in New Zealand from several months to two years. None of the students had attended an intermediate school in New Zealand. Their levels of English ranged from elementary to intermediate and they all had basic computer and keyboard skills. The teachers involved in the programme were mainstream science teachers and ESOL teachers. The mainstream science teachers had completed in-service training in teaching ESOL students in the classroom.

The students accessed a CAI programme which had been set up on the local network by a science teacher, in conjunction with an ESOL teacher. The programme was designed by a science teacher and consisted of units containing visual slides and text, together with associated worksheets. It was set up on the school's local area network and was accessible to all students and staff. The content consisted of seven sequential units related to the Year 10 science programme. Corresponding to each unit was a worksheet with questions and activities that referred to the key ideas in each slide. The language was at an appropriate level for Year 10 students and was not modified for low literacy or ESOL students. The format of the units shadowed the mainstream curriculum and was favourably sequenced to enable the students to build on previous knowledge. The students downloaded the programme from the school's network and were able to work on the units at a time and pace that suited each individual learner. Generally, several students worked together on the same unit. For the duration of the study, the students worked in a small computer suite which is part of a newly constructed and purpose built "Village" for Languages and ESOL within the school. They had access to teachers but were not directly supervised.

## DATA GATHERING PROCEDURES

The main objective was to gather data on student achievement and to gauge teacher and student perceptions as to the usefulness of the CAI programme. Tests, questionnaires, interviews and observations were all used throughout the study.

Data gathering procedures were as follows:

- pre vocabulary test  
Paul Nation's 1000 word *vocabulary test* was used to indicate the students' understanding of the first 1000 words in English.

- Pre- science test  
A Year 10 Science test was used to indicate student achievement before implementing CAI.
- Post - science test  
A post-test was carried out to measure what extent student achievement had been enhanced through the use of CAI.

Teachers and students participated in interviews throughout the study as well as completing a questionnaire on how useful they felt the programme was for teaching and learning.

## DATA COLLECTION

The data collection was carried out in English over a period of nine weeks. Details of the study were outlined and parental and participant approval obtained through the signing of consent forms. The questionnaire was modified during the research process as a shift occurred toward placing more emphasis on teacher and student dialogue, rather than student achievement.

## DATA ANALYSIS

To what extent did the programme enhance student achievement?

Results from the tests are outlined in the table below:

<b>Name</b>	<b>1000 word Vocabulary test</b>	<b>Year 10 Science Pre-test</b>	<b>Year 10 Science Post-test</b>	<b>Percentage gain for Science after using CAI</b>
Student a	44	53	64	11
Student b	82	46	78	32
Student c	100	73	75	2
Student d	55	38	62	24
Student e	87	55	72	17
Student f	86	51	61	10
Student g	87	66	70	4
Student h	87	44	70	26
Student i	75	50	51	1
Student j	62	27	40	13
Student k	67	53	68	15
Student l	80	40	67	27

The scores in the vocabulary test did not seem to significantly relate to gaining higher or lower scores in the pre or post science tests. Given there were a significant number of variables such as students' background knowledge, different mainstream science teachers, varying interests in science and so on, it would appear that using general vocabulary level scores to gauge a students' achievement in science was not suitable for this study. On the other hand, after completing the CAI programme, all students scored higher in the post-test. To what extent the scores were enhanced solely by the programme is difficult to ascertain from the data. It is therefore more useful to consider teacher and student perceptions about their experience of participating in the programme.

## **DISCUSSION**

### *How Useful did Teachers and Students Perceive the Programme to be?*

Comments from the questionnaires (see Appendix I) and interviews revealed that all participants (100%) in the programme found it "very useful" for both teaching and student learning. These are elaborated on in the discussion.

### *In what ways did the programme contribute to student learning?*

Insights into how the programme contributed to student learning can be grouped into four general categories.

The programme:

- provided opportunities for students to use language for genuine communicative purposes;
- provided a vehicle for content and language learning strategies to develop together;
- provided an environment for building learner autonomy and self direction;
- provided a shared purpose for collaboration between ESOL and science teachers.

#### **1. The Programme Provided Opportunities for Students to Use Language for Genuine Communicative Purposes**

##### *Communication strategies*

It was evident throughout the programme that the students were engaged in, and developed, a range of communication strategies such as questioning, repetition, paraphrasing and so on. At the beginning of the programme, comments from the ESOL teachers highlighted their concerns associated with students working individually at a computer with little opportunity, or reason to, communicate with each other. On the contrary, all students were observed to a greater or lesser degree involved in real communicative exchanges around the computers. The focus of these interactions was mainly around students making themselves and the language in the texts more readily understood.

##### *Negotiation of meaning (questioning and clarifying)*

There was a significant amount of communication around the target language where the students acted as a learning resource for each other to gain meaning from the text. This was particularly noted among Korean students who would congregate around a single computer screen and exchange ideas and talk about the difficulties they were encountering with the content. Often the ideas would be discussed in the students' first language and then in English. This was more evident when there were several students of the same nationality and a single student from another nationality working on the same text. First, the monolingual students would clarify understanding among themselves, and then a spokesperson from the group would clarify the problem in English to the student from a different nationality. At the same time, he might revert back to his first language to check with the group that what he was saying was correct. All the students confidently asked each other questions while working on the same texts. This had the outcome of students producing the target language and developing fluency quite naturally. These interactions were more frequent between students than between teachers and students.

## **2. The Programme Provided a Means for Content and Language Learning to Develop Together**

In a shared meeting with science and ESOL teachers, it was generally agreed that a significant advantage of the programme was that it effectively provided a way for content and language learning skills to develop together. It was a win - win situation for ESOL teachers, science teachers and students as the content was reinforced by what was being taught in the curriculum. Because it was set up "in house", the science teachers were able to choose the most useful and frequent vocabulary items as well as repeat key ideas and concepts according to frequency and need across the science syllabus. They were also able to exclude information that was of less use, or had little return, for the effort it would take students to learn new information.

The students stated a preference for using CAI over textbooks and handouts in the classroom. Some of the comments were that using CAI they felt more confident, had more independence and knew what was important at the end of each unit. They also said it was helpful to have key concepts and new language items repeated throughout the units of work. For example, coastal erosion, glacial erosion and stream erosion. As many of the students had little background knowledge and low English language levels, not surprisingly, they expressed that they had difficulty in their classes with new ideas, especially those related to processes. They stated that the sequence of units enabled them to work out the vocabulary from previous worksheets or from making connections between the slides and the text. It would appear that the slides, as well as having the effect of prompting previous knowledge, also illustrated meaning for a lot of the vocabulary in the texts.

## **3. The Programme Provided an Environment for Building Learner Autonomy and Self – Direction**

As the students became more familiar with the programme, they also became more independent and motivated. Two of the science teachers, who also taught

the students in ESOL classes, commented that a number of their "lethargic" students became more confident, motivated and less likely to require the teacher to "spoon feed" them work. At first it was evident in a general willingness to come to class, however it developed into students planning their work and getting started without teacher direction or prompts. It was also observed that a number of students, when they had a free period, came over to the "Village" and asked if someone could open the computer the room to enable them to continue with their work. At the end of each unit the students would ask to download the worksheets for the next unit. There were a number of factors that contributed to this.

#### *An expectation of success*

A motivating factor for the students was the expectation that they would be able to complete the whole programme. From the very beginning, they were able to see an outline of the work and how they were progressing through it. Each worksheet followed a similar format and as the students completed each unit, their belief that they were able to achieve became a powerful incentive to actually do so. It increased their motivation to continue. The students stated that they were not particularly motivated by the content of the material and also that they had difficulty with the vocabulary. It therefore appears that the greatest motivation for the students was seeing the cumulative progression of their achievement.

#### *A positive learning environment*

Student motivation was further enhanced by both the learning environment and the presentation of the programme. Students partly attributed their eagerness to study to the new rooms and partly to the idea of computers being fun and up-to-date. Either way, the physical environment created a favourable attitude.

#### *Reduced inhibition*

All the students said that they felt more confident and independent working in the computer suite than in the classroom. This could be partly attributed to all the students having basic computer and keyboard skills. They did not require any direct teaching to access and use the programme and consequently did not need constant teacher intervention. The teachers noted how relaxed the students were initiating conversation with their peers and how one particularly shy student was able to begin communicating with other students as he faced the same problems as other students working on the same text. The students said that they felt the teacher wasn't checking up on them all the time and that there was less pressure to get everything right and complete tasks within a set time period.

#### *Familiarity with a linear learning style*

The students expressed a preference towards a linear style of learning similar to their own country. Each period the students knew what was expected of

them and incrementally increased their familiarity with the format and types of activities contained in the programme. Most of the students, when comparing a topic being taught in their Year 10 science classes, commented that they could not follow the instructions, could not understand the language and had little opportunity for dialogue with the teacher or their peers. As all of their science teachers use a wide variety of teaching methods and lesson formats, it would seem the students have difficulty knowing how to carry out the activities and what information is important. In contrast, the predictability of CAI meant that the students could concentrate more fully on the content.

#### *Sufficient time for task completion*

Of importance to the students was being given the time to complete one task before being given another. Students said that in the classroom the teachers spoke too quickly and that there was not enough time to either understand or complete the tasks. One teacher noted during CAI, a student skimming through a text with relative ease, highlighting parts of it and then returning to the text after conversing with another student. Having time to complete tasks made it more likely that the students would implement learning strategies to complete the work.

#### *Peer dialogue, models and feedback*

The students throughout the programme modelled the language for each other and self corrected their worksheets. They also kept a record of what they had achieved, thus monitoring their own learning. Being able to get feedback without teacher interference gave the students the confidence to make and revisit their mistakes.

#### **4. The Programme Provided A Shared Purpose for Collaboration between ESOL and Science Teachers**

For ESOL and science teachers, the programme provided a focus for joint planning and implementing units of work that would benefit ESOL students in science long-term. The ESOL teachers commented that they often struggled to find out what units their students may be working on in science. Similarly, science teachers said that they did not know what the students were doing in ESOL. Increasing the dialogue between the two departments increased the confidence of ESOL teachers who, unfamiliar with the content of the mainstream science syllabus, considered that the programme provided them with enough support and guidance to enable them to move from the more traditional role of "teacher" to facilitator. Because the aims, content and sequence of the programme were already established, the ESOL teacher was able to enhance student learning by providing other resources to support the programme. For example, when the students were studying Earth Science, the teacher provided a range of igneous, and sedimentary rocks which enabled the students to see and experience the various rock types. As a result, there was a high level of morale among the teachers and a willingness to address mainstream content areas and supplement learning in curriculum areas from a position of strength.

The science teachers, also, were enthusiastic about the programme because of the relative ease in setting it up and the constant availability of slides that are free for educational use. In comparison, the teachers had investigated the use of CD Roms which are expensive, subject to copyright, and therefore cannot be trialed and changed to achieve specific learning outcomes.

## CONCLUSIONS

### Implications for teachers

The results from this research indicate that CAI can be used to enhance both content learning and language learning strategies. The programme addresses both what students learn and how students learn. Although the results suggest that students are able to cope with linguistic items and concepts considerably higher than their levels of language proficiency, the value of this study is in looking at teacher and student perceptions. The students developed a range of learning strategies, none the least being learner autonomy. Because the students were removed from a range of information sources they had more independence, and control over the time it took them to understand and learn new language items. Of note is the amount of communication around the target language both in English and in the student's first language. To what extent students learned content through interaction is difficult to ascertain. We do, however, gain some valuable insights into how CAI can be used to increase collaboration between teachers and make new language more accessible for students. The computer room environment is not an isolated learning environment but one that is rich in language and opportunity for students to communicate freely with each other so that the learning experience is both enjoyable and meaningful.

## REFERENCES

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## Appendix I

### Questionnaires

#### End of Programme Questionnaire (Teacher)

During the programme you were asked to consider how useful the visuals and worksheets were for student learning. The purpose of this worksheet is to consider the programme as a whole.

The questions below are intended as a guide only. Please feel free to respond to them in any way that you choose.

1. In terms of assisting learners from non-English speaking backgrounds, to what extent do you feel the programme was useful in assisting student learning? Please put a cross on the line below to indicate which of the statements is applicable.

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not useful                      not very useful                      moderately useful                      useful                      very useful

2. Any comments about the applicability of this programme to supporting student learning.
3. What differences (if any) do you feel this programme has made to student teaching and learning?
4. This programme has focused on an independent approach to student learning. Have you any comments on how effective you think this might have been?
5. In what ways do you think this programme could be improved?
6. Having looked at student worksheets and results, have you any comments on the usefulness of this programme compared with other initiatives that you have trialed?

## End of Programme Questionnaire (Student)

The programme that you have completed aimed to help you with your studies in Science.

The purpose of this questionnaire is to find out how useful it was.

Please feel free to answer the questions in any way that you choose.

1. How useful was the programme? Please put a cross on the line below which best describes how useful you found the slides and worksheets (x).

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not useful                      not very useful                      moderately useful                      useful                      very useful

2. How did this programme help you learn more about the topic you were studying? eg. knowing what is important, pictures helped understanding, more time to complete the work
  
3. What differences (if any) do you feel this programme made to your studies? eg. understanding more words, understanding new ideas, higher grades, knowing what to concentrate on and study, more confidence
  
4. You have been able to study this programme on your own. Why or why not was this a good way to help you study in Science? Write one or more reasons.
  
5. What could have helped you more? How could the programme be improved?
  
6. Do you think the programme helped you achieve better results?