

Vocabulary games as a memory enhancement device¹

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I report here on a study whose aim was to determine whether any long-term vocabulary gains were achieved as the result of participation in a game program involving three vocabulary games based loosely on Poker (Pick Red), Chinese Blind Chess and Gobang. Forty six students from a language college in Taiwan participated in a twenty hour game program involving the creation of English compound words from single English words appearing on game cards and game pieces. A vocabulary test relating to these compounds was administered at the beginning of the program (the pretest), on two occasions during the program, on completion of the program and 45 days after completion of the program (the delayed test). Although the results indicated some vocabulary losses between the end of the program and the delayed test, comparison of pretest and delayed test results indicated significant vocabulary gains.

Keywords: educational game; memory enhancement; retention; vocabulary strategies.

Introduction

I have previously reported on different aspects of a study involving the impact of a vocabulary games program on acquisition of vocabulary (Chen, 2009a) and on vocabulary learning strategies (Chen, 2009b). The initial study was conducted in a language college in Taiwan. It involved a 20 hour English vocabulary game training program involving 46 students with an average score of 143.65 in the College Students English Proficiency Test (CSEPT), a score that is roughly equivalent to Common Reference Level A1 in the Common European Framework of Reference for Languages (Council of Europe, 2001). During the program, the students were grouped and regrouped according to the nature of the games in which they were involved but an attempt was made to ensure that each group was made up of students with similar proficiency test scores. Three vocabulary games invented by the author on the basis of three popular games – Poker (PickRed)², Chinese Blind Chess³ and Gobang⁴ – were used. In each case, game players had to attempt to create compound words in English (e.g. cowboy) by pairing single words that appeared on game cards or game pieces. The total number of (unrepeated) compound words that can be produced in these vocabulary games is 454. Samples of the game cards and game pieces are provided in *Figures 1 – 3* below.⁵

Figure 1: Sample cards from Poker vocabulary game



Figure 2: Sample pieces from Chinese Blind Chess (Xiangqi) vocabulary game



Figure 3: Sample pieces from Gobang vocabulary game



Review of selected literature on vocabulary acquisition and vocabulary learning strategies

Over the past few decades, the importance of vocabulary to language acquisition has been highlighted in a number of studies, the extent of a language learner's vocabulary having been shown to be a critical factor in effective language manipulation (Horwitz, 1988). Nation (2006) has estimated that a learner of English as a foreign or second language (EFL; ESL) will require approximately a 6,000 to 7,000 word-family vocabulary to comprehend spoken texts and an 8,000 to 9,000 word-family vocabulary for unassisted reading comprehension. In addition, research has indicated that the extent of learners' vocabulary has a significant impact on reading achievement (Francis & Simpson, 2003; Qian, 2002) and on language learning outcomes more generally (Gu & Johnson, 1996; Kojic-Sabo & Lightbown, 1999). Studies such as these have reinforced the importance of research on vocabulary

learning strategies and vocabulary strategy learning programs such as, for example, those conducted by Gu and Johnson, 1996; Merefat and Shirazi, 2003; On-Lai, 1993, Rasekh, and Ranjbary, 2003; Sanaoui, 1995; Siyanova and Schmitt, 2007; and Wesche and Paribakht, 2000.

Schmitt and Schmitt (1993) conducted research whose aim was not only to identify the strategies used by Japanese EFL students when learning vocabulary, but also to determine participants' perception of the usefulness of various vocabulary learning strategies. Fourteen methods of learning new words and 28 strategies for memorizing and retaining words learned were reported by the 600 participants in this study. So far as the participants in this study were concerned, verbal repetition and writing were highly favored strategies, whereas the use of word lists and flash cards was considered to be the least useful strategies. On the basis of a similar study involving 50 adult ESL students, Sanaoui (1995) concluded that adult learners used both structured and unstructured approaches, with repetition, imagination and association being used as mnemonic strategies by both beginners and advanced language learners.

Gu and Johnson (1996) explored the relationship between the use of vocabulary learning strategies and learning outcomes in the case of 850 non-English major university students in China. They found that although self-initiation, elective attention, oral repetition and cognitive strategies correlated with both vocabulary size and language proficiency, the use of memory strategies (such as imagery and visual and auditory associations) correlated with vocabulary size only.

Kojic-Sabo and Lightbrown (1999) explored the use of vocabulary learning strategies in different language learning settings involving 47 ESL and 43 EFL learners. They found that although the EFL learners tended to review what was learned more often than the ESL learners and to use repetition (in speech and writing) more frequently, both groups made frequent use of note-taking strategies and the dictionary.

A number of strategy instruction programs aiming to reinforce learners' short-term and long-term memory have been introduced in (Y. M. Chen, 2006; Chien, 2006; Chu, 2007; Dunbar, 2004; Hsu, 2004; Huang, 2004; Yek, 2006).

Y. M. Chen (2006) investigated the use of memory strategies by young learners in the context of the use of keywords and flashcards. Sixty-nine (69) participants aged 11 were divided into three groups. With one group, a keyword-received method was employed; with another, a keyword-generated method was employed;⁶ with the third group, the focus was on rote repetition. In tests given after one week, two weeks and three months, students exposed to the keyword-received method outperformed the others.

Chu (2007) conducted research involving the interaction between memory strategy training, use of vocabulary learning strategies and spelling accuracy. One hundred and twenty six (126) fourth graders were divided into two groups (control and experimental). The experimental group, whose members were provided with strategy training, outperformed the control group in terms of both spelling accuracy and use of vocabulary learning strategies.

Strategies involving imagery and visual repetition have been found to relate generally to students at higher levels. Huang (2004) conducted research involving the

association of drawing activities with vocabulary learning in the case of an experimental group and more traditional methods in the case of a control group. In-depth interviews revealed participants in the experimental group had positive attitudes towards the use of drawing as an aid to the memorization of vocabulary and believed that it contributed towards lexical recall.

In research involving 91 senior high school students, Hsu (2004) used three different approaches to teaching commonly used roots – an iconic-morphological approach, a non-iconic-morphological approach and a traditional-definition-based approach. The students who had been introduced to the iconic-morphological approach were found to perform better than the others in terms of morphological awareness, spelling ability and short-term and long-term retention.

Research conducted in Taiwan has demonstrated a strong connection between the implementation of vocabulary learning strategies (either in regular classroom teaching or in activities outside of classrooms) and successful learning. Even so, there are areas of disagreement and/or uncertainty. Thus, for example, whereas some researchers have emphasized the importance of learning words in context, others have found that decontextualized approaches to vocabulary learning, such as the use of word lists, can result in transfer to long-term memory (Martin-Chang, Levy & O'Neil, 2007). The fact remains, however, that language learning, including the learning of vocabulary, whether contextualized or decontextualized, is often associated with frustration and high levels of stress. It follows that any approach that students are likely to enjoy, such as learning through game playing, is worthy of investigation.

The word 'edutainment' (from 'education' and 'entertainment') began to be used in the early 1990s and has now become popular (Hadfield, 1990; Lewis & Bedson, 1999). Indeed, the importance of educational games, games that educate by combining fun with goal-setting, challenge and competition, has been stressed by a number of educationalists (Crookall, Oxford & Saunders, 1987; Hadfield, 1990; Lewis & Bedson, 1999; Shie, 2004; Thornton & Cleveland, 1990). Games used in ESL/EFL classrooms often involve a high level of repetition, thus assisting students to build competency, speed, and accuracy (Newby, Stepich, Lehman & Russell, 2000), while, as familiarity with the games grows, leading to a reduction on anxiety (Macedonia, 2005). Central to the research reported here is an attempt to determine whether combining game playing with vocabulary learning can enhance strategy use and lexical retention.

The study

Overall purpose

The overall purpose of the study reported here was to determine whether:

- a 20 hour game program based on adaptations of PickRed, Chinese Blind Chess and Gobang (in which players attempt to combine game cards and game pieces involving single English words in ways that create compound words) would result in a significant level of lexical retention;
- any of the three game types led to more significant vocabulary gains;
- participants' proficiency levels had an impact on vocabulary gains and retention.

Participants

The study involved 46 students from a language college in Kaohsiung, Taiwan. The students, aged from 17 to 31 with an average proficiency score of 143.65 in the CSEPT, had voluntarily participated in an earlier study (Chen, 2009a & b).

Research instruments

The instrument used in this part of the research was a vocabulary test, designed by the author, used a format adapted from a vocabulary level test designed by Schmitt, Schmitt and Clapham (2001). It was made up of 174 questions (in Chinese), associated with which were 348 English compound nouns taken from the three vocabulary games to which the students had been introduced. The students' task was to select the correct Chinese definition for the compound nouns (see *Table 1* below).

Table 1: A sample from the vocabulary test

1. lifetime 2. lifework 3. handline 4. website 5. workhand 6. worksite	_____ 一生 _____ 雇工 _____ 畢生的工作
1. horseback 2. horseman 3. horsepower 4. mankind 5. manpower 6. workhorse	_____ 馬力 _____ 人類 _____ 吃苦耐勞 的人
1. doorkeeper 2. doorway 3. eyebath 4. sunbath 5. suntrap 6. trapdoor	_____ 日光浴 _____ 陷阱門 _____ 守門人

The test, which was administered 45 days after completion of the program, was also administered four times during the program (at the beginning; after completion of the Poker vocabulary games; after completion of the Chinese Blind Chess vocabulary games; and at the end of the program, that is after completion of the Gobang vocabulary games). The order of the test items was changed once.

Data Collection

The game-based vocabulary learning program was run in two separate sessions. Participants who were involved in the program in July took the test to which this study largely relates in the second week of September; participants who were involved in the program in August took the test in the second week of October. The data from these tests was analyzed along with the data from the tests the participants had taken earlier.

Data Analysis

The Statistics Package for Social Science (SPSS) was applied to calculate the mean scores and the standard deviations of the vocabulary tests. All the participants were grouped according to their proficiency and the group test score was further analyzed in a *one-way ANOVA* test. A *paired-sample-t-test* was used to investigate vocabulary gains between different tests.

Vocabulary test results

The average number of correct answers increased from 132 items in the 1st test to 161 items in the 4th test (out of a possible total of 174). Furthermore, the standard deviation diminished from test to test, indicating that the gap between participants' performance narrowed as a result of the program. Comparison of the results of the first and fourth tests reveals a significant difference in Pair IV ($p=.000***$), the *t-value* in Pair IV indicating the effectiveness of the learning program. The *paired-sample-t-test* scores indicate significant improvement ($p=.000***$) between each of the first four tests. Although the overall mean for the fifth test (taken 45 days after completion of the program) was approximately 6 items lower than it was for the fourth test, the standard deviation increased from 7.6 to 8.5. The results of the fifth test are similar to those achieved in the third test, indicating that although there had been some loss in the longer term, the gains retained were similar to those achieved in the third test (see *Table 2*). Note that * = $p<.05$, ** = $p<.01$, *** = $p<.001$; N = 46; T1=pretest, T2=test after Poker, T3=test after Chess, T4=test after Gobang, T5=delayed test.

Table 2: Comparison of the results of vocabulary tests taken immediately before and immediately after the program, on two occasions during the program and after a delay of 45 days

	Pair I		Pair II		Pair III		Pair IV		Pair V		Pair VI		Pair VII	
	T1	T2	T2	T3	T3	T4	T1	T4	T4	T5	T1	T5	T3	T5
M	131.7	148.0	148.0	154.8	154.8	161.1	131.7	161.1	161.1	154.7	131.7	154.7	154.8	154.7
SD	11.6	9.6	9.6	8.4	8.4	7.6	11.6	7.6	7.6	8.5	11.6	8.5	8.4	8.5
<i>t</i>	-12.458		-9.181		-10.466		-21.850		9.158		-18.680		.067	
<i>p</i>	.000***		.000***		.000***		.000***		.000***		.000***		.947	

Comparison of the results of the first four tests indicates that the participants learned most new words from playing the Poker vocabulary game, followed by the Gobang vocabulary game and, finally, the Chinese Blind Chess vocabulary game. However, there are a number of factors that could have impacted on the results. Thus, for example, because each of the games includes content that appears in the other games, there is an element of reinforcement as the participants proceed through the games that may have accounted for the higher level gains in the case of the Poker game as compared to the Gobang game. However, the fact that there is an overlap among the games in terms of the compound words that can be created may have led participants to rely more heavily as the program proceeded on words already learned, thus remaining within their comfort zone. This could have been a factor in the lower level of vocabulary gains following the final game as compared to the vocabulary gains following the other two games.

On the other hand, the novelty of learning vocabulary through game playing may have begun to wear off towards the end of the program, something that might have

accounted for lower gains in the case of the Chinese Blind Chess game as compared with the Gobang game. To test these hypotheses, it would be necessary to rerun the program several times changing the game order and, on some occasions, altering the game cards and game pieces so as to ensure that each game is associated with a unique set of compound word possibilities. In this way, it should be possible to determine whether any of the games is typically more effective than the others in terms of vocabulary gains and whether similar gains can be achieved in less time where a particular game is the focus of attention.

The interaction between proficiency and vocabulary gains was explored by grouping participants (three groups) in terms of proficiency scores in the CSEPT test and comparing the proficiency scores of each group. A *one-way ANOVA* test was used to determine whether there was a significant difference among the three proficiency groups for all the five vocabulary tests taken during and after the program. The findings are presented in *Table 3*. Note that the maximum score obtainable in the CSEPT is 360.

Table 3: Relationship between proficiency and vocabulary gains

Group	No.	CSEPT Range	Means	SD
Group 1	7	114	96.86	8.84
Group 2	30	115~172	142.43	17.37
Group 3	9	173	184.11	9.31
Overall	46	86~198	143.65	29.82

A significant difference was detected among the three proficiency-based groups in terms of vocabulary gains for the first four tests, particularly the tests taken after players finished playing Poker Cards (*Test 2*) and Chinese Chess (*Test 3*). In this connection, it is important to note that a slight difference was found between Group 1 and Group 3 in the pretest but that the results for Group 1 and Group 2 were very similar. However, after finishing playing the Poker Card vocabulary game, a significant difference between Group 1 and Group 2 is detectable. On average, the three groups improved by about 15 items. However, whereas the first group (lowest proficiency group) improved by 16 items and the second group by 17.6 items, the third group (highest proficiency group) improved by only 12.3 items (*Test 4*).

After finishing the Chess game, the third test was administered. At this point, there was also a significant difference between Groups 1 and 2. Group 2 increased to 157 items (a 6.8 item improvement); Group 1 increased to 145.6 items (a 7.9 item improvement). Group 3 improved by 5.6 items. Surprisingly, the lowest proficiency group showed the most improvement, the highest proficiency group showed the least improvement. The fourth test result (on completion of the program) indicated a slight difference among the three groups ($p=.032^*$). The gap had diminished. In the case of the final test (45 days after completion of the program), the mean for each group decreased (by about 6 items) and the standard deviation increased from 7.6 to 8.5 (see *Table 2*). However, there was no significant difference among the groups, indicating that proficiency was no longer a factor. Even so (see *Table 4*), the scores were similar to those achieved in the third test. Note that $^* = p < .05$, $^{**} = p < .01$, $^{***} = p < .001$; T1=pretest, T2=test after Poker, T3=test after Chess, T4=test after Gobang, T5=delayed test.

Table 4: Relationship between proficiency and vocabulary gains (mean and standard deviation)

	Test 1		Test 2		Test 3		Test 4		Test 5	
	M	SD	M	SD	M	SD	M	SD	M	SD
Group 1	121.7	6.3	137.7	8.0	145.6	8.5	154.3	9.0	148.0	7.9
Group 2	132.6	11.6	150.2	8.2	157.0	7.4	162.3	7.2	155.8	8.4
Group 3	136.4	11.1	148.7	10.5	154.3	6.9	162.4	5.4	156.2	7.3
p	.029*		.005**		.003**		.032*		.072	
f-ratio	3.855		5.901		6.619		3.730		2.797	
Post-hoc	G3>G1*		G2>G1**		G2>G1**		G2>G1*			

The relationship between proficiency and the vocabulary gains associated with completion of each game is indicated in *Tables 5 – 7*. There were 7 participants in the lowest proficiency group, 30 in the middle proficiency group and 9 in the highest proficiency group. In considering the results recorded in these tables in terms of significance, it is important to bear in mind the small size of two of the groups.

Table 5: Lowest proficiency group test results

	Pair I		Pair II		Pair III		Pair IV		Pair V		Pair VI		Pair VII	
	T1	T2	T2	T3	T3	T4	T1	T4	T4	T5	T1	T5	T3	T5
M	121.7	137.7	137.7	145.6	145.6	154.3	121.7	154.3	154.3	148.0	121.7	148.0	145.6	148.0
SD	6.3	8.0	8.0	8.5	8.5	9.0	6.3	9.0	9.0	7.9	6.3	7.9	8.5	7.9
t	-4.024		-3.442		-4.620		-6.953		3.167		-5.966		-1.415	
p	.007**		.014*		.004**		.000***		.019*		.001***		.207	

Table 6: Middle proficiency group test results

	Pair I		Pair II		Pair III		Pair IV		Pair V		Pair VI		Pair VII	
	T1	T2	T2	T3	T3	T4	T1	T4	T4	T5	T1	T5	T3	T5
M	132.6	150.2	150.2	157.0	157.0	162.3	132.6	162.3	162.3	155.8	132.6	155.8	157.0	155.8
SD	11.6	8.2	8.2	7.4	7.4	7.2	11.6	7.2	7.2	8.4	11.6	8.4	7.4	8.4
t	-12.472		-8.428		-8.875		-18.962		7.285		-16.977		1.577	
p	.000***		.000***		.000***		.000***		.000***		.000***		.126	

Table 7: Highest proficiency group test results

	Pair I		Pair II		Pair III		Pair IV		Pair V		Pair VI		Pair VII	
	T1	T2	T2	T3	T3	T4	T1	T4	T4	T5	T1	T5	T3	T5
M	136.4	148.7	148.7	154.3	154.3	162.4	136.4	162.4	162.4	156.2	136.4	156.2	154.3	156.2
SD	11.1	10.5	10.5	6.9	6.9	5.4	11.1	5.4	5.4	7.3	11.1	7.3	6.9	7.3
t	-3.369		-2.713		-4.785		-9.693		4.128		-7.420		-1.241	
p	.010**		.027*		.001***		.000***		.003**		.000***		.250	

In the case of the group with the lowest proficiency scores (see *Table 5*), the biggest increase was achieved after completion of the Gobang game (Pair IV). Although there was a loss in the case of the delayed test as compared with the fourth test, the results of that test were similar to those of the third test and indicated a significant gain compared to the pretest (Pair 6, $p=.001***$).

In the case of the middle proficiency group (see *Table 6*), a group whose CSEPT scores were around the average for all of the participants, the standard deviation (except in the case of the pretest) was more stable it was for the other groups. The differences among the first four tests were significant, indicating continuing vocabulary expansion. However, the *p-value* from Pair V (fifth test) indicates significant loss (a loss of around 7 items) in relation to the fourth test. Nevertheless, there was still a significant difference (indicating vocabulary gains) between the results of the first and last tests.

So far as the group with the highest proficiency level is concerned (see *Table 7*), the gains were initially more gradual, with the most significant increase occurring in the fourth test (as compared to the third test). Although there was a loss in the fifth test (as compared with the fourth), there was, nevertheless, an overall gain in comparison with the pretest.

Conclusion

As indicated in *Table 2*, although the participants' vocabulary gains immediately following the game program were higher than they were after a 45 day delay, comparison of the pretest results with those of the delayed test results provides evidence of significant long-term vocabulary gains. However, the small number of participants in two of the proficiency groups (the highest and lowest) was a limiting factor and further research involving a higher number of students with different proficiency levels would be required before any definite conclusions could be reached in relation to the impact of proficiency level on vocabulary gains. Furthermore, a more extensive research project involving different game sequences would be required in order to determine whether any of the games is more effective in relation to vocabulary gains. Finally, in order to determine the comparative effectiveness of this game-based program, it would be necessary to establish control groups whose members were introduced to the same vocabulary in different ways.

Endnotes

1. A version of this paper was presented at the 26th Conference of English Language Teaching and Learning in Republic of China.
2. PickRed is a game in which players are given up to six cards, depending on the number of players. The rest of the cards are put aside and four cards are placed face-up on the table. Players aim to match cards (from their hands or the cards on the table), producing pairs of red cards (hearts and diamonds) that add up to ten. In the version of the game designed by the author, the cards have pictures and words on them and paired cards must combine to create compound nouns.
3. Blind Chess is played with all pieces upside down on one half of the board. There are 16 red pieces and 16 black pieces which, depending on type, may move horizontally, vertically and/or diagonally. Pieces can leap over one another to capture their target or capture their target directly by moving in any direction except diagonally. In the version of the game designed by the author, the pieces have words written on them and players gain points by lining up pieces to form compound nouns. The game ends when one player successfully takes the general, or checkmates the other player.
4. Gobang, also known as 5-in-a-Row, is a traditional oriental game played with black and white pieces on a 19x19 go board. The pieces can be lined vertically, horizontally and diagonally. It can be played by two individuals or two teams. In the version of the game designed by the author, each piece has a word written on it and players need to line up the pieces so that each juxtaposed pair makes up a compound noun.

5. Note that a patent application has been made in respect of these games (Application No. 097101167).
6. Note that 'keyword-received' refers to situations in which students are provided with a verbal description of an interactive picture and asked to imagine the picture, whereas 'keyword-generated' refers to a situation in which students create their own interactive images.

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Title

The title should be in Times 12 cpi boldface and should be centred on the page. The title should indicate as clearly as possible the nature of the content of the manuscript. All content words of the title are to have an initial capital letter.

Abstract

Each article must include an abstract of not more than 200 words. The heading Abstract should be in Times 12 cpi boldface, and centered.

Headings

Level 1 headings should be capitalized in the same way as the main title, and centered. The font used is Times 12 boldface. The format for *level 2* headings is the same as for *level 1* headings except that the font is Times 11, and the heading is justified to the left of the column. There should be the equivalent of a one line space between level 1 and level 2 headings and the following text. The format for *level 3* headings is the same as for level 2 headings, except that the font is Times 10, and there should be no space left between the heading and the text.

References within the text

All references within the text should be placed in parentheses containing the author's surname followed by a comma and a space before the date of publication (Jones, 1999). If the sentence already includes the author's name, then it is necessary only to put the date in parentheses: Jones (1999). When several works are cited, each entry should be separated by a semicolon: (Jones, 1999; Peters, 1995; Simon, 1993). When a reference has more than three authors, cite only the name of the first author followed by *et al* in every subsequent reference to the same work. When including page references, separate them from the date by a comma and a space (Jones, 1999, pp. 7 – 14). Page numbers should be indicated as follows: Peters (1999, p. 1), Jones (1998, pp. 4 - 7).

Endnotes

Endnotes are indicated within the text by a number¹ in superscript. They should be in Times 9, and appear together at the end of the article and before the reference list.

Tables and Figures

All tables and figures should be centered in the manuscript. Tables and figures should be numbered in the text, and should be preceded by a caption in Times 12 cpi italic. The equivalent of one line space should be left between captions and the tables or figures to which they refer. Captions and the tables or figures to which they refer should always appear together on the same page.

References

References should be listed in alphabetical order at the end of the article. The title of the section, 'References', should be a *level 1 heading*. The first line of each bibliographical reference must be justified to the left of the column, and the rest of the entry should be indented five spaces. The following examples (of fictitious references) illustrate the format required for conference proceedings, books, journals, articles, Ph.D. theses, and chapters of books respectively:

- Jones, L. E. (1999). Marae Protocol. In *Proceedings of the First Annual Conference of the Society for Māori Language Revitalisation* (pp. 71 -- 133). Wellington, NZ: Te Rapa Books.
- Peters, S. O. (1997). *Words and Meanings*. London: Groves and Parker.
- Stephens, E. & Jones, A. E. (1987). An Experimental Approach to Case, *Journal of Case Studies*, 2 (3), 12 - 17.
- Houia, A. (1992). Common Syntactic Errors in Young Learners of Greek. Doctoral Thesis. University of Te Rapa, Auckland.
- Edmonds, A. B. (1991). Scaffolding Second Language Learning. In T. A. Stone, A. T. Bread & V. Matthews (Eds.), *Scaffolding in Education* (pp. 12-48). Wellington, NZ: Learning Media.

Policy regarding use of the macron

The editors will respect the decisions made by authors in relation to their use of the macron in text written in English and/or Maori. Where Maori words are included by the editors themselves in text written in English, the macron will not be used in cases where a particular word (such as, for example, the word *Maori* itself) is deemed by the editors to have been fully integrated into New Zealand English. Thus, the macron is not used in the title of the Journal.

Submission

Each manuscript should be submitted on white A4 paper (3 copies) and sent to the Production Editor (Dr. Winifred Crombie) at *Pua Wānanga Ki Te Ao* (the School of Māori and Pacific Development), *Te Whare Wānanga o Waikato* (University of Waikato), Private Bag 3105, Hamilton, New Zealand.

The manuscript should be accompanied by a Word Disk and/or also sent by email attachment to <crombie@waikato.ac.nz>. Author's names should **NOT** be included in the manuscript but should be indicated in an accompanying letter in which institutional affiliations, institutional addresses, email addresses and phone and fax numbers are also included. The accompanying letter should indicate clearly whether the content of the manuscript has, in the same or similar form, either (a) been delivered as a conference paper and, if so, where and when, or (b) been produced or published in any other context and, if so, where and when.

Acknowledgments

Place all acknowledgements (including those concerning research grants and funding) in a separate section at the end of the article.
