
Title	Word Juxtapoz: An innovative tool for promoting interest in science education
Author(s)	R. Subramaniam, Goh Ngoh Khang, Daniel Tan and Chia Lian Sai
Source	<i>MERA-ERA Joint Conference, Malacca, Malaysia, 1-3 December 1999</i>

This document may be used for private study or research purpose only. This document or any part of it may not be duplicated and/or distributed without permission of the copyright owner.

The Singapore Copyright Act applies to the use of this document.

WORD JUXTAPOZ – AN INNOVATIVE TOOL FOR PROMOTING INTEREST IN SCIENCE EDUCATION

R. Subramaniam

Singapore Science Centre

Goh Ngoh Khang, Daniel Tan & Chia Lian Sai

Nanyang Technological University

Abstract: Word Juxtapoz, a new approach which uses words, letters, numbers or symbols juxtaposed in a particular manner or format to convey ideas is shown to be useful for promoting interest in physics, chemistry, mathematics and biology. The juxtaposition of seemingly incongruous elements in the Word Juxtapoz puzzles fosters a scientific way with words that becomes apparent only with some understanding of the topics covered. The etymological basis of such puzzles is discussed as well as the methodology for generating the puzzles. Several examples are used to illustrate the approach, and their potential benefits enumerated for teachers and students.

Introduction

The use of innovative and unorthodox approaches for fostering interest in science education contributes an important tributary to the attainment of cognitive and affective gains in the learning process. Such approaches include the use of cartoons, music, puzzles and so on. The advantage of such approaches is that they provide opportunities for students to be exposed to a myriad of creative learning modes of an enrichment nature that help to further foster understanding of the subject content as well as expand their mental framework of ideas.

More recently, Subramaniam, Goh and Chia have pioneered and popularized a new approach known as Word Juxtapoz in the fields of physics [1], chemistry [2], mathematics [3] and biology [4]. Their approach uses words, letters, numbers or symbols juxtaposed in a particular manner or format to convey ideas about concepts in science.

The inspiration behind the use of Word Juxtapoz in science education came from a recent local best-seller [4].

Word Juxtapoz can be easily illustrated with some simple examples. For example, YY4U can be interpreted to mean “too wise for you”, $\frac{IQ}{140}$ can be interpreted to mean “IQ above 140”, $\frac{0}{B.Sc.}$ can

be interpreted to mean “2 degrees below zero”, and “NOON GOOD”

M.Sc. can be interpreted to mean “Good Afternoon”.

The purpose of the present paper is three fold:

- to demonstrate a further suite of puzzles which we have developed,
- to address the etymological basis of such puzzles, and
- to expound on the methodology for generating these puzzles.

The latter two objectives have not been addressed previously.

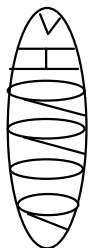
Word Juxtapoz in Science Education

A sprinkling of new Word Juxtapoz puzzles which we have developed recently for various concepts in Physics, Chemistry, Mathematics and Biology is reflected in Table 1. Their interpretation is given in Table 2, and it is advised that reference be not made to it before at least an attempt is made to unravel the meanings of the puzzles.

Table 1: Word Juxtapoz Puzzles in Science

Physics

1) FORCE



2)

3) Energy \$0

4) | Entropy |

Chemistry

5) $XY \rightleftharpoons YX$

RATE OF REACTION

6) **RATE OF REACTION**

RATE OF REACTION

RATE OF REACTION

7) C O E F F I C I E N T

8) Theory $\rightarrow$ $\leftarrow$ Theory

Mathematics

9) NUMBER

ZERO

V

E

10) C

T

O

R

11) decimal decimal decimal

12) $\text{TILE} \diagdown_4$

Biology

13) $\int$ ribs

14) V I T _ M I N

15) $\overset{1}{\text{CROSS}}$

16) B | A | C | T | E | R | I | A

Table 2: Answers to Word Juxtapoz Puzzles

- 1) Lines of force
- 2) Convex mirror
- 3) Free energy
- 4) Absolute entropy
- 5) Isomerisation
- 6) Increasing rate of reaction
- 7) Partition Coefficient
- 8) Collision Theory
- 9) Positive number (that is, number above zero)
- 10) Column vector
- 11) Recurring decimal
- 12) Quartile
- 13) Integral ribs
- 14) Vitamin A deficiency
- 15) Reciprocal cross
- 16) Bacterial fission

Commentary on Word Juxtapoz Puzzles

The Word Juxtapoz puzzles find applications in the following contexts:

- filling spare time slots in curriculum time
- as brain teasers
- as ice-breakers in presentations
- for introducing creative elements in homework
- as extra assignments for students who have completed work ahead of time
- as an interesting pastime of a scientific nature
- as a pleasurable interlude in the instructional process.

Educators can leverage on the opportunities presented in order to inject a fresh stimulus to their lessons in suitable learning contexts. Indeed, novel approaches which provide ways to rivet student

attention, excite them about the lesson and engender enthusiasm need to be in the armoury of instructional strategies of all teachers!

Students can also be encouraged to construct Word Juxtapoz puzzles on various topics. Even those who dislike the lesson are likely to find such digressions fun and interesting because of the fascinating approaches which it provides for word play.

At the Nanyang Technological University, we have piloted Word Juxtapoz puzzles on several batches of trainee teachers reading for their Postgraduate Diploma in Education. Feedback from these trainee teachers on the use of such strategies as an adjunct to the formal instructional process has been overwhelmingly positive. Indeed, the suite of puzzles which we have presented to them have engendered such unbridled enthusiasm that they have on their own generated a wider assortment of those puzzles!

Etymological Foundations of Word Juxtapoz Puzzles

Generating Word Juxtapoz puzzles in any area of subject matter is a highly creative exercise. Axiomatic to this exercise is the recognition that certain key words in the English language lend themselves admirably for the formulation of Word Juxtapoz puzzles if such words also find resonance in the lingo of the particular discipline. It is this etymological basis which is central to the configuration of Word Juxtapoz puzzles. Some of the key words which we have put to good use are reflected in Table 3. The list is by no means exhaustive.

Table 3: Etymological Roots of Word Juxtapoz Puzzles

	Root	Example of Word Juxtapoz Puzzle	Meaning
1)	Absolute	C ₂ H ₅ OH	Absolute ethanol
2)	parallel	//x	Parallax
3)	Shift	RATOR OPE	Shift operator
4)	semi	Conductor / ₂	Semiconductor
5)	Above	Boiling point Freezing point	Boiling point lies above freezing point
6)	di	cotyledon cotyledon	dicotyledon
7)	Inverse		Inverse function
8)	Square	ROOT ²	Square Root
9)	Partition	C H R O M A T O G R A P H Y	Partition Chromatography
10)	Expansion	C O E F F I C I E N T	Coefficient of expansion
11)	contraction	— / LORENTZ / —	Lorentz Contraction
12)	sliding	— / —	Sliding friction
13)	separation	V A R I A B L E S	Separation of variables
14)	degree	B.Sc., M.Sc., Ph.D.	3° (3 degrees)
15)	Transform	RIER FOU	Fourier Transform

16) Wave	$E Q U A T I O N E Q U A T I O N$	Wave Equation
17) Bond	007 007	Double bonds
18) partial	$\square \Delta C T I O N$	Partial fraction
19) derivative	$R C O O H \frac{d y}{d x}$	Carboxylic acid derivative
20) deviation	$S T A N D A R D$	Standard deviation
21) Man	$G O \rightarrow$	Mango
22) lateral	$I N V E R S I O N$	lateral inverse
23) dilation	$T I M E$	Time dilation
24) non	conductor	non-conductor
25) negative	ion < 0	negative ion
26) positive	feedback > 0	positive feedback
27) double	$V I S I O N$	Double vision
28) Integral	$\int$ ribs	Integral ribs
29) balance	$N_2 \quad \triangle \quad N_2$	Nitrogen Balance
30) Margin	$\begin{array}{c} E \\ R \\ R \\ O \\ R \end{array}$	Margin of error
31) Clockwise	$\begin{array}{c} M O M \\ T E N \end{array}$	Clockwise moment

Generating Word Juxtapoz Puzzles

One manner of generating Word Juxtapoz puzzles which we have found to be highly effective is to look up the indexes of various subject textbooks for the occurrence of the key words such as those in Table 3. It is then a straightforward task to formulate a Word Juxtapoz puzzle. In this context, it has been our experience that a visit to the library to scan the indexes of various subject text books

has been a highly productive exercise. Often some other index words will suggest possibilities for further puzzles.

It is important to bear in mind that whilst formulating Word Juxtapoz puzzles along the lines enunciated in the foregoing paragraph is a relatively straightforward task, their interpretation is contingent on a knowledge of the lingo of the particular discipline and its underlying conceptual framework. By way of example, we illustrate with the following Word Juxtapoz puzzles; which are self-explanatory:

Equation	Equation	
		Balancing (chemical) equations
N ₂	N ₂	
		Nitrogen Balance
probability	probability	
		Balance of probabilities

Conclusion

An innovative tool for promoting interest in science education has been presented. It is important to realize that such approaches cannot supplement the formal instructional process and has to be used judiciously to foster the benefits enumerated in the context of curricular and sessional constraints.

References

- Subramaniam, R., Goh, N.K., & Chia, L.S. (1998). *Physics Education*, 33(4), 216-218,
 Subramaniam, R., Goh, N.K. & Chia, L.S.(1999). *J. Chem. Ed.*, 76(4), 484-488, 1999
 Subramaniam, R., Goh, N.K. & Chia, L.S. (1999). *Int. J. Math. Ed. Sci & Technol.*, 30(4), 616-619.
 Subramaniam, R., Goh, N.K. & Chia, L.S. (1999). *J. Biol. Ed.*, 33(2): 103-104.
 Chan, P. (1996). *Word Juxtapoz*. Singapore: Juxtapoz Communications.