Puzzle Logic
Puzzles used in an educational setting can include geometric shape arrangements, logic problems, crossword puzzles, Sudoku exercises, divergent thinking activities, pattern recognition, crossword, and word riddles. They can be used to develop problem solving ability and, in some case, to introduce and learn content
The goal was to introduce students to new terms, definitions, and people, all using a strategic exercise.
The first step in learning is familiarization, and the approach presented here is used to familiarize students with a host of periodic table and chemical topics.

3x3 Puzzle Beginning Puzzle

|  |  | L |
| :--- | :--- | :--- |
|  | I |  |
|  |  |  |
|  |  |  |

Completed Puzzle with Points

| W | A | L |
| :---: | :---: | :---: |
| R | I | M |
| O | $C$ | $N$ |

Li, I, O, C, N, W, Ar, Ra, Mn, La, WI, Cn, Cr, Co, Ca, $\mathrm{Mn}, \mathrm{Ni}, \mathrm{Ir}, \mathrm{Cm}$ (Total points = 19 pts )

Abbreviation Puzzles for the Periodic Table
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Puzzles can be used as an educational exercise for a number of reasons; they emphasize strategy and familiarize students with a new topic or new words. Crossword puzzles typically require prior knowledge on a topic while a Sudoku type puzzle is focused on developing strategy. A type of puzzle, based on abbreviations of the elements, is developed and presented as an educational exercise. It is not a single puzzle format but one that can be easily varied for students of different ages and students with different objectives. The goal is familiarization with the periodic table, its symbols, the groups as well as physical and chemical properties, using a strategic approach.

Puzzle Instructions

1. Start with an empty grid ( $2 \times 2,3 \times 3$, $4 \times 4$, etc.).
2. The instructor adds an element abbreviation, one or two letters, from the list of elements.

Different scoring methods can be used but this can result in additional time needed. A blank puzzle can be assigned with the goal being the highest score.

Completed Puzzle with Points


Requirements for a Completed Puzzle
verv time a letter is added it should result in a
Every time a letter is added it should result in a new element being identified. The rules are as follows:
a. Only one letter per grid.
b. Every square must contain a letter for the puzzle to be considered complete. Letters must be added that increase the number of elements. For example, in Puzzle 6, if $X$ was added next to $P$ forming a PX, it would not be allowed because there is no elemental symbol for $X, P X$ or $X P$.
c. Abbreviations can be made as long as the squares touch each other, vertically, horizontally, diagonally, forward or reverse.

## $1 \times 10$ Puzzle

Beginning Puzzle


Completed Puzzle with Points

|  | R |
| :---: | :---: |
| C | E |
|  | H |
|  | 0 |
|  | C |
|  | A |
|  | R |
|  | A |
|  | T |
|  | B |

$\mathrm{C}, \mathrm{Co}, \mathrm{Ho}, \mathrm{O}, \mathrm{H}$, He, Er, Re, Ca, Ar, $\mathrm{Ra}, \mathrm{At}, \mathrm{Ta}, \mathrm{Tb}, \mathrm{B}$ (Total points = 15 pts)

## Puzzle Flexibility

Besides the periodic table, these grid puzzles provide flexibility when it comes to the topics that can be covered. If there is an abbreviation, either established or created, they can be used for any subject or topic. We have created puzzles over plant and animal cell organelles, the 50 states in the US, wildlife diseases, emerging infectious diseases, and amino acids.
Here is an example of an emerging infectious disease puzzle, which is a $4 \times 4$ grid. Here is an example of an emerging infectious disease puzzle, which is a $4 \times 4$ grid.

Beginning Puzzle

|  |  |  |  |
| :--- | :--- | :--- | :--- |
|  |  | A |  |
|  | C |  |  |
|  |  |  |  |

Completed Puzzle with Points

| E | F | R | V |
| :---: | :---: | :---: | :---: |
| H | G | A | K |
| D | C | S | P |
| B | M | L | T |

$\mathrm{CA}, \mathrm{AC}, \mathrm{AA}, \mathrm{CC}, \mathrm{AG}, \mathrm{CG}, \mathrm{GG}, \mathrm{CH}, \mathrm{HC}, \mathrm{HG}, \mathrm{CD}, \mathrm{CHG}, \mathrm{CHD}, \mathrm{CDC}$,
$\mathrm{CA}, \mathrm{AC}, \mathrm{AA}, \mathrm{CC}, \mathrm{AG}, \mathrm{CG}, \mathrm{GG}, \mathrm{CH}, \mathrm{HC}, \mathrm{HG}, \mathrm{CD}, \mathrm{CHG}, \mathrm{CHD}, \mathrm{CDC}$,
$\mathrm{GD}, \mathrm{HD}, \mathrm{AS}, \mathrm{CS}, \mathrm{GS}, \mathrm{SA}, \mathrm{SG}, \mathrm{SC}, \mathrm{SS}, \mathrm{MC}, \mathrm{MS}, \mathrm{HG}, \mathrm{CLM}, \mathrm{CL}, \mathrm{SL}$, AP, CSP, LP, PS, PA, SP, TT, TP, TL, TS, ST, AF, CHF, HF, KA, AK SCB, DB, BM, BC, BB, HE, GE, FR, SAR, KR, RF, RV, VV, KK (Total points $=59$ pts)

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Puzzle Competition
In Summer 2019, a puzzle competition was held at Valdosta State University's Bailey Science Center. We invited children of all ages, from $3^{\text {rd }}$ grade to adults, to compete in various age group by completing the puzzles. Certificates and recognition was given to the individuals that acquired the most points per age group


