

CERTIFICATION OF APPROVAL

Interactive Courseware to Help Retention of Periodic Table Elements in Chemistry Education


by

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10886

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Approved by,



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CERTIFICATION OF ORIGINALITY

This is to certify that I am responsible for the work submitted in this project, that the original work is my own except as specified in the reference and acknowledgements, and that the original work contained herein has not been undertaken or done by unspecified sources or persons.



NAJMI BIN PASARUDIN

ABSTRACT

The trend of combining multimedia and education elements into courseware has high acceptance among people with the growth of multimedia technology. Computer-based training has been used a lot nowadays and courseware with multimedia elements is among them. Interactive courseware in periodic table can enable students to understand more about the content while tracking it on the table. It can provide tutorial for beginners and reference for others. The objective of such courseware is help students in retention of the elements of the periodic table. Difficulties arise when students beginning to learn how to read the table and later remembering the elements. The throw away methodology will be used in developing the courseware. Such methodology is to discover the suitable design to achieve the courseware objective.

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CHAPTER 1

INTRODUCTION

Background of Study

Today people are getting accustomed in using computer as their tool for learning. Many rely on internet to get information but courseware can be a stand alone tool in providing tutorial or guidance for a certain subject. For example, the information regarding chemistry elements in periodic table [1].

Hydrogen 1 H 1.0079																	Helium 2 He 4.0026						
Lithium 3 Li 6.941	Boron 5 B 10.811	Beryllium 4 Be 9.0122																	Carbon 6 C 12.011	Nitrogen 7 N 14.007	Oxygen 8 O 15.999	Fluorine 9 F 18.998	Neon 10 Ne 20.180
Sodium 11 Na 22.990	Aluminum 13 Al 26.982	Magnesium 12 Mg 24.305																	Silicon 14 Si 28.086	Phosphorus 15 P 30.974	Sulfur 16 S 32.065	Chlorine 17 Cl 35.453	Argon 18 Ar 39.948
Potassium 19 K 39.098	Calcium 20 Ca 40.078	Scandium 21 Sc 44.956	Titanium 22 Ti 47.867	Vanadium 23 V 50.942	Chromium 24 Cr 51.996	Manganese 25 Mn 54.938	Iron 26 Fe 55.845	Cobalt 27 Co 58.933	Nickel 28 Ni 58.693	Copper 29 Cu 63.546	Zinc 30 Zn 65.38	Gallium 31 Ga 69.723	Germanium 32 Ge 72.64	Arsenic 33 As 74.922	Selenium 34 Se 78.96	Bromine 35 Br 79.904	Krypton 36 Kr 83.798						
Rubidium 37 Rb 85.468	Sr 38 Sr 87.62	Yttrium 39 Y 88.906	Zirconium 40 Zr 91.224	Niobium 41 Nb 92.906	Molybdenum 42 Mo 95.94	Technetium 43 Tc [98]	Ruthenium 44 Ru 101.07	Rhodium 45 Rh 101.07	Palladium 46 Pd 106.42	Silver 47 Ag 107.87	Cadmium 48 Cd 112.41	Indium 49 In 114.82	Tin 50 Sn 118.71	Antimony 51 Sb 121.76	Tellurium 52 Te 127.60	Iodine 53 I 126.90	Xenon 54 Xe 131.29						
Cesium 55 Cs 132.91	Ba 56 Ba 137.33	* 57-70	Lanthanum 57 La 138.91	Hafnium 72 Hf 178.49	Tantalum 73 Ta 180.95	Tungsten 74 W 183.84	Rhenium 75 Re 186.21	Osmium 76 Os 190.23	Iridium 77 Ir 192.22	Platinum 78 Pt 195.08	Gold 79 Au 196.97	Mercury 80 Hg 200.59	Thallium 81 Tl 204.38	Lead 82 Pb 207.2	Bismuth 83 Bi 208.98	Po 84 Po [209]	Astatine 85 At [210]	Rn 86 Rn [222]					
Francium 87 Fr [223]	Radium 88 Ra [226]	** 89-102	Lr 103 Lr [260]	Rf 104 Rf [261]	Db 105 Db [262]	Sg 106 Sg [263]	Bh 107 Bh [264]	Hs 108 Hs [265]	Mt 109 Mt [266]	Uun 110 Uun [267]	Uuu 111 Uuu [268]	Uub 112 Uub [269]	Uuq 114 Uuq [270]										
* Lanthanide series			La 57 La 138.91	Ce 58 Ce 140.12	Pr 59 Pr 140.91	Nd 60 Nd 141.21	Pm 61 Pm [145]	Sm 62 Sm 150.36	Eu 63 Eu 151.96	Gd 64 Gd 157.25	Tb 65 Tb 158.93	Dy 66 Dy 162.50	Ho 67 Ho 164.93	Er 68 Er 167.26	Tm 69 Tm 168.93	Yb 70 Yb 173.04							
** Actinide series			Ac 89 Ac [227]	Th 90 Th 232.04	Pa 91 Pa 231.04	U 92 U 238.03	Np 93 Np [237]	Pu 94 Pu [244]	Am 95 Am [243]	Cm 96 Cm [247]	Bk 97 Bk [247]	Cf 98 Cf [251]	Es 99 Es [252]	Fm 100 Fm [257]	Md 101 Md [258]	No 102 No [259]							

Figure 1: Periodic Table

At first glimpse, the table only provide the elements' name but there are more to know by understand why such table existed. For beginner or in this case new chemistry students, knowing how to read the table is very important and it is the first step. For those who already informed, the table usually served as reference. By including animation video together with the information needed, this will be able to encourage students to keep on learning about the table. In addition, people can gain more understanding by watching video than just reading.

Problem Statements

Learning and remembering the table can be difficult and some even prefer to remember selective chemistry elements only. In addition, some students may not know how to extract information from the table.

Objectives & Scope of Study

The main objective is to develop a courseware for helping students in remembering elements from the periodic table. In addition, to develop the courseware and apply animation video in the table's elements to encourage students to keep learning more about the elements.

CHAPTER 2

LITERATURE REVIEW

This chapter will divide into two parts. In the first part, an example of current available courseware on periodic table will be explained and the features will be discussed. Next, in the second part, addition of features in this project will be discussed.

The example taken is a courseware specifically made for periodic table. The courseware titled as freshney.org Periodic Table [2].

The screenshot shows the 'freshney.org Periodic Table' interface. The main area displays a periodic table with a large, detailed view of Hydrogen (H) in the center. The interface includes a navigation menu at the top with options like 'Main', 'Graph', 'Search', 'Atomic', 'Images', 'Map', 'Docs', and 'Toolbox'. On the right side, there is a 'Properties' panel for the selected element, listing various characteristics such as 'State: gas at 298 K', 'Boiling Point: 20.268K', and 'Density: 0.08988g/cm³'. Below the periodic table, there are sections for 'Lanthanoid Series' and 'Actinoid Series'. The bottom of the interface features a 'Display Mode' dropdown set to 'Colour' and a 'Default page' dropdown set to 'Main properties'.

Figure 2: freshney.org Periodic Table

It provides the periodic table as the main screen. For the first time using it, it requires users to explore a bit before they can use it. The courseware does not have any instructions for beginners. Some of the buttons are hard to distinguish and can only be identify by hovering on the text. The interaction available is to sort the information depths. More detailed information will require more exploration.

For light use, users can simply click on the elements given and the information on the right side will change accordingly. The information given divided into several parts from such as the basic characteristic until the history of the element. The users are given options to explore more of the interaction to get more information.

From the figure, the courseware is using text and pictures for the information. There are no animations except for electron configuration. The courseware serves as reference for users and not as tutorial. It will be challenging for beginner to learn from the courseware.

In this project, addition of features will be done based on the current courseware. The addition will be beginner tutorial, advantage of animation in the information and game.

First of all, why is tutorial important [3]? Courseware does not necessarily meant for non-beginners. There a lot of beginners out there in learning chemistry and they want to know learn from the start. As mentioned, freshney.org Periodic Table is suitable to work as reference. In the tutorial, information about the table's appearance needs to be discussed. The table was form in such order to distinguish the group number and the period.

Next, the advantage of animation in the information [4]. Animation can represent few pages of book and increase the speed of learning. Some students are shy to ask in class and probably would hope someone can explain to them again. Given that animation is provided with video-like controller, users can do more interaction like fast forward the animation. This is to encourage users to get the details that they miss. Some people are comfortable listening, watching and even interacting when learning rather than just reading.

Finally, the game chosen for this courseware will be picture puzzle. There are many kinds of picture puzzle but this project will use picture slide puzzle.

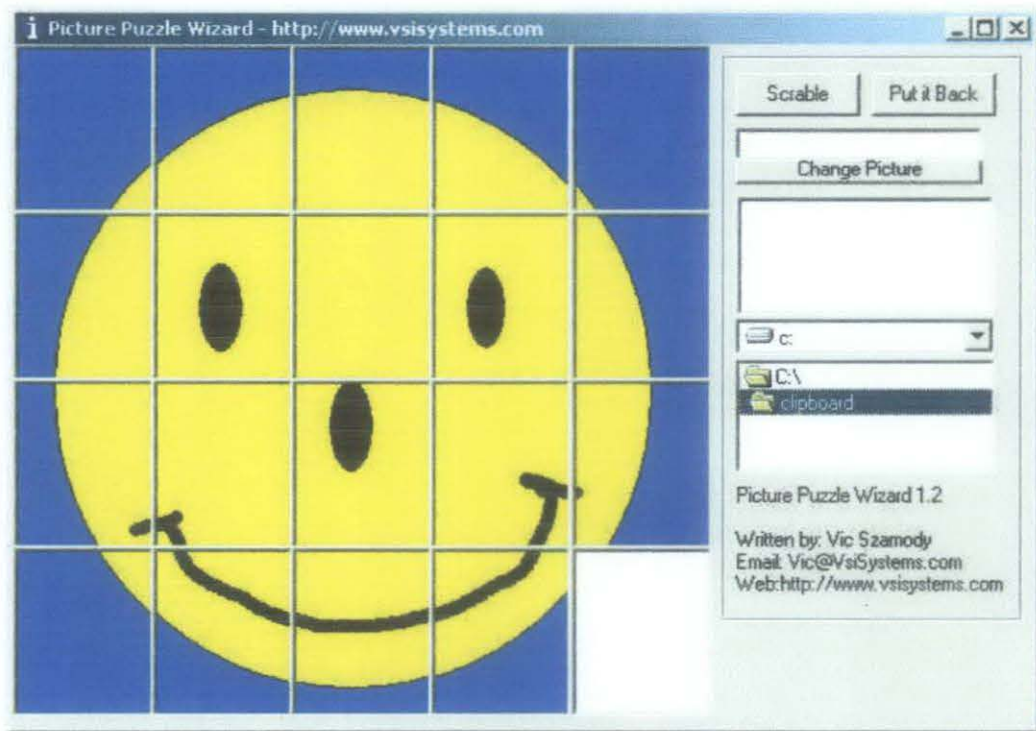


Figure 3: Example of picture slide puzzle

Picture puzzle will require users to use certain learning abilities like reason, deduce, analyze, sequence and problem solving [5]. This will increase the brain activity as well as improving the retention.

CHAPTER 3

METHODOLOGY

For development of this courseware, the throw away prototyping will be used [6]. One of the objectives of this project is to develop the courseware. By developing a dummy prototype of the courseware, ideas can be explored in completing the real courseware. The prototypes then are discarded if it did not meet the requirement. Other areas that can be explored by using this method are the interface design, layout and interaction styles. The prototype sometimes called 'mock-ups' or 'click dummies' because it provides the appearance of the courseware but not the functionality.

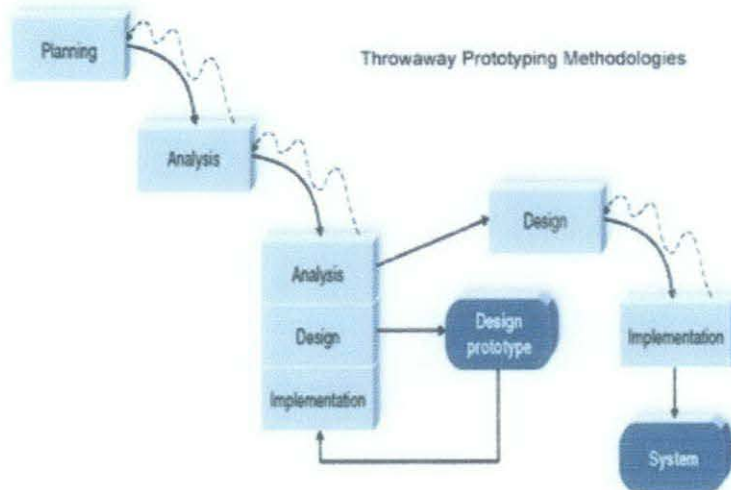


Figure 4: Throw away Prototyping Methodologies

The speed of prototyping by using this method can give the some good ideas on designing a suitable style for this courseware. In addition, it also can reveal missing features at early stage.

Steps involve in Throw away Prototyping Methodologies that relates to this project are:

1. Plan the storyboard of the courseware.
2. Analyse the depth of information required.
3. Design a prototype.
4. Analyse the prototype.
5. If the prototype does not meet requirement, design different design.
6. Repeat step 3 to 5 until a suitable design is found.
7. The final prototype will be tested and implemented.

The activities for the project are listed below:

1. Find a periodic table reference for the courseware.
2. Determine the depth of information required for the elements.
3. Design each page (cover, content and game) of the courseware.
4. Create graphic materials for the courseware.
5. Apply interaction for the courseware.
6. Design the game.
7. Refine the courseware technically and graphically.

NO	Detail/Week	1	2	3	4	5	6	7		8	9	10	11	12	13	14	
1	Plan project	Process							MID SEM BREAK								
2	Information research	Process															
3	Prototype 1	Process	Process	Process													
5	Evaluate previous prototype				Process												
6	Prototype 2				Process	Process	Process	Process									
7	Progress report							Milestone									
8	Evaluate previous prototype										Process						
9	Prototype 3										Process	Process	Process				
10	Evaluate previous prototype											Process	Process				
11	Finalizing product												Process				
12	Poster Exhibition												Milestone				
13	Dissertation (soft bound)														Milestone		
14	Oral presentation															Milestone	
15	Dissertation (hard bound)																Milestone

	Milestone
	Process

Tools:

1. Adobe Flash CS4

Considering the experience I gain from Internship period, this authoring tool is the most suitable for me to present the content with multimedia elements. Programming, animation, graphic and audio materials will be compiled using this tool.

2. Adobe Photoshop CS4

This tool will help me to manage the graphic materials. Some effect can be done in Flash CS4 but extra features like lasso or crop will be needed in Photoshop CS4.

3. Audacity

This tool manages audio editing. The audio file converter is limited but the editing like cut and volume control is sufficient.

4. Five Star Audio Converter

As Audacity has limited file conversion, this tool will be the substitute.

CHAPTER 4

RESULT AND DISCUSSION

The current progress of the project is the development of the content animation.

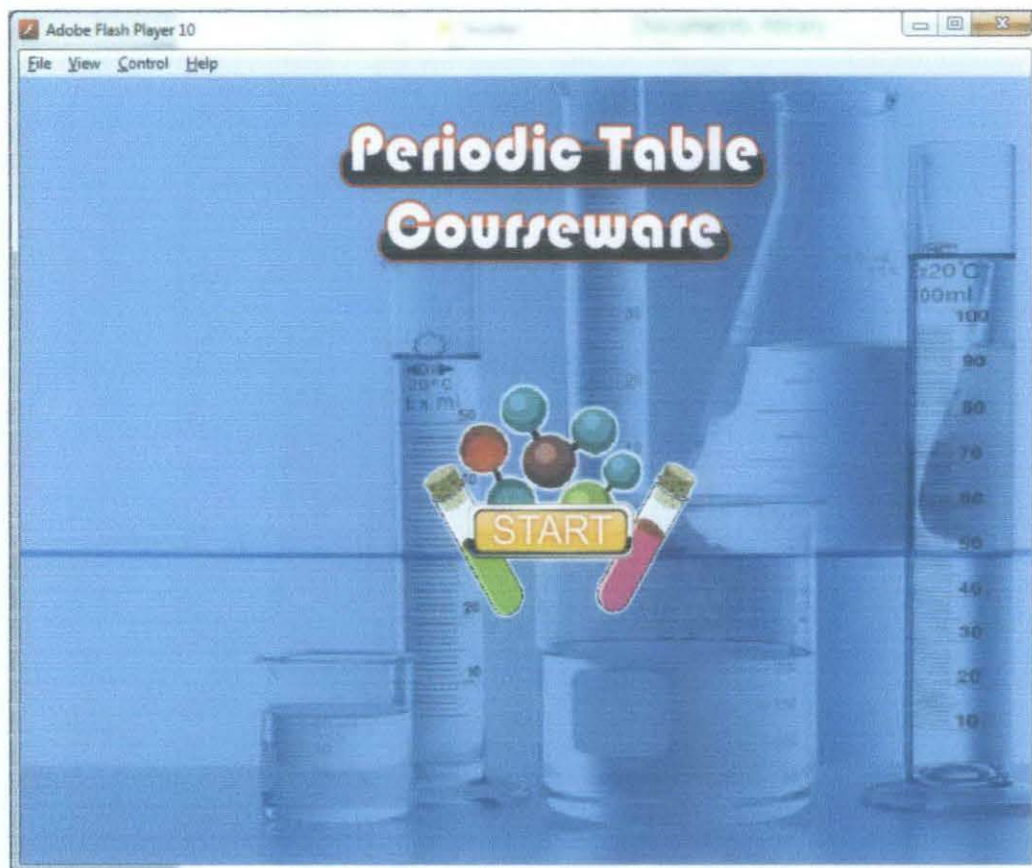


Figure 6: Courseware main screen

In figure 6, the main screen only consists of start button. The start button will lead to the menu screen.



Figure 7: Courseware menu screen

In figure 7, the menu screen has three options; What to know?, Periodic Table and Game.

What to know? button leads to an introduction page which covers the basics of the periodic table. The Periodic Table button leads to the table with buttons for each element for users to click and get information. The Game button leads to the game page which provides the picture slide puzzle game.

The screenshot shows a software interface titled "table.swf" with a menu bar (File, View, Control, Debug). The main area displays a periodic table with the title "Periodic Table" in a large font. A detailed information box for Hydrogen (H) is open, showing the following data:

H	
Name	: Hydrogen
Atomic No	: 1
Neutron	: 0
Group No	: 1
Group Name	: Non-metals
State	: Gas
Colour	: Colourless
Classification	: Non-metallic

Below the information box are three navigation buttons: a backward button (left arrow), a play button (right arrow), and a forward button (right arrow). A "Back to menu" button is located in the bottom left corner. The background of the interface features a laboratory setting with beakers and test tubes.

Figure 8: Courseware periodic table screen

In figure 8, the table and the information will be viewed. The entire element grids are clickable and the information box will change accordingly. The information provided will cover the element's name, atomic number, neutron, group number, element's state, colour and classification. Further information will be in the animation video which the users can control with the backward, play and forward button.

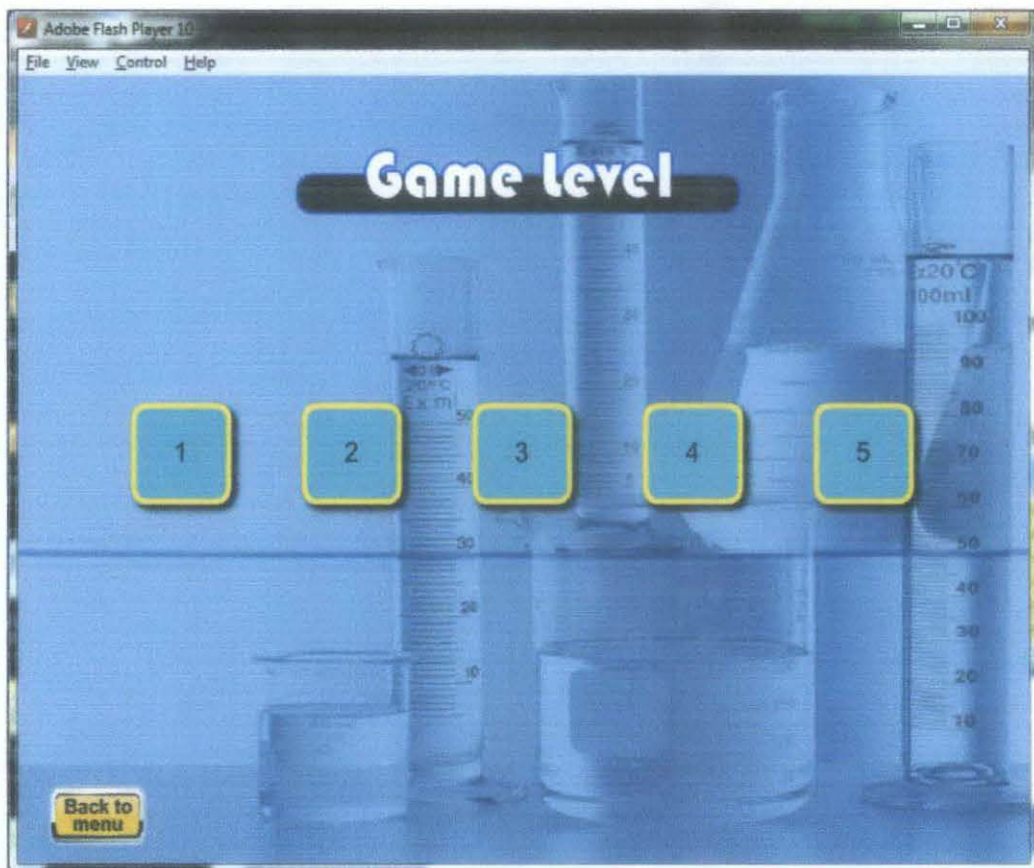


Figure 9: Courseware game level screen

In figure 9, the game level will available for selection. As for now, there are only five levels. The level design is random and do not have any specific difficulties.

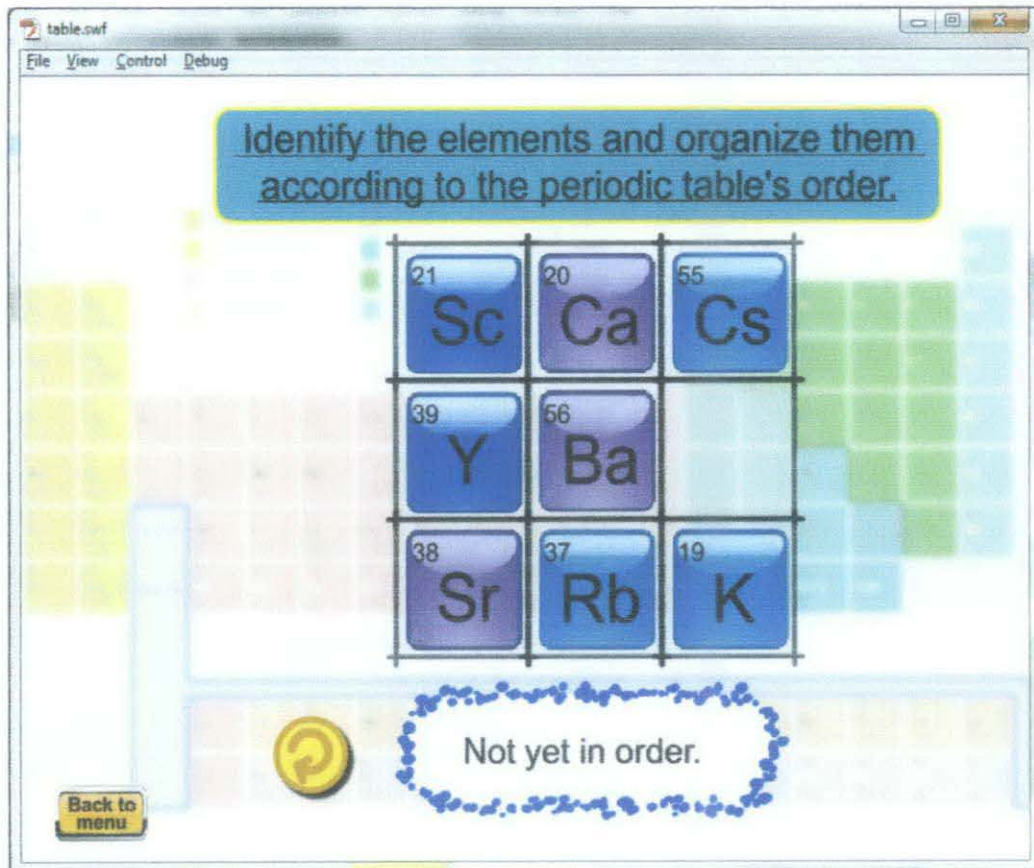


Figure 10: The slide picture puzzle screen (unsolved)

In figure 10, the game will start and users need to solve it according to periodic table.

The users can only click on the box that is next to the blank box. The box that is clicked will move to the blank box. The users will need to move the box in the correct order as in the periodic table.

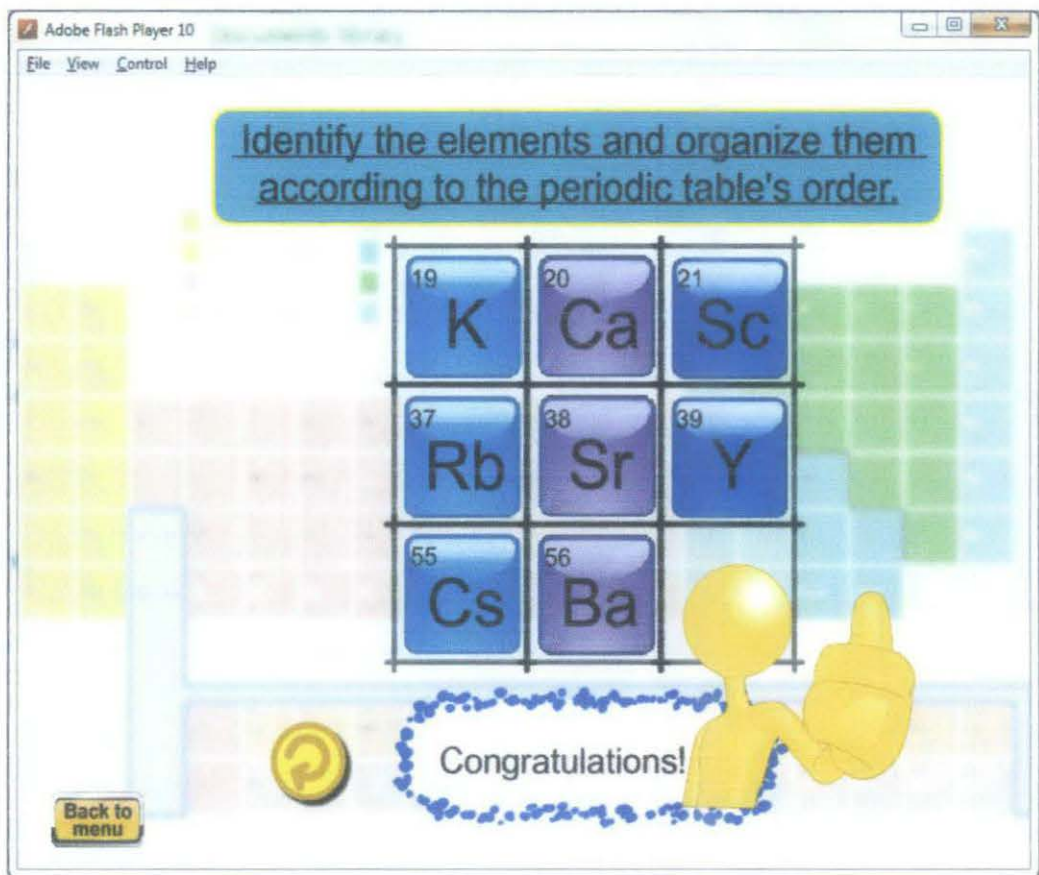


Figure 11: The slide picture puzzle screen (solved)

In figure 11, the game is solved.

CHAPTER 5

CONCLUSION AND RECOMMENDATION

Conclusion:

Applying courseware in chemistry periodic table is an effort to help the retention of the elements in the table. Information can be represented in animation to encourage users to keep learning. By using Throw-away prototyping methodologies, different styles of design can be explored and later the suitable one will be chosen.

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