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El Fuego: A Teachware on Fire Safety Awareness and Prevention

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Abstract: As the Republic Act 1945 or the "Amendment Fire Code of 2008" requires, the Bureau of Fire Protection conducts seminars and drills to raise awareness and to help prevent fire-related accidents in the Philippines. To conduct the seminar, the use of slideshow presentations are very limiting because the slides are non-interactive, and the presentation is quite linear. As such, it can be difficult to simulate and represent certain scenarios and processes. Thus, there was a need to come up with a teaching solution that would be more interactive and more adjustable.

The proponents decided to develop a teachware to be used by the instructors of the fire-safety seminar that would solve issues for instructors, issues such as non-interactiveness and linearity.

The teachware uses two instructional theories, the Cause and Effect and the Cognitive Flexibility Theory. For example, residential building fire scenarios are not able to be constructed physically, thus, some lessons in the teachware contain a scenario-based design that show a cause and effect event. As per the Cognitive Flexibility Theory, emphasis is placed upon the presentation of information from multiple perspectives and use of many case studies that present diverse examples. These were adapted to address the problem issues encountered by the instructors who conduct the seminar using more traditional means, such as slideshow presentations.

The main topics in the teachware are understanding fire, preventive measures through good housekeeping, and fire precautions and emergency plans. The content was designed by the Bureau of Fire Protection, organized by the proponents to maximize the teachware, applying the instructional theories. The teachware incorporated a mixture of videos, animation, images, text and interactive activities.

Key Words: teachware, fire safety, learning innovation

1. INTRODUCTION

Due to increasing number of fire incidents, the Bureau of Fire Protection, also known as the DILG Act of 1990, was created under the mandate of Rule 111, Section 49 of the Republic Act. The Bureau is responsible to conduct seminars and drills to raise awareness and to help prevent fire-related accidents in the Philippines. To ensure public safety and promote economic development through the prevention and suppression of all kinds of destructive fires, the Bureau fully implemented the RA 1945 or "Amendment Fire Code of 2008". With the establishment of the RA 1945, the Bureau is required to conduct seminars and drills to all private and public buildings, facilities or structures erected or constructed before and after its affectivity.

The Bureau conducts daily seminars to residential housings, government institutes, and private sectors, teaching all the owners, administrators or occupants of buildings, structures and their premises or facilities and other responsible persons within the premises. Each seminar is cut into two parts; The Learning Process and Actual Demonstration. The first part of the seminar is the longest and is most important, since it is where the important aspects of fire are thoroughly discussed with the attendees.

To conduct the seminar, the use of slideshow presentations are very limiting because the slides are non-interactive, and the presentation is quite linear. As such, it can be difficult to simulate and represent certain scenarios and processes. Thus, there was a need to come up with a teaching solution that would be more interactive and more adjustable.

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2. FRAMEWORK

The teachware will be categorizing each module to a more proper arrangement, which varies from understanding the concepts of fire to the preventive measures through good housekeeping and the precautions to be done when a fire occurs. In this framework, the flow of the teachware will not be sequential and linear as to what the current method is. In this way of delivery, the instructor will have the option of differentiating, comparing, and manipulating each topic more freely, thus making the seminar more of letting the learners have the essence of being fire safety aware instead of just giving them pure concepts.

The teachware will be utilizing two instructional theories, which are the Cause and Effect and the Cognitive Flexibility Theory.

The Cause and Effect concept refers to the concept of causality, from which events are the cause of another event. This concept will be used to teach the first module which is about Understanding Fire. This module consists of the scientific processes such as the Fire Triangle, Stages of Fire, Methods of Heat Transfer and the Classification of Fire. These topics are applicable to the concept of Cause and Effect because all of these processes have a cause or an event that has a corresponding consequence that led to another phenomenon or event. The cause and effect will be shown through animations in order for the instructor to be able to have an easier time teaching the topic. For example, a fire that was caused by a household appliance falls under a Class C fire. The cause of the fire was an appliance that was left unattended and short circuited thus leading to a fire that can be extinguished by a fire extinguisher and not simply by just using water.

Cognitive Flexibility Theory is a theory that allows the reconstruction of knowledge through many different ways. This theory is the basis and is used to teach all of the modules. For these modules, it includes different scenarios which can be manipulated wherein in these scenarios the objects can be moved and have multiple options to show different outcomes that may happen when an object is dragged to a certain location. In these options there is only one correct answer and if the wrong

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answer is given, then it will show why the answer is wrong. Once the right option is made, then it would proceed with the next scenario and this will continue until all the scenarios are finished. Let us take preventive measures and fire hazards inside the house as an example. In this example, there will be different settings such as kitchen, living room and the garage. In each of these settings there are different scenarios given. For example, if the kitchen setting is chosen, then the objective of the setting is for the instructor to teach the proper preventive measures in a kitchen situation. It is done by showing the what and where not to's in the kitchen. Fire prone objects such as liquid materials, lighters, cords, and metallic objects will be used as drag and drop objects by the instructor. The instructor would be using drag and drop to place the objects in its proper position. If an object is wrongly placed, then a new screen would pop up to show what is wrong and explain what needs to be done. For the fire precautions and emergency plans, Scenario Based Learning will also be used for the different topics. An example would be the fire escape plan; the instructor is given a fire scenario and there are choices in which the instructor can choose from. In these choices there would be a correct and wrong way of escaping fire. Cognitive Flexibility Theory is important for the teachware because the topics mostly use images and they are not able to express and teach fully the lesson. It needs to be recreated and reconstructed for the instructor to be able to teach the topic better. With these options, the instructor is able to teach the module in a more fun and effective manner.

Figure 2.1. Fire Prevention Sample Screen. Text, visuals, and animations are present in this screen, and the same goes for the sub topics screens. Draggable objects are also present. Once the instructor moves around an object to a place, a pop out screen will appear which will explain the proper place to put a certain object supported with the proper audio.

For example, on figure 2.1, a stove next to the LPG tank on the right is left on with the frying pan on it. During the seminar, the instructor will ask what are the potential fire hazards from the display. The longer it takes the audience to identify a hazard, the more it will show signs of danger, such as the frying pan emitting large amounts of smoke. This will continue until the pan is dragged away from the stove and put in its proper place and the stove turned off. This goes with other such fire hazards as overloaded or octopus sockets or open sources of fire left on. This is an example of scenario-based learning, and cause and effect.

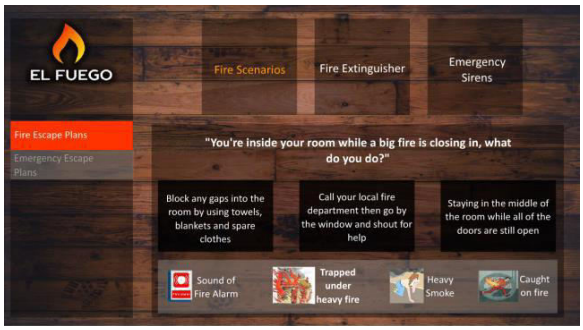

Figure 2.2 Fire Precaution Sample Screen. Text, visuals, animations, and videos are present in this screen, and the same goes for the sub topics screens. In this module, for the Fire Scenarios, there will be four scenarios given and the instructor can choose what scenario he would like to teach. After choosing a scenario, it will show the description or video of a scenario and a list of different solutions which could either be right or wrong. When the instructor clicks an answer, a popup screen will come out saying why this certain solution is right or wrong, supported with audio or video.

For example, in figure 2.2, the audience is asked what to do if they are inside their room with fire closing in. When a choice is selected, a video is displayed reenacting the choice and what would happen because of it. This is also an example of scenario-based learning, and cause and effect.

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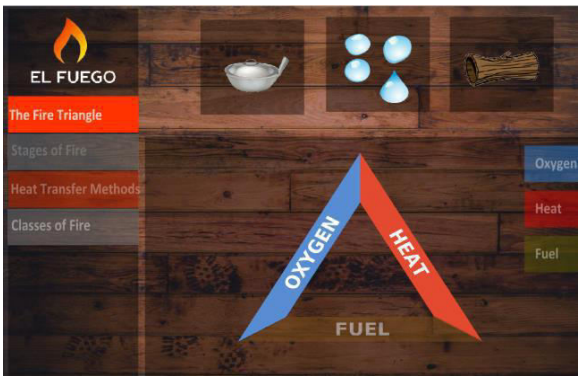

Figure 2.3 Understanding Fire Sample Screen. This screen is interactivate such that objects can be dragged into an appropriate area and a popup screen will appear explaining what happened.

For example, in figure 2.3, to emphasize the fire triangle, that is, the needed elements of fire, and to show how to stop a fire by eliminating one of the sides of the triangle, a cooking pan with a closed lid can be used to effectively knock out the oxygen side of the fire triangle, illustrating, for example, that if there is fire inside the cooking pan, covering it with the lid can help deprive the fire of its needed oxygen, thus helping it die out. The instructor can use this illustration while explaining the fire triangle and then asking the audience for examples on how to eliminate any and each of the sides of the fire triangle. This is also an example of scenario-based learning, and cause and effect.

When these various styles or methodologies of presenting information are combined, it is an example of the application of cognitive flexibility theory, that is, allowing learners to learn using various methodologies, and reinforcing previous learnings through different perspectives or presentations.

3. SCOPE AND LIMITATIONS

The teachware covers Fire Awareness and Safety among Residential areas such as family buildings (bungalow houses, two-story buildings), apartments, residential condominiums, and dormitories (particularly in Quezon City). These are areas wherein people are not transient, or people that live in one place. Commercial establishments such as hotels, motels, and malls will not be covered by the teachware due to limitations and because based on statistics, residential areas have a higher chance of setting fire than commercial buildings.

Topics include:

1. Understanding Fire
2. Fire prevention through Good Housekeeping
3. Fire precautions through fire emergency plans

4. TOPIC OUTLINE OF THE TEACHWARE

The topics were developed by the Bureau of Fire Protection, and organized by the proponents to their logical groupings, typically by the similarities in topics, and the similarities or differences of approaches to be used in the teachware.

Module 1: Understanding Fire

1) Definition of Fire
2) Stages of fire
    a. Incipient Stage
    b. Smoldering Stage
    c. Flame Stage
    d. Heat Stage
3) Classes of fire
    a. Class A Fires
    b. Class B Fires
    c. Class C Fires
    d. Class D Fires
4) Methods of Heat Transfer
    a. Direct Heat Transfer
    b. Heat Transfer by Radiation
    c. Heat Transfer by Conduction
    d. Heat Transfer by Convection

Module 2: Fire Prevention through Good Housekeeping

1) Preventing fire accidents in different areas of the house
    a. Kitchen Area
    b. House Rooms
    c. Garage / Storage Areas

2) Usage of Fire Alarms
    a. Automatic Fire Alarms
    b. Manual Fire Alarms

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Module 3: Fire Precautions

1) Fire Escape Plans

a. How to properly escape a fire depending on the scenario

b. Locating, Understanding and drawing out an effective emergency plan.

c. What to do when caught in fire

d. How to differ a fire-fighter siren from any other emergency sirens

1. Fire Truck Siren
2. Police Siren
3. Ambulance Siren

2) Fire Extinguisher Mechanics

a. Checklist for Fire Extinguisher maintenance

b. The different types of Fire Extinguishers

1. Dry Powder Fire Extinguisher
2. Foam Fire Extinguisher
3. Carbon Dioxide Fire Extinguisher
4. Water Fire Extinguisher

c. Proper procedure in using a Fire Extinguisher

1. P-A-S-S Method

5. EVALUATION AND RECOMMENDATIONS

After realizing 2D images are not enough, the teachware employed videos simulating the situations and lessons being described. Additional videos and animation would further improve the attractiveness and efficacy of the teachware.

The teachware was signed off and accepted by the client after presenting it to them. They agree that the teachware can address the issues they had when conducting the seminar without the tool.

6. REFERENCES

Jonassen, D., Ambruso, D . & Olesen, J. (1992). Designing hypertext on transfusion medicine using cognitive flexibility theory. Journal of Educational Multimedia and Hypermedia, 1(3), 309-322.

Spiro, R.J., Coulson, R.L., Feltovich, P.J., & Anderson, D. (1988). Cognitive flexibility theory: Advanced knowledge acquisition in ill-structured domains. In V. Patel (ed.), Proceedings of the 10th Annual Conference of the Cognitive Science Society. Hillsdale, NJ: Erlbaum.

Spiro, R.J., Feltovich, P.J., Jacobson, M.J., & Coulson, R.L. (1992). Cognitive flexibility, constructivism and hypertext: Random access instruction for advanced knowledge acquisition in ill-structured domains. In T. Duffy & D. Jonassen (Eds.), Constructivism and the Technology of Instruction. Hillsdale, NJ: Erlbaum.

Spiro, R.J. & Jehng, J. (1990). Cognitive flexibility and hypertext: Theory and technology for the non-linear and multidimensional traversal of complex subject matter. D. Nix & R. Spiro (eds.), Cognition, Education, and Multimedia. Hillsdale, NJ: Erlbaum.