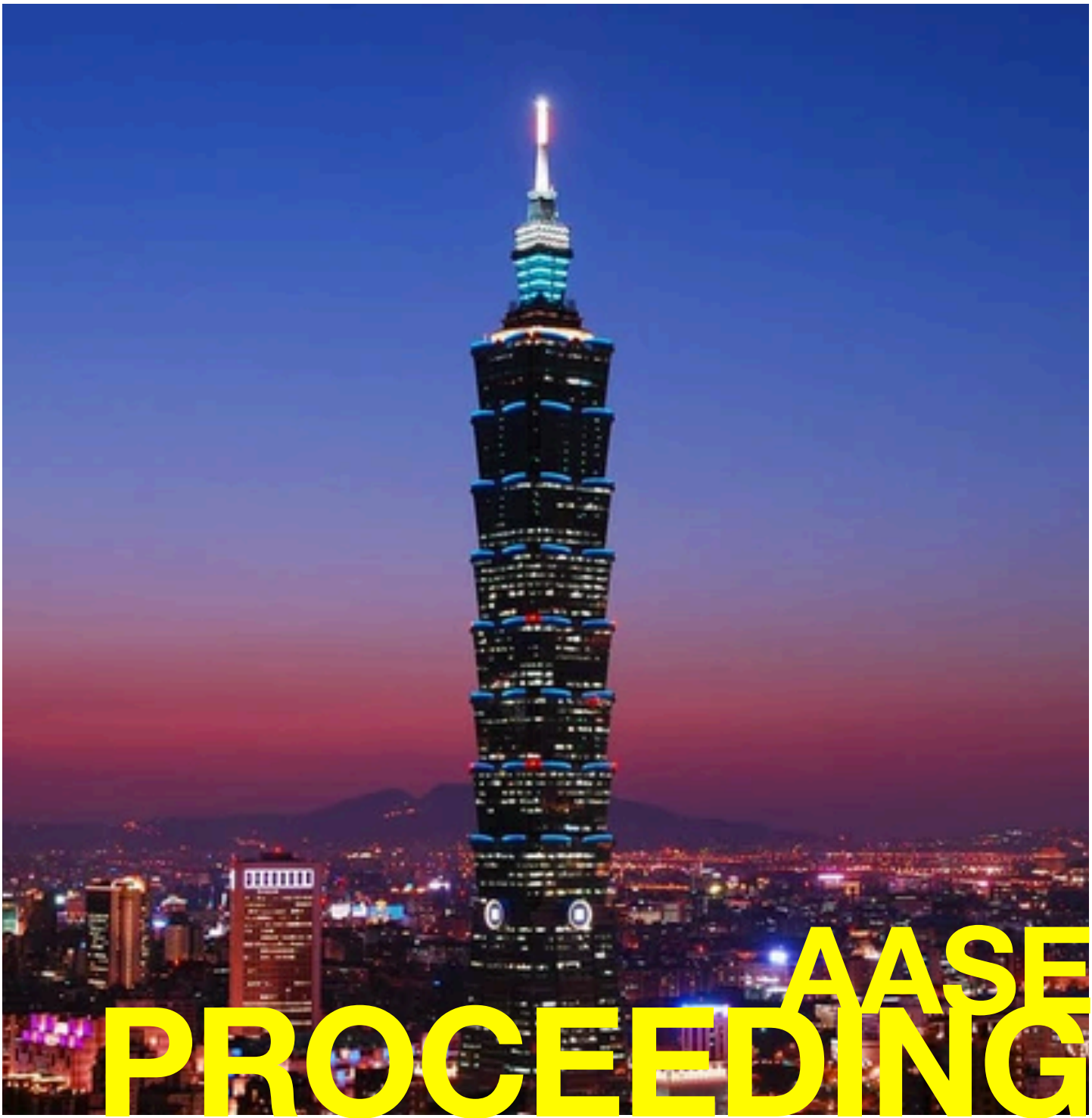

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PROCEEDINGS OF AASE INTERNATIONAL CONFERENCE

50th ETAS & 51th BESM Conference

Applied and Advanced Science Exchange (AASE)

Published by

ETAS/BESM Academic Press

International Conference on Engineering, Technology and Applied Science (ETAS)

- 50th ETAS @ Taipei/Taiwan, Mar. 24th-25th, 2020

International Conference on Business, Education, Social Science, and Management (BESM)

- 51th BESM @ Taipei/Taiwan, Mar. 24th-25th, 2020

Publication title: PROCEEDINGS OF AASE INTERNATIONAL CONFERENCE 50th ETAS & 51th BESM Conference
Edited by: Applied and Advanced Science Exchange (AASE)
Publisher: Association of Advanced Science Exchange
Telephone: +886-905-463-331
Website: https://www.aaseconference.org
Publication date: Apr. 2020 (First edition)
ISBN Code: Pilot Version

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EDITORIAL MESSAGE

It is my proud privilege to welcome you all to the AASE International Conference at Taipei/Taiwan on 24th-25th Mar, 2020. AASE International Conference serves as platform that aims to provide opportunity to the academicians and scholars from across various disciplines to discuss interdisciplinary innovations. We are happy to see the papers from all part of the world published in this proceedings. This proceeding brings out the various Research papers from diverse areas of science, engineering, technology, management, business and education. These articles that we received for these conferences are very promising and impactful. We believe these studies have the potential to address key challenges in various sub-domains of social sciences and applied sciences. I am really thankful to all the participants for being here with us to create an environment of knowledge sharing and learning. I am also thankful to our scientific and review committee for spending much of their time in reviewing the papers for these events. I am sure the contributions by the authors shall add value to the research community.

Editor-In-Chief
Dr. H. Miyamoto

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★★★

Extraction of Acemannan Polysaccharides Active Substance from Aloe Vera Flesh with Etanol Solvent

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Abstract

This study was conducted to extract Acemannan Polysaccharides from aloe vera flesh using ethanol solvents and obtain the optimum extraction temperature and deposition time of the extraction process. The process was carried out in batches and in a laboratory scale, with the principle of liquid solid extraction in a stirred glass beaker. The extraction temperatures were 25°, 30°, 35°, 40°, and 45° C and the deposition times were 10, 12, 14, 16, and 18 hours. Some other variables were: 50 cc aloe vera juice volume, 200 cc solvent volume with 96% ethanol concentration, 45 minutes stirring time, and 500 rpm stirring speed. The results obtained were: the largest sediment mass, which was 2.1967 gram, was obtained at extraction temperature of 45° C and deposition time of 18 hours. Based on the results of qualitative analysis, the highest acemannnan content was obtained at 14 hours of deposition with a stirring temperature of 40° C and with 515.18 mg/gram glucose content.

Keywords: Aloe vera, acemannan polysaccharides, active substance extraction

- *This research was presented on 50th International Conference on Engineering, Technology and Applied Science (ETAS-50): Taipei/Taiwan, March, 24th-25th, 2020*

1. Introduction

Aloe vera is a plant that is often used for its medicinal properties or as a raw material for making cosmetics, because this plant contains many substances that can be utilized. From the data obtained from Indonesian central statistical agency on horticulture, especially aloe vera collected some data regarding the availability of production of aloe vera plants and if all the data availability of aloe vera in Indonesia is accumulated, then a harvest area of 1,193,035 m^2 is obtained with a total production of 15,191,612 kg obtained an average yield of 12.73 (kg/m^2). Based on the availability of abundant aloe vera plants that exist in the country of Indonesia and if associated with their utilization these plants are still considered quite low, therefore it is necessary to have a form of effort to study and use of each part contained in this tanman so that the availability of aloe vera is this overflow can be optimized well. In addition, according to Das, Mishra, Gill, et al. [1], Aloe Vera is efficacious as an anti-inflammatory, anti-fungal, anti-bacterial and helps the process of cell regeneration. In addition to reducing blood sugar levels for diabetics, controlling blood pressure, stimulating the body's immunity against cancer, and can be used as a nutritional support for cancer, people with HIV/AIDS.

Aloe vera contains all kinds of vitamins except vitamin D, minerals needed for enzyme function, saponins that function as anti-microbial and 20 of 22 types of amino acids. From Aloe vera there is a compound called Ancemanan / Acemannan is a complex polysaccharide found in the inner leaf gel of the Aloe vera plant, which is produced by special cells called leucoplasts. Acemannan polysaccharides consist of manosa, glucose, and galactose monomers. Mono saccharide composition estimates of acemannan are 31 β (1,4) -linked mannoes, 1β (1,4) -linked glucose, and 1 α (1-6) -linked galactose. Acemannan is produced as a long polymer with an average molecular weight greater than 5 million Dalton (Da), because acemannan is dominated by ship molecules with little or no branching so it can be considered a flexible material [2].

Broadly speaking, these antioxidants include carbohydrates, fats, minerals, phytoestrogens, proteins, and vitamins needed to maintain nutritional balance in the human body. Acemannan is efficiently used by the body for energy production or put into a mannose pool to maintain a healthy structure and function of key body components. Acemannan has also been aimed at activating macrophages and causing many functions including recognition of foreign antigens (viruses, bacteria, and cancer) capturing and removing them and healing wounds. Acemannan can act through an indirect mechanism by activating local macrophages and stimulating an immune response to cancer and induction of cytokine anticancer such as Tumor Necrosis Factor α [3]. Based on research conducted by Kusmawati [4], "Pengambilan Polisakarida Acemannan dari Aloe vera menggunakan Etanol sebagai Pengendap", by using the independent variable handling time Aloe vera picking with stirring operating

temperatures obtained acemannan polysaccharide yields as much as 0.5 grams, while for the free variable temperature settling stirring operations obtained acemannan weighing 0.11 grams.

Based on research conducted by Istianah [5], "Isolasi Mannan dari Daun Lidah Buaya (Aloe Vera) dengan Proses Ekstraksi sebagai Bahan Dasar Pembuatan Edible Coating Berbasis Polisakarida", by using independent variables namely extraction time yielded yields of mannan content (0.3265; 0.4255; 0.453; 0.4835) gr, while the yield of Mannan precipitate produced is (1,763; 1.7695; 1.9605; 2,116) gr, while for the independent variable the ratio of aquadest: filtrate aloe vera weight ratio is obtained by the ratio of solvent: Aloe vera 2: 1, 3: 1. In the comparison of solvent: Aloe verra 4: 1 yield obtained 2,119 gr and 0.6015 gr, while in the ratio of solvent: Aloe vera 5: 1 yield yielded 1,818 gr and 0.4435.

Aloe Vera extraction was also carried out by Padmadisastra [6], Aloe Vera extract produced in the study was used as a health drink formula by adding flavor and aroma. At this time not many people have done research on the extraction of Aloe vera that uses parts of other aloe vera so that not much information and data can be taken and utilized.

The purpose of this study is the processing of Aloe vera by using an extraction process to obtain precipitates in the form of acemannan polysaccharides contained in Aloe vera plants. Therefore, to obtain better results than previous studies, in this study using the settling time and using stirring temperature variations with using 96% Ethanol solvent which is used as a polysaccharide solvent as an independent variable.

2. Research Methodology

Our experiment conditions and variables can be seen in Table 1 and our extraction tool can be seen in Figure 1. The raw material used in this study was Aloe vera meat obtained from Aloe vera plants from the Faculty of Agriculture of UPN "Veteran" East Java. In addition there are several other materials used in this study, namely Ethanol 96% as a precipitant of polysaccharides from the Chemical Store and Aquadest as an Aloe vera washing solution obtained from the Laboratory of Chemical Engineering UPN "Veterans" East Java.

Table 1: Experiment conditions and variables.

No.	Variables/conditions	Unit	Value
1	Stirring temperature	°C	25, 30, 35, 40, 45
2	Deposition time	hour	10, 12, 14, 16, 18
3	Aloe vera juice volume	cc	50
4	Ethanol volume	cc	200
5	Stirring time	minute	45
6	Ethanol concentration	%	96

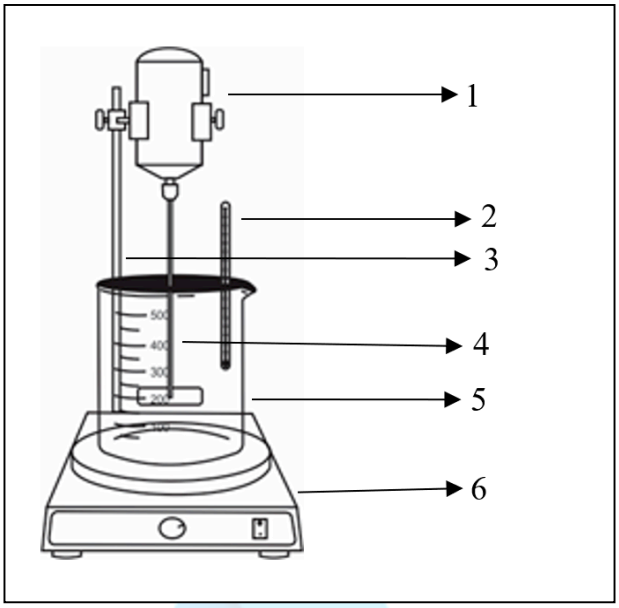

Figure 1: Our extraction tool. The parts are: (1) motor, (2) thermometer, (3) statif, (4) stir, (5) beaker glass, and (6) electric heater.

After Aloe vera is harvested, the stem of the plant is immediately washed using a solution of Aquadest. The stem was then peeled and its flesh was taken and cut into small pieces, which were then put in a juicer. The Aloe vera juice obtained is taken and then added with 96% ethanol in a ratio of 1: 4, in this 50 cc of Aloe vera juice is added with 200 cc of 96% ethanol. The mixture of Aloe vera juice and ethanol is stirred for 45 minutes at a variable temperature of 25; 30; 35; 40; 45 0C was then allowed to settle for 10, 12,14, 16, and 18 hours.

3. Results and Discussions

Aloe vera first underwent an extraction process with various temperature variations at the time of stirring ie 25, 30, 35, 40, and 45 oC and continued with the process of settling, filtering, and drying.

From Figure 1 it can be seen that the stirring temperature and the deposition time are very influential in the extraction process of Aloe vera. This can be shown that the higher the extraction temperature, the more acemannan polysaccharide weight is obtained, and the longer the deposition time the more or more little by little the polysaccharide deposits. The most sediment yield was obtained at the extraction temperature of 45 oC, with a deposition time of 18 hours, namely 2.1967 grams. From the data obtained this can happen because the higher the temperature, the more diffusion of mass will increase so that the transfer of solutes to the solvent also increases mass diffusion [7].

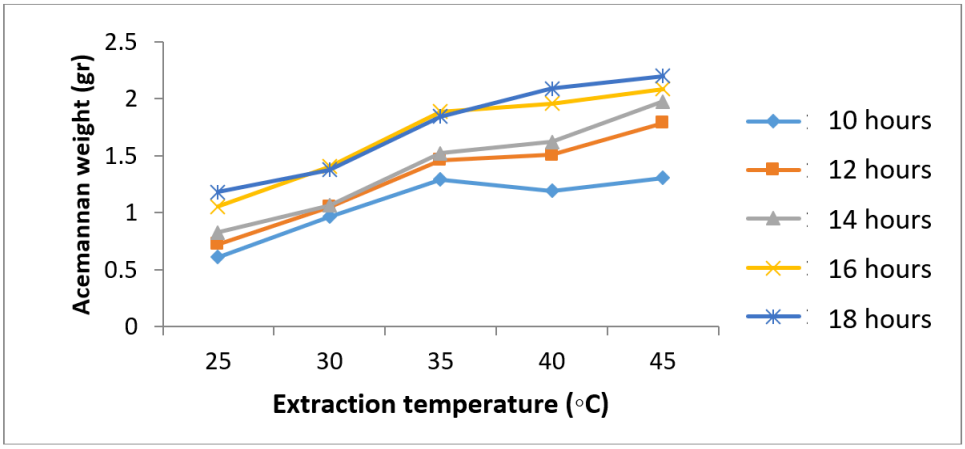

Figure 1: Effects of extraction time and deposition temperature to the weight of acemannan.

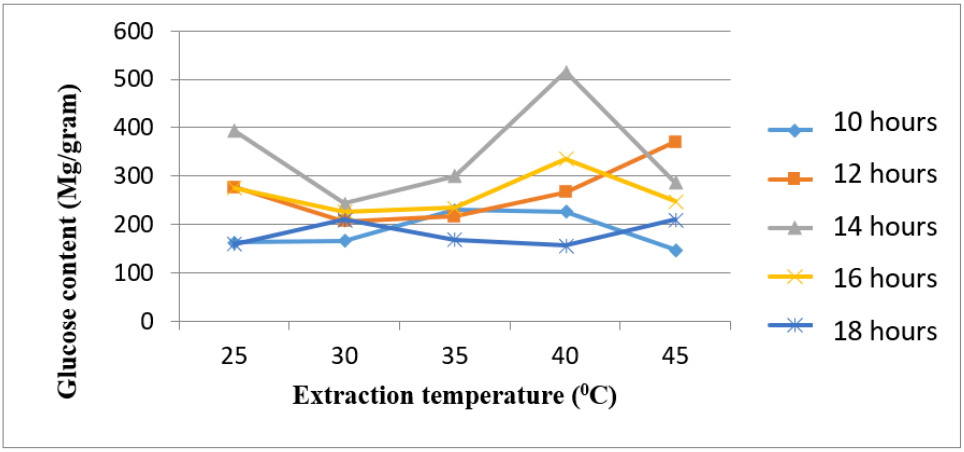

Figure 2: Effects of extraction time and deposition temperature to glucose content of acemannan.

From Figure 1 it can be seen that the longer the deposition time the greater the weight of the acemannan, but from the data in Figure 2 the greatest acemannan content from the deposition of 10-18 hours is 14 hours. The 14 hour deposition time is the maximum point of the polysaccharides forming the acemannan polysaccharide bonds and the glucose levels contained in the acemannan polysaccharides are highest when the stirring temperature of 40 0C is 515.18 Mg / gram. After 14 hours, it turns out that the acemannan polysaccharide levels decreased slightly, this could be due to the polysaccharides being depleted or damaged due to too long deposition time [4]. The damage of the polisa-carida is caused by the decomposition of substances present in the acemannan that occurs when the deposition time is too long.

As a comparison from the results of previous studies by Kusmawati and Pratiwi [4], with a variable extraction time of 10 minutes and settling for 10 hours obtained the most acemannan polysaccharides 0.11 grams. With our variable extraction temperature and deposition time, we got the best results of acemannan polysaccharide precipitate at 18 hours

deposition time with a temperature of 45 oC as much as 2.1967 grams. And with the results of Nelson Somogyi's qualitative analysis, the best acemannan levels were obtained at the time of deposition of 14 hours with a stirring temperature of 40 0C as much as 515.18 Mg / gram.

4. Conclusions

The most sediment yield was obtained when the extraction temperature was 45 oC with 18 hours of deposition time, which was 2.1967 grams. Based on the results of quantitative analysis, the highest glucose content in the Acemannnan was obtained at 14 hours of precipitation and at a stirring temperature of 40 oC, which was 515.18 mg / gram.

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Design and Analysis of Context-Agnostic Educational Games under Mechanics Dynamics Aesthetics Framework

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Abstract

The use of games for serious purposes, including education, has been increasing steadily. Different subjects are commonly accommodated by different educational games with varying gameplay contents, and this is not very efficient with regards to development cost. A way to keep the development cost low is to employ a context-agnostic approach, which results in educational games capable of flexibly presenting any educational content to the player. In this research, we aimed to understand how to develop a context-agnostic educational game through the lens of Mechanics Dynamics Aesthetics (MDA) framework. We analyzed the game's game content and educational content and the way their components would interact across the three layers of the MDA framework. We then demonstrated the components and their interactions through a proof-of-concept educational platformer game. Our results uncover some principles in developing the game effectively.

Keywords: Educational games, serious games, context-agnostic, MDA framework.

- *This research was presented on 50th International Conference on Engineering, Technology and Applied Science (ETAS-50): Taipei/Taiwan, March, 24th-25th, 2020*

1. Introduction

Digital games have become an inseparable part of modern society. Starting its relatively short history as a medium for pure, unadulterated entertainment, it has not only reaped record-breaking profits [1] but also influenced the global culture [2]. Games have also found their way into more serious contexts, thanks to its ability in inducing a deep emotional state called "Flow" [3]. Education [4], skill training [5], marketing [6], and other fields have begun to improve and enrich their activities with games. The future looks bright for serious game industry as its market expands steadily [7].

One of the most popular types of serious games is educational games. The games are used to deliver educational content, whether alongside lectures and other activities in a class or as a substitute for the class itself. Even though their acceptance by educational institutions is rising, there are still problems hampering their progress. One of the most pressing is the cost of development [8], which has been plaguing the game industry as a whole [9]. As content contributes to the cost significantly, methods to ease and speed up content production need to be researched and implemented.

In this paper, we present our research on how to develop an educational game while minimizing cost. We began our research by reviewing the literature on serious and educational games. Reflecting on the review, we set out to analyze the components of a context-agnostic educational game. We performed the analysis under Mechanics Dynamics Aesthetics (MDA) framework, and we later developed a proof-of-concept game to demonstrate the components.

2. Literature Review

2.1 Game Content and Educational Content

Unlike games for pure entertainment, an educational game is composed of not only game content but also educational content. The interplay between the two types of content has been studied extensively, resulting in guidelines and models. Arnab et al. [10] proposed the Learning Mechanics-Game Mechanics (LM-GM) model, which lists a large number of game mechanics and educational or learning mechanics and provides a guideline to connect them. The model was intended as an improvement over older ones such as the Game Object Model [11]. LM-GM model was refined further into LMGM-SDT framework [12] with the incorporation of self-determination theory (SDT). Meanwhile, Carvalho et al. [13] expanded LM-GM model in a different direction by incorporating instructional components, resulting in the Activity Theory-based Model of Serious Games (ATMSG).

2.2 Development Efficiency and Context-Agnostic Approach

The matter of efficient architectures for serious and educational games has been of considerable importance. Carmosino et al. proposed a game engine plug-in approach for games that utilize investigation mechanics [14]. Stavrev, Terzieva, and Golev proposed a modular architecture for serious games that accepts user inputs from multiple sources [15]. Van Der Vegt et al. developed RAGE Architecture to accommodate component reuse among serious games [16]. Carvalho et al. took elements of the ATMSG model and implemented them as components of a service-oriented architecture (SOA) framework for educational games [17].

In this research, we approached development efficiency from the point-of-view of the duality of game content and educational content. Creating educational content often involves cooperations between the game developer and the experts of the content's subject or educational topic [18]. The developer must then connect the content to appropriate game content and present both contents as a single game package to the player. The whole process may require a lot of resources, especially if different educational contents have different and non-interchangeable gameplay requirements.

Several approaches exist in educational games literature to minimize the cost of preparing and connecting the contents. Ku et al. [19] described loose coupling, instead of tight coupling, between game content and educational content, where both contents are only partially connected. This approach, defined as context-agnostic by Baron, Heath, and Amresh [20], reduces the burden of content preparation and allows for a higher degree of educational content interchangeability. In a similar vein, Rosyid, Palmerlee, and Chen [18] proposed a development framework that employed generic, instead of tailor-made, gameplay mechanics and annotated learning materials that could be deployed automatically.

So far, we can say that the field of educational games has started to acknowledge the context-agnostic approach. However, the mechanism and structural details of the games have not been thoroughly studied, especially in a more formal manner. We identified it as a research gap, which we intended to fill with this research.

2.3 Mechanics Dynamics Aesthetics Framework

MDA framework [21] has been very influential among game developers and game researchers. The framework describes a game as composed of three causally-linked layers: mechanics, dynamics, and aesthetics. The layer of mechanics consists of basic building blocks of the game: game rules, game elements, and possibly others. How the building blocks are arranged in the game world, both spatially and temporally, and interact with each other and the player constitutes the dynamics layer. Lastly, the spatial and temporal dynamics of the game influence, and are influenced by, the aesthetics layer, which defines the player's experience and emotional responses during the game.

As a robust way to formalize the design and analysis of games, the MDA framework has been acknowledged in the field of serious games. Based on the framework, Xu, Buhalis, and Weber identified game design elements of serious games for tourism [22]. Arnab and Clarke [23] incorporated the framework, alongside Intervention Mapping and other methods, in a trans-disciplinary methodology to develop educational games. On the other hand, incorrect usages of the MDA framework may be found here and there in the serious game field. Deterding [24] mentioned several of such usages and warned against ignoring the causality between MDA layers.

3. Research Methodology

Under the MDA framework, we conducted our analysis of a context-agnostic educational game in three steps. First, we identified the components of the game's game content and educational content across the mechanics, dynamics, and aesthetics layers. Second, we uncovered several connections between the components that were required by the context-agnostic attribute. Third, we analyzed the matter of replacing the game's educational content and how to minimize the impact of the replacement on the game's components.

3.1 Mechanics, Dynamics, and Aesthetics Components

We dissected a context-agnostic educational game into components that belong to the three layers of the MDA framework. Figure 1 shows the resulting 14 components, which are split between game components and educational components. To simplify our analysis and design, we defined the educational components as the counterparts of the game components. We based the game components on design elements in Salazar et al.'s game design document (GDD) format, which was itself based on the MDA framework [25][26]. The GDD format's design principle is actually not identical to that of the framework, because it incorporates the game's audio-visual aspects (sprites, sound effects, and others) into the aesthetics layer. However, we see the difference as minor and harmless, because a game's audio-visual aspects are often seen as being a part of, or enhancing, the player's experience.

The first component in the mechanics layer defines game elements (GEs) and their behaviors: the player character, enemies, weapons, etc. The component's counterpart, educational content elements, defines educational elements (EEs) and educational logics (ELs). EEs are the "atoms," the smallest building blocks of the knowledge in the educational content. For example, the EEs of content on the subject of chemistry may be various chemical elements, which the player must compose into molecules. An EL will then defines the rule for a specific molecule, e.g., a sulfuric acid molecule is composed of two hydrogen atoms, one sulfur atom, and four oxygen atoms with a specific structure.

The 3rd component defines the rules that govern the interactions between GEs; e.g.,

whether the bodies of the enemies harm the player character, as commonly seen in classic 2D games. The fourth component, educational content interaction rules, specifies the way the player interacts with the educational content, i.e., their steps in the learning process. For example, the component may require the player to gather and input EEs sequentially (e.g., into an array), and the game will then check if the EE arrangement follows a certain EL.

The dynamics layer contains six other components. Component 5, game flow, defines the flow of the gameplay, especially at the macro level. Its counterpart, educational content flow, defines the flow of the educational content throughout the game. The flow is composed of educational materials (EMs), each of which presents a piece of knowledge (represented by EEs and ELs) related to the educational content. For example, an EM of content on chemistry may teach, or test, the player about the molecular structure of sulfuric acid. The EM may present not only the correct EEs (the seven atoms that make up the structure) but also the wrong EEs, as a way to test the player's comprehension.

If the game's "macro-flow" is composed of smaller parts (most commonly levels), the parts are defined in component 7, game levels, alongside the GEs that make up the parts. Component 8, on the other hand, defines the details of each EM: its EE composition, whether there is an instructional text, and others. Meanwhile, game interfaces defines the interaction channels between the player and the game, i.e., control schemes and UIs, with educational content interfaces as the component's educational counterpart.

In the aesthetics layer, component 11 (audio-visual aspects of the game) and component 12 (audio-visual aspects of the educational content) define sprites, sound effects, music tracks, and other visual and auditory elements of the game content and the educational content, respectively. The last two components, feel of the game and feel of the educational content, defines the player's emotional experience during the game and the learning process.

3.2 Connections between Game Components and Educational Components

In Figure 1, a bidirectional arrow represents a connection between a pair of a game and an educational component. The connection means that the members of the pair influence each other. On paper, one may simply use the complete set of connections, i.e., one simply connects every game component to its educational counterpart. However, as our literature review showed, not all connections are required for the context-agnostic attribute. Here we take one example of an appropriate connection pattern from the literature and discuss it briefly.

Figure 2 shows Chem Dungeon by Rosyid, Palmerlee, and Chen [18], a dungeon crawler game for teaching the subject of chemistry. Each blue pickable item object contains a specific chemical element, and the player must gather the correct items to form chemical compounds. The items behave the same way: they are stationary and the player collects them by colliding

their character with them. The behaviors do not take the EEs into account; we could change the subject to math and the chemical elements to numbers without changing the items' behaviors. Therefore, there is no connection between component 1 and component 2 of the game.

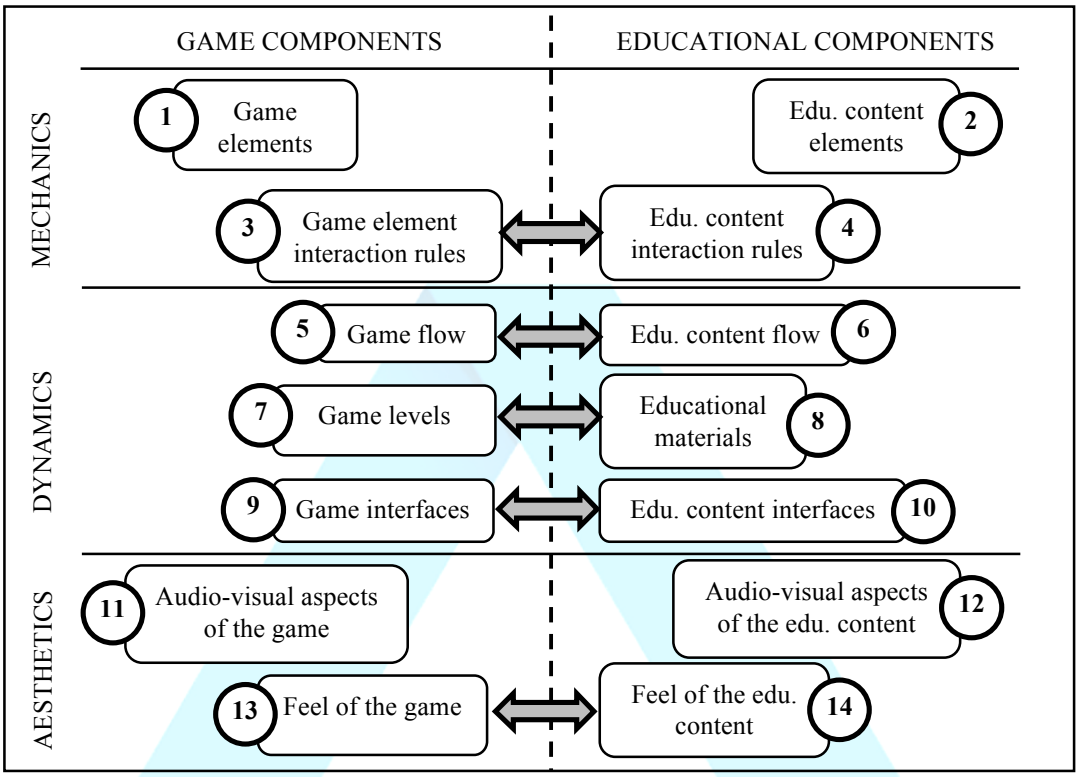

Figure 1: Components of mechanics, dynamics, and aesthetics of a context-agnostic educational game.

Meanwhile, we see that all pickable items are represented by identical blue sprites and the symbols of the chemical elements are merely superimposed on the sprites. It means that there is also no connection between component 11 and component 12, as the looks of the EEs do not influence those of the GEs.

The way the game connects educational content to game content is mainly through the dynamics layer. The game assigns a chemical element (an EE) to every pickable item (a GE) in the current level, which means that component 7 and component 8 of the game are connected. The assignment must obey constraints related to the level's spatial design, or else the level may become unwinnable. Meanwhile, the game also needs to connect component 5 to component 6, because the player's learning achievement in the current level may influence the flow of the game (e.g., the next level may need to be easier or harder). On the matter of interfaces, the gameplay and the learning process are shown on the same screen and their display elements are intertwined somewhat. The way the player controls their character also becomes their way to interact with the educational content. We can, therefore, conclude that there is a connection between component 9 and component 10.

A relatively minor, yet important, connection can be found in the mechanics layer, between component 3 and component 4. The game has to bridge the gameplay with the learning process; i.e., what can the player do to the GEs to manipulate the EEs? In the case of *Chem Dungeon*, an interaction rule states that whenever the player collects an item, they automatically gain the chemical element assigned to it. Meanwhile, the last connection is between component 13 and component 14 in the aesthetics layer. As the gameplay and the learning process take place simultaneously, their feels influence each other and the player may even experience them as one thing.

The MDA connection pattern in *Chem Dungeon* is also found in the works of Papastergiou [27], Beserra et al. [28], and Garneli et al. [29]. Of commercial games, *Toon Math* [30] and *Mathmateer* [31] are two examples that implement the pattern.

3.3 Analysis of Context-Agnostic Modification of Educational Content

Based on the MDA connection pattern, we analyzed how a context-agnostic game replaces its educational content with new content. The typical flow of the replacement begins from component 2 by replacing the EEs and the ELs. The replacement is a straightforward task if component 2 is sufficiently modular. To speed up the process, the developer may prepare templates beforehand for the component, to accommodate different types of ELs (linear, tree-like, and others).

Changing component 2 may or may not require changing component 4. Unless the new and the old educational contents differ significantly in the characteristics of their ELs, the player may still be able to interact with the new content in the same way. For example, contents on arithmetic operations and grammars may both require the player to compose their EEs sequentially; hence, storing the EE composition in an array will be sufficient. On the other hand, due to its higher degree of non-linearity, content on molecular structures may need a different component 4, e.g., one that uses a tree to store the content's EE composition.

Figure 2: A screenshot of *Chem Dungeon*, a game-based tool for teaching chemical compounds [18].

Meanwhile, changes to component 3 closely follow those to component 4. For example, interaction rules that allow the player to eliminate enemies to input the content's EEs and pick special items to delete previously inputted EEs will accommodate any educational content with linear ELs. On the other hand, new interaction rules, e.g., "activate object x to switch child node in the player's EE structure," may need to be added to component 3 to accommodate branching in the content on molecular structures.

In line with the MDA connection pattern, the highest workload for the content replacement process may occur in the dynamics layer. Fortunately, it is also possible for the components in the layer to stay as they were. Even if the old and the new educational contents have different EEs and ELs, their macro-flows may share similarities, e.g., if the EMs of the contents are presented in order of difficulty. If the difficulty levels of the EMs (or the ELs, as the building blocks of the EMs) have been specified beforehand (as what Rosyid, Palmerlee, and Chen proposed [18]), the ordering of the EMs can be automated. Therefore, it will not be necessary to modify component 6 to accommodate the new educational content.

The same principle of automation is applicable to component 7 and component 8. The developer may build component 8 with the ability to generate EMs automatically. The generation procedure may take the EEs and ELs from component 2, and possibly additional instructions as well, as inputs. Meanwhile, the assignment of EEs to GEs in a level typically obeys several constraints, such as the number of the elements (assuming a one-to-one relationship, the EEs must not outnumber the GEs), the reachability of the correct EEs (the player must be able to gather all of the EEs in the correct order, without getting obstructed by enemies or other objects), and others. By utilizing procedural content generation (PCG) [32], component 7 can automatically generate valid levels for any EEs and ELs.

With generic UI templates, component 9 and component 10 can easily accommodate the display needs of the new educational content. The templates should show basic relevant information, e.g., the name of the subject, the current EM, and the player's progress. The templates also need to accommodate different educational purposes; for example, EMs for testing students' comprehension (e.g., for quizzes) may need different UIs than those for building comprehension.

Meanwhile, a game's control scheme typically accommodates the game's mechanics. As modifying the educational content does not entail modifications to GEs, the behaviors of the player character will be unchanged; therefore, the way to control the character will also stay the same. On the other hand, changes to component 4 may result in new interactions between the player and the new educational content, e.g., selecting a child node and going back to a parent node, if the new ELs are tree-like. New controls may be added to the control scheme to facilitate the new interactions. However, the addition may be omitted if the interactions are already facilitated by component 3, i.e. if the interactions are set to happen through interactions between GEs (e.g., our previous example, "activate object x to switch child node...").

In the aesthetics layer, modifying component 12 to change the pictures, texts, sounds, and other audio-visual aspects of the educational content is straightforward. Conversely, care should be exercised when modifying component 14 (and, subsequently, component 13), as changes to the player's emotional experience may affect everything in the dynamics and mechanics layers. To ease the modification, we advise that the developer employ an aesthetic model for component 14, e.g., the one proposed by Arnab and Clarke [23].

3.4 Design of the Proof-of-Concept Game

For the proof-of-concept game, we developed a 2D educational platformer game. We based the gameplay on classic titles such as *Super Mario Bros*. The player traverses several levels, each presenting an EM of a subject. The player eliminates enemies and collects coins and treasure chests to gather EEs. They may quit the level anytime by touching a white flag at the end of the level. The game will then proceed to a level result screen, where the game evaluates the player's EE arrangement in the previous level. If the end of the game has not been reached, the next level will be presented afterward with a new EM.

Of the established object types of a classic platformer game [33], we employed five for the GEs in the game's component 1: the player's character, obstacles, collectible items, platforms, and triggers. The white flag is the sole trigger object in a level. Meanwhile, the game's component 2 takes any educational content with linear EE arrangements for the ELs.

The game's component 3 contains standard interaction rules of a platformer game. It also defines how the player inputs EEs: eliminating enemies and collecting items. An array in

component 4 receives inputted EEs, which will be compared to the ELs in component 2.

The educational content's macro-flow, as controlled by component 6, arranges EMs sequentially in order of difficulty. The details of each EM, including its difficulty level, are defined manually and the EM presents exactly one EL. EMs are split between type 1, which builds the player's comprehension, and type 2, which tests the comprehension. For the game content's macro-flow, component 5 presents sequentially-arranged levels, each containing one EM.

Meanwhile, the game's component 7 implements a simple template-based PCG for the levels, akin to that of *Spelunky* [34]. To generate a playable level, the PCG method first reads the EEs as prepared by component 8. The method then composes pre-defined level chunks into a whole level with two goals: (1) ensuring there is an unobstructed path connecting the enemies and items which host the correct EEs, and (2) making the path as long and unpredictable as possible. The composition may have to be repeated, up to a number of iterations, before both goals are achieved. There is also a maximum number of EEs in a level, and component 6 will not use any EM with more EEs than the number.

For component 9 and component 10, we utilized two UI templates for the two types of EMs. On the other hand, the control scheme during the gameplay is the same for both types of EMs.

The game's component 11 contains every audio-visual assets of the game. As the game shows only textual information on the educational content, the game's component 12 is not utilized. For the game's component 13 and 14, we employed Arnab and Clarke's aesthetic model [23]. We set the player experience as "challenge" and "discovery," as the game can be used to teach and test the player. The aesthetic design mainly influences component 8, resulting in type 1 and type 2 EMs as mentioned, and component 7, resulting in procedural generation of levels and assignment of EEs to GEs that are directed toward encouraging exploration and presenting spatial challenges.

4. Results and Discussions

Figure 3 shows two gameplay screenshots of our game. We tested the game to present educational contents on chemistry and English grammar. As seen in Figure 3, the names or symbols of EEs are put above collectible items and enemies. It may create a display problem if the names or symbols are quite long, as they may overlap with each other. Potential UI problems related to length differences between UI texts of different educational contents also need to be anticipated.

The game reads EEs, ELs, and EMs from text files. The content on chemistry teaches molecular structures to the player with various chemical element atoms as its EEs, whereas the content on English grammar has nouns and verbs as its EEs. We decided to use linear ELs

for the content on chemistry, e.g., a sulfuric acid molecule is represented by an "HHSOOOO" string. There is only one correct answer to a molecular structure EM, whereas an English grammar EM can accept any combination of words that forms a proper sentence. The "discovery" aesthetic is stronger during the English grammar EMs, as the player may try and discover different word combinations for the subject, verb, and object of a sentence.

Depending on the EMs, the simple template-based PCG may sometimes generate a suboptimal level. In such a level, the player may find it hard, or even impossible, to get from one correct EE to another without getting obstructed by unwanted enemies and items. We compensated for this by modifying the game in two ways. First, we excluded lives and health from the player character's mechanics, effectively making the player character unkillable. The exclusion allows the player character to move safely past enemies with the wrong EEs. It does not mean that the modified gameplay is devoid of challenges, as each level has a time limit and getting attacked by the enemies slows the player's progress. Second, we set the rule for item collection to requiring the player to press a button, instead of happening automatically (as is the standard in 2D platformer games) when the player character collides with the item. With the new rule, it is possible for the player to avoid collecting the wrong items.

The flaw of the PCG also preventing the game from fully realizing the aesthetic design. As previously stated, "challenge" and "discovery" rely on EE distributions that encourage or require exploration and quick thinking. With our simple PCG method, some EEs may sometimes be positioned too close to each other in the correct order, allowing the player to win the level with less effort than expected. Likely, the problem may only be solved by utilizing a more robust PCG method.

5. Conclusions

We have analyzed a context-agnostic educational game through the lens of the MDA framework. We have dissected the game into 14 components in the mechanics, dynamics, and aesthetics layers of the MDA framework and connects several pairs of the components according to a proper connection pattern. We have also analyzed the matter of replacing the game's educational content with new content while minimizing the changes to the game's components. We have demonstrated the components and their connection pattern through a proof-of-concept educational platformer game, to show their strengths and several potential problems that may hinder their implementations.

The next steps for the MDA components and connection pattern are, at least, threefold. First, it is worth investigating the system architecture to support the MDA components and their connections. Second, applications of the components and connection pattern in real scenarios are also worth to be studied in detail. Third, the analysis and design of the

components may be expanded by applying various game genres and incorporating GameFlow [35], ATMSG, and other relevant models.

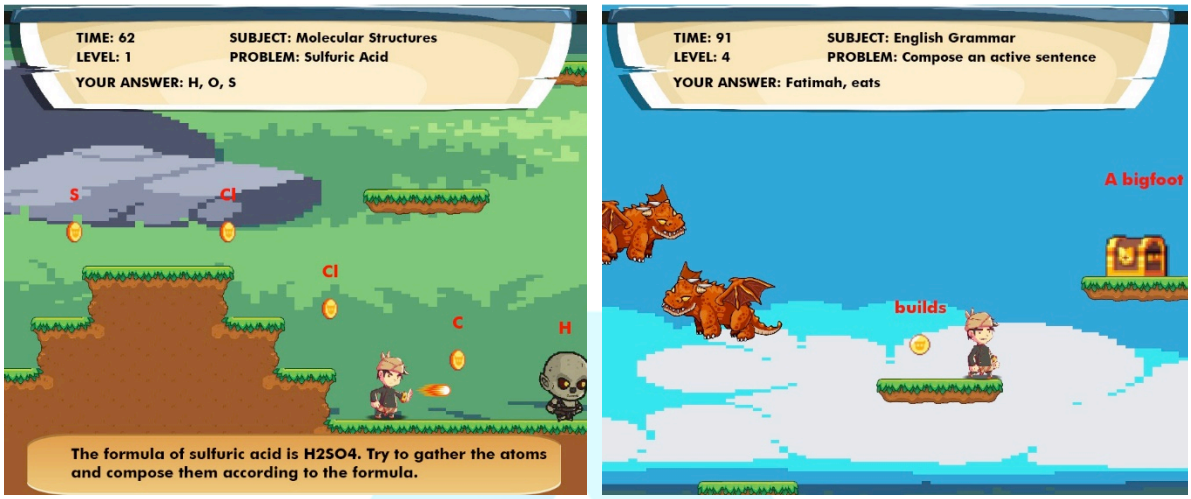

Figure 3: Screenshots of the gameplay of the proof-of-concept educational platformer game. The EM on the left is of type 1 (building comprehension), and the one on the left is of type 2 (testing the comprehension). The UI for type 1 EMs shows an instruction text at the bottom of the screen.

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Endowed with Social Responsibilities in Universities with Aesthetic Consciousness

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Abstract

To reach a perfect learning environment in teaching participation, this study designed an aesthetic course. From the research outcome, it is concluded that through the upgrading of aesthetic consciousness, creating ample dialogues between participants and the service community, bringing in concern and feelings, linking love with the social responsibilities and obligations, the learning participants will deeply feel the problems in the community, thus focusing their attention on it, and in turn creating particular results in social practice.

Keywords: esthetic consciousness, educational aesthetics, social responsibilities

- *This research presented on 51th International Conference on Business, Education, Social Science, Management (BESM-51): Taipei/Taiwan, March, 24th-25th, 2020*

I. Foreword

1. Motive of Research

Agricultural education talks about farming education, diet education and environmental education in one comprehensive topic, in which progresses from individuals, schools, family to society. Many countries have already legislate to allow students to embrace agricultural education, instilling concepts of caring for the environment and land, and healthy eating habits in them from young. By forming good living habits, then only can they practice, developing a sustained attitude.

Whereas aesthetics is about cogitations and explorations of things related to beauty. It possesses a capability of initiating conscious awareness, and with this awareness only can the habit itself be thoroughly awakened and changed. Therefore, this research attempts to integrate agricultural education with the education of aesthetics, combining the two, unfolding Shenkeng community as the experiment base, allowing students to trigger their aesthetic consciousness through the probing and attention of issues linked with agricultural aesthetics, all the while viewing it as a change, investigating whether if there are specific efficacies of strengthening social responsibilities in university students from the societal participation and practical learning experiences.

2. Aim of Research

Nowadays, education in universities focus on a cross-field learning direction, where problems awaiting to be solved usually involve the integration ability of multiple fields. Therefore, the education scene should not be only be confined within the school walls, but to guide students to face society at an earlier time, to participate in the society, and to cultivate the ability to communicate and express themselves, their attitudes, and contact with crowds from different fields, and through the inspirationof aesthetic consciousness in the courses, opening up the student's ability and vision on creative thinking and comprehensive connection. Thus, social practice is a rather important part in university education, whereby designing courses through the modes of social practice, allowing students to finish their preparations to be in a part of the society at an earlier stage, with an initiative, positive attitude while facing society. The main aim of this research is to allow the mutual input of different professional fields through the innovative design of courses, whereby increasing the embedding of the concept of aesthetic consciousness, opening up different views towards aesthetics, priming a learning motivation, and using it to strengthen social resposibility.

3. The problems faced in the research

This research brings social practice to communities near universities, integrating

professions from different departments in Shenkeng community with the implementation of agricultural education as the main axis, while assisting aesthetic education to bring in the aesthetic consciousness in modules of different courses, prompting the increase of university students' social liability. The following are the problems in the research:

(1) How to design social practice courses with a series of agricultural aesthetics consciousness from a concept of educational aesthetics.
(2) How to infiltrate aesthetics into the learners, allowing the agricultural aesthetics consciousness to awaken, and increasing the universities' social liability.
(3) Assessing the specific effectiveness of the curriculum.

II. How the series of courses in agricultural aesthetics practice in community

This research focuses on the agricultural aesthetics as the main axis, planning two main options: the first course group being a series of hand by hand courses – [involved in the service education of new aesthetics concept in agriculture], Shenkeng community as a social practice location. Through the collaboration with elementary schools, integration of regional academic resources, promoting series of service education, facilitating the dialogue between agriculture and aesthetics, and from within friends and companions to generate perceptions towards the lands, environment and people. Through service education, using different narrative forms to express and communicate, it produces a creativity of perception and care from the contact with people and the environment.

The second course group, being a series of community building courses – [A Building and Activation of Brands in Shenkeng Agricultural New Aesthetics], focuses on the beautification of environment and marketing as a motivation aim, combining tourism and design groups, from demands in various profession agreements, for example, interactive e-books, marketing proposals, inventory checks on local resources, cultivating Shenkeng community guides, website designing, and beatification of farm booths. From the initiation of campus farms in universities and schools, ample dialogues with the community, resources from the media department, and the usage of spoken language, literature, professional mediums, diversified media, table shows, spatial expressions etc., unfolding a feast of motion in the community lives in Shenkeng.

10 courses planned for the course group, listed as below:

Course	Course Name	Credit
1	Practical Chinese	2
2	Agricultural Aesthetics	2
3	Study of Colours	2
4	Appreciating Western Arts	2
5	World Civilization & Multi-culturalism	2
6	Digital media Publishing Practice	3
7	Product Designing	3
8	Tourism Resources Survey and Internship	3
9	Interior Design	3
10	Web Design	3

III. How Courses Infiltrate Aesthetics into the Learners

In order to let the learning subjects be provided with a rough understanding towards agriculture and aesthetics, this series of agricultural aesthetics courses uses a common course outline, allowing learners from different fields under the guidance of a mutual planning in aesthetic education, with an inquiring precursory course, be led to an aesthetic experience with the perception encounters. The common courses planned are as followed:

Week	Course Content	Teaching materials
1	Understanding Agricultural Aesthetics in Shenkeng – Concept in Education of Agricultural Aesthetics, History & Culture of Shenkeng Awareness of Situational Consciousness in Agriculture Slight debates in food nutrition, food safety, food hygiene, food digestion, food source, food science, aesthetic sense in food arts etc. Task – Writing an article in aesthetic experience of development of five senses and comprehension of six senses	DIY PPT、Learning sheet one
3	Agriculture environmen in Shenkeng, Experience 1 **《A Walk on the Tea Valley Trail》** learning history and humanities,visiting a hundred-year-old building Task: Sketch a map of the tea valley	Outdoor activity Learning sheet 2
4	Agriculture environment in Shenkeng, Experience 2 《Imagining the Colors of farmland》-The memories and feelings towards the old trail and village in Shenkeng 1) Recite countryside poems, write countryside poems 2) Paint a map of landscape	Outdoor activity Learning sheet 3
10	Agriculture environment in Shenkeng, Experience 3 – Society Participation Learners involved in the agricultural aesthetic course are to assist in harvesting and donate as charity	A report on the practical participation

IV. Discussion and conclusion

Using "Cross-field Learning Between Agriculture and Aesthetics" as an operating example, this research aims to unite the areas in Shenkeng community as a practice locale, being endowing with the Social Responsibilities in Universities with Aesthetic Consciousness as the research title. Waves of trending societal on-field-practice in universities has been set off lately, intending to motivate the integration between the universities and the neighboring communities, combining university resources and local features, creating an opportunity for profession-integrated prosperity. However, with the integration of university students into the communities, how should they be prompted to use their profession to generate thoughts, and to induce creativity? Strengthening the social responsibilities is a key factor, whereby if the subject's social responsibility to the service area is present, then only will the societal

on-field-practice in universities come into effect. This research aims to integrate agricultural education with aesthetic teachings, using agricultural aesthetics to introduce a subject of aesthetic consciousness (teacher),an aesthetic object (curriculum), and aesthetic subjects(students, participants), all the while looking from a view of education aesthetics, applying it on a few concepts e.g. thoughts, meetings, input, and participation, using them to design a common course outline, the correspondence between people, releasing communion and sympathy, creating a beauty in the flow of maneuvered rotations, and between teachers and students (aesthetic consciousness subject and aesthetic subject) is the common body for learning in the flow loop, and with it, to reach a perfect environment in teaching participation. Throughout the courses operated in three semesters, 2017-1, 2017-2, and 2018-1, results have been produced as listed below: (1) assimilation of learnings into daily lives, (2) demonstration of information sharing module, (3)woodwork collaboration to transform farms, (4)infusing care and concern into aesthetics of small farms, (5) professional on-field-practice in societal communities, (6) results in expanding condensed areas. From the research outcome, it is concluded that through the upgrading of aesthetic consciousness, creating ample dialogues between participants and the community, bringing in concern and feelings, linking love with the social responsibilities and obligations, the learning participants will, because of these factors, deeply feel the problems in the community, thus focusing their attention on it, and in turn creating particular results in social practice.

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The Construction of ESG (Environmental, Social, and Governance) Portfolio Investment and a Comparative Analysis of ESG Portfolio Performance on Indonesia Stock Indices

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Abstract

This research aims to build up the best performance ESG (Environmental, Social, and Governance) Portfolios Investment and compare the portfolio's performance with the top four indices in Indonesia Stock Exchange. The signatories of the Responsible Investment Principle have rapidly increased since sustainability becomes a 'basic needs' in the world of business as much as the negative impact of the business on the environment, social issues, and corporate governance. The ESG portfolio construction is based on stakeholder's concern of each ESG pillars, such as climate change, green operations, labor management, and governance. Throughout this model, this research tries to improve the existing sustainable investment index in Indonesia (SRI-KEHATI) which most of the stock criterion is based on corporation's financial standing. The methods using in this research is the weighted model scoring system and quantitative descriptive. From this step, we construct three ESG Portfolio classes: Elite ESG, Top 10 ESG, and Best Class ESG. Finally, we extend the Fama-French three factors model by adding ESG factor to evaluate ESG portfolios investment. The result shows that regardless of cumulative returns or Sharpe Ratios, the Elite ESG Portfolio is the best-performing among three classes ESG Portfolios. When we compare to four mainstream Indonesia Stock Indices as our available benchmark back-testing period, the Elite ESG Portfolio has beaten up all the benchmarks. In terms of the Fama-French three factors model, we find our new factor (TMB Factor) is a significant contributor to the return individual after the market return. We adjusted R-squared values are all suitably high, meaning that ESG factor can adequately explain the return of an investment.

Keywords: ESG, Sustainable Investing, Emerging Market, Fama-French three factors model

- *This research presented on 51th International Conference on Business, Education, Social Science, Management (BESM-51): Taipei/Taiwan, March, 24th-25th, 2020*

1. Research Background

Environmentally sustainable, socially responsible or also known by Responsible and Impact Investing (SRI) is hitting the market, one of them is ESG (Environmental, Social, and Governance). SRI is a broad term that encompasses any investment strategy that fulfills the investor's financial objectives along with their concerns about ESG issues (Munoz, Vargas, and Marco, 2014). The data from Global Sustainable Alliance (2018) explain that sustainable investing is not only growing rapidly in the Europe or America but also in the Asia Pacific. In Japan, assets owned in sustainable investment strategies quadrupled between 2016 and 2018, making the country the world's third largest sustainable investing market after Europe and the United States. In China, by 2018 presented 18% of global green bond issuance and the Asia-Pacific region accounted for 26.7%. But does ESG matter in Emerging Markets? An empirical research from Gunnar *et. al* (2015) concluded that ESG investing is likely to have a positive impact on return. Taken from meta-analysis which combined results from more than 2,200 unique primary studies released since 1970s, shows that across all regions, the majority found a positive ESG impact on corporate financial performance. Furthermore, the result illustrates an even stronger positive impact on corporate financial performance from ESG investing in Emerging Market versus developed markets. Authors such as Derwall et al. (2015) and Kempf and Osthoff (2007) suggests sustainable investment can outperform mainstream investment because the screening and selection process on environment criteria may reveal additional information relevant to investment decisions.

Consideration of ESG factors can also contribute to risk reduction in these historically volatile markets. Emerging market have tended to exhibit greater volatility than developed markets. Companies with stronger ESG standards may be less likely to face the financial and reputational implications of corporate controversies or fines. Companies with a focus on sustainability may be more likely to take pre-emptive actions to mitigate risks from potentially costly events such as natural disasters or litigations, Schroders (2016). An ESG analysis can provide investors with additional insight into material risk exposures faced by company, the quality of a company's management, and the company's strategic positioning. The integration of ESG analysis can therefore lead to better informed investment decisions and provide a potentially higher level of safeguard against uncertainties. Thus, stimulate sustainable investing in emerging markets is an essential issue needs to be addressing.

In this study we provide a construction of the best performance of ESG Portfolio Investment in Emerging Market of Indonesia, the object of this research is listing companies on the Indonesia Stock Exchange during the Periods 2014—2018. A comparative analysis performance of the ESG Portfolio towards mainstream Indonesia indices by Sharpe Model, and evaluate the influence of ESG factor by extending Fama-French three factors model. Constructing the ESG portfolios in an emerging market Indonesia, this research is not only

help investment decisions have a longer-term perspective but also improves society and the environment through investment and stimulates a sustainable social development for the corporations.

2. Hypotheses

In this research, we examine 2 hypotheses:

Hypothesis 1. There is a significant difference in the Sharpe ratio between ESG Portfolios and benchmark indices.

We expect the effect hypothesized above to be amplified by ESG Portfolios with a maximized criterion selection during the ESG constructions.

Hypothesis 2. There is a significant influence of return market, market size, book value to market return, and ESG factor to return individual.

As the objective of extending the Fama-French Model, to evaluate the influence of ESG Score to the individual return. We expect the effect of adding ESG factor to our Fama-French model could represent the pivotal of ESG factor towards final individual return.

3. Methodology

For a general explanation, our research method is sort of a quantitative descriptive. We have several steps to running this research, first we build the ESG database and conduct a weighted scoring system to rank the ESG Score, then we start to generates a comparative analysis by extracting Sharpe ratio and evaluate the ESG factors by extending the Fama-French three factors model.

3.1 Data and Sample

To operationalize our model, in accordance with the approach taken by other researchers (e.g Michael Banch et. al, 2019; Roy Henricksson et. al, 2019; Mike Chen and George Musalli, 2019) we use a weighted scoring model to examine the total score of ESG for each constituent. To begin with, the criteria to select our sample is the disclosure of the following items. These items have been adjusted to the availability of ESG data disclosure in Indonesia. Due to data limitations, we integrate three reports: Annual Report, Sustainability Report, and Corporate Governance Report.

Table 1. Variables and Descriptors

Variables	Descriptors	Items
Environmental (Weight=33.34%)	Water Resource Management	Total Water Use (25%)
		Water Policy (25%)
	Green Operation	Energy Consumption (25%)
	Climate Change	Total GHG Emission (25%)
Social (Weight=33.34%)	Workplace Health and Safety	Occupational Health and Safety Policy (25%)
	Employee Diversity and Equality	Percent of Woman Employees (25%)
	Consumer Satisfaction	Consumer Satisfaction Index (25%)
	Social Welfare	Community Expenses to Pretax Profit (25%)
Corporate Governance (Weight=33.34%)	Business Performance	Earnings per Share (IDR) (16.67%)
	Information Transparency	Total Fraudulent Disclosure (16.67%)
	Board Operation	Percent of Independent Directors (16.67%)
		Board Size (16.67%)
		Percent of Board Meeting Attendance (16.67%)
		Percent of Women on Board (16.67%)

Source: Author, 2020.

Based on this purposive sampling, we generate 20 constituents from 5 industries, they are Finance, Mining, Consumer Goods, Chemical and Basics, and Property Industry. We classify three ESG portfolios: Top 10 ESG as the result of Top 10 ESG Score, Best Classes ESG as the top rank ESG Score for each industry, and Elite ESG as the union of Top 10 ESG and Best Class ESG. We match the available data for each industry and adjust the difference data disclosure to our weighted scoring system. Table 2 describes the sample composition by industry while Table 3 describes the compositions of each ESG Portfolios Class.

Table 2. Sample Composition each Industry

Finance	Mining	Consumer Goods	Infrastructure	Chemical and Basics	Property and Real Estate
6 Constituents	8 Constituents	1 Constituent	2 Constituents	2 Constituent	1 Constituent

Source: Author, 2020.

Table 3. ESG Classification

ESG Classes	Finance	Mining	Cons.Goods	Infrastructure	Chemical	Property	Total
Top 10	4	1	1	1	2	1	10
Best-Class	3	4	1	1	1	1	11
Elite	4	4	1	1	2	1	13

Source: Author, 2020.

3.2 Sharpe Ratio Comparison Results

To compare the performance of three ESG Portfolios towards Indonesia Stock Indices, we extract the Sharpe ratio model developed by William F. Sharpe (1966). It is used to help investors understand the return of an investment based on overall risk. Subtracting the risk-free rate from the mean return allows an investor to better isolate the profits associated with risk-taking activities. Generally, the greater the value of the Sharpe ratio, the more attractive the risk-adjusted return. Table 4 shows the comparison of the Sharpe ratio between Three Classes ESG and the benchmark indices.

$$Sharpe\ Ratio = \frac{R_p - R_f}{\sigma} \qquad (1)$$

Table 4. ESG Portfolios Performance Comparison towards Indonesia Indices

Periods	TOP 10 ESG	Best Class ESG	Elite ESG	Overall ESG	JKSE	LQ45	SRI-KEHATI	JII
2014	1.327	1.521	1.404	-0.447	1.593	1.838	1.954	0.738
2015	-1.302	-1.540	-1.540	-2.121	-1.377	-1.046	-0.987	-1.260
2016	-0.090	0.295	0.372	2.043	0.863	0.365	0.563	0.812
2017	1.837	1.498	1.790	1.837	1.963	1.902	2.375	0.436
2018	-4.206	-3.315	-3.315	-3.652	-6.584	-5.451	-5.275	-4.796
Average	-0.487	-0.308	-0.258	-0.468	-0.708	-0.478	-0.274	-0.814
Rank	6	3	1	4	7	5	2	8

Source: Processed by Author, 2020.

The table above describes the best performing ESG towards all the available benchmark back-testing periods. Elite ESG has beaten up all indices, while generally analysis all overall three ESG Portfolios outperforms the available benchmarks. Albeit the difference between Elite ESG and SRI-KEHATI is small, for a long-run investment decision, Elite ESG would perform a higher return and minimize the risk optimally. The negative result of the Sharpe ratios due to the relatively high deposits rate before tax we use to represent the risk-free rate.

3.3 Extended Fama-French Three Factors Model

This section develops an extended version of the Fama-French (1997) three-factor model by including ESG-score where the ESG-score estimates are consistent given the market's degree relative to risk aversion. The model assumes that an investor's future consumption depends on the return on the financial portfolio plus the outcomes of an ESG-score to the additional individual return. In doing so, we modify the Fama-French three factors model as follow:

$$R_i - R_f = \alpha + \beta_1(R_m - R_f) + \beta_2(SMB) + \beta_3(HML) + \beta_4(TMB) + \varepsilon \qquad (2)$$

Based on the above model, we generate the regression results as shows by this table:

Table 5. Regression Result

	Coefficients	**Standard Error**	**t Stat**	**P-value**	**Lower 95%**	**Upper 95%**	**Lower 95.0%**	**Upper 95.0%**
Intercept	-0.03	0.01	-2.23	0.03	-0.06	0.00	-0.06	0.00
Rm-Rf	1.03	0.02	57.19	0.00	0.99	1.06	0.99	1.06
SMB	0.00	0.00	2.39	0.02	0.00	0.00	0.00	0.00
HML	0.04	0.03	1.07	0.29	-0.03	0.11	-0.03	0.11
TMB	0.05	0.03	1.98	0.04	-0.01	0.10	-0.01	0.10

Source: SPSS Processed, 2020.

Interprets the result, the table summarizes the influence of market return, company's size, book value to market return, and ESG Score to the return individual of stocks. The p-value of market return, company's size, and ESG Score are less than 0.05 means we need to reject the null hypothesis and accept the H_a, there is a significant correlation between those 3 factors to the individual return. However, the p-value of HML (Book Value to Market Return) is 0.29 ≥ α 0.05, we fail to reject the null, and conclude there is no correlation between Book Value/Market return to the individual return.

Table 5. R-Square Adjusted Table

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.994[a]	.988	.987	.0255

Source: SPSS Processed, 2020

The high value of R Square of 0.988 describes this model are 98% could represent the factors influence individual return among other factors outside the model.

4. Empirical Results and Discussion

This research, for instance tries to investigate how to construct an ESG Portfolio Investment in the Emerging Market such as Indonesia. With the limitation of ESG database for the country in Southeast Asia, we integrate three company's reports: Annual Report, Sustainability Report, and Corporate Governance Reports. We then examine the ESG Score for each sample and classify them into three portfolio classes: Top 10 ESG, Best Class ESG, and Elite ESG. To understand the performance of these portfolios, we make a comparison to mainstream Indonesia Indices as our benchmarks: JKSE, LQ-45, SRI-KEHATI, and JII. Each of these benchmarks represents different market choice, JKSE for instance describe the overall volatility of all listed stocks in Indonesia Stock Exchange, LQ-45 represents the index for 45 stocks which most liquid in the market, SRI-KEHATI represents the index for socially responsible stocks with most of its criterion was based on financial standing, and JII represents the index for Islamic Market in Indonesia.

When we extract the Sharpe ratio to compare their performance, the Elite ESG has beaten up the overall benchmark and other ESG portfolios. Meaning that Elite ESG could provide better returns compare to overall available indices. Further, we also extend Fama-French three factors model to evaluate the ESG factors towards individual return. The regression running shows that regarding the four factors model of Sharpe, three factors have a positive correlation to the return individual. Moreover, the beta of ESG factor is 0.05 describes the sensitivity of this factor to the overall market volatility, this beta is the second biggest number after the beta of the market return.

This research again proved the possibility of responsible investment or green investments having similar performance or an even stronger impact compares to mainstream investment instrument's performance. Albeit there is some 'unperfect' result of the Sharpe ratio, it is constrained the ESG Portfolio Investment to outperforms the deposits rate, although it still a before-tax number. Despite this uncontrollable factor, ESG Portfolios' performance is giving stronger impacts on the investor. Moreover, results implicate how constituents included in this research are performing doing well by doing good.

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Completed Iris Recognition System For a Low-cost Platform

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Abstract

Iris recognition is a reliable but still expensive biometrics method on the market nowadays. The rapid improvement of both performance and cost of the single-board computers recently bring opportunities for more affordable iris recognition solutions. Despite there have been a few works came up with this idea, all of them have only measured the identification performance on the platforms. The main contribution of this research is a more practical iris recognition for businesslike applications where multiple devices are required. We propose a mechanism consisting of two main components: The iris recognition devices built from Raspberry Pi 3 B+ modules with an automatic sample acquisition feature and a management application for controlling the devices over an MQTT private network. The sample capturing procedure is assisted with a set of 940nm NIR LEDs, a compact 5MP camera equipped with a 25 mm CCTV lens, and a light-weight ultrasonic sensor. This combination allows a low expense for additional components and reduces the total size of the recognition device. The identification task is implemented in 6 stages based on the popular Daugman algorithm, but the efficiency of each fundamental function is enhanced regarding the pros and cons of the selected platform. The early prototype gives a convenient usage for the users and stable performance with less than 6% of EER and over 96% of the maximum accuracy rate. The execution time is another great achievement with only around 1.3 seconds on average. In the future, the system can be improved for faster execution time and better iris sample quality, which in turn results in higher accuracy.

Keywords: Iris recognition, biometrics, Raspberry Pi, Daugman algorithm, low-cost, automatic sample acquisition.

➢ *This research was presented on 50th International Conference on Engineering, Technology and Applied Science (ETAS-50): Taipei/Taiwan, March, 24th-25th, 2020*

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ETAS 50 & BESM 51/2020.03.24-25
Organized by: AASE
Published by: ETAS/BESM Press