TEPIAN Vol. 5 No. 3 (September 2024) 86-93 p-ISSN 2721-5350 e-ISSN 2721-5369
https://doi.org/10.51967/tepian.v5i3.3119 © 2024 Tepian Politeknik Pertanian Negeri Samarinda


# Culinary Learning Using Virtual Reality Based on Gamification Method

**Winanti** *
Information System, Insan Pembangunan Indonesia University, Tangerang, Indonesia, 15810
*winanti12@ipem.ac.id
*Corresponding author*

**Nurasiah**
Information System, Insan Pembangunan Indonesia University, Tangerang, Indonesia, 15810
nurasiah8@ipem.ac.id

**Beby Tiara**
Information System, Insan Pembangunan Indonesia University, Tangerang, Indonesia, 15810
bebytiara22@ipem.ac.id

**Erick Fernando**
Informatics Engineering, Universitas Multimedia Nusantara
Tangerang, Indonesia, 15810
fernandoerick8@gmail.com

**Sucipto Basuki**
Information System, Insan Pembangunan Indonesia University, Tangerang, Indonesia, 15810
ciptainsan@yahoo.com

**Riyanto**
Information System, Insan Pembangunan Indonesia University, Tangerang, Indonesia, 15810
riyanto62@ipem.ac.id

*Submitted: 2024-08-24; Accepted: 2024-09-11; Published: 2024-09-21*

***Abstract*—**Culinary is a promising business and food is a basic need for human life. Many people fall ill due to improper diet. Since the emergence of Covid-19 a few years ago, most people tend to be careful in maintaining their diet, and awareness of healthy food has increased. Significantly, learning with virtual reality-based gamification in post-pandemic conditions, many people prefer digital learning. To increase creativity, motivation, innovation, and student involvement and ultimately open many businesses in the food sector, fun learning is needed with interesting content with virtual reality-based gamification scenarios. Ease of learning will have an impact on improving culinary learning outcomes. The purpose of this study is to learn using virtual reality-based gamification methods to increase student creativity in determining recipes, choosing the right ingredients, and using the right cooking utensils. Increase student learning motivation, and create innovation in the culinary field, from combining recipes to attractive presentations. Student involvement and its output is the creation of technopreneurs in the culinary field, considering that culinary is the backbone of a country's economy and is a promising business

***Keywords*—** Learning, Gamification, Culinary, Virtual Reality

## I. INTRODUCTION

Culinary learning has become a trend after the Covid-19 pandemic where many people are more concerned about the food they consume every day. Healthy and well-processed food is a concern for many people today. Food is a lifestyle and basic human need and determines a person's health (Aguilar et al., 2019). Many diseases arise due to improper and unhealthy eating patterns, lack of cleanliness, and improper processing. (Walls et al., 2019). In Indonesia, 67% of creative economy business actors work in the culinary sector. (Bekraf, 2018). Awareness of healthy food is increasing, many people are trying to process their food at home to make it more hygienic and clean, especially after the Covid-19 pandemic (Winanti et al., 2021), so it is not uncommon for them to try to learn and search for information about how to process food properly and correctly (Ardianti et al., 2020).

A strategy is needed to develop and increase students' interest in learning about culinary communities, namely by utilizing information technology through gamification (Gaol & Prabowo, 2022). One of the activities that actively involves users with the resource management facilities provided is in the form of games through elements such as levels, leaderboards, and points (Jusuf, 2016). Gamification can be applied in various fields so that learning becomes more interesting, fun, and interactive (Wang et al., 2023). Gamification methods are widely adopted for multiple types of learning, besides being fun, gamification can create maximum learning outcomes compared to conventional methods. (Padirayon, 2019).

The digital era of technology, apart from being a form of entertainment, is also used for educational games and motivates users to continue learning more deeply and adopting an activity so that they can solve the problems they face (Behlau et al., 2021).

Gamification is a way of thinking, process, product, experience, design method, and system that simultaneously involves utilizing game elements to solve non-game problems (Marisa et al., 2020). Gamification is a process of applying aspects in games to increase user motivation and involvement in the learning process (Pratomo, 2018) so that gamification can increase participation in the learning process in the culinary community.

Gamification is very effective in improving student learning outcomes, can motivate, makes learning more enjoyable, and makes the involvement between

instructors and students direct and interactive, gamification even encourages students to get high grades (Winanti et al., 2020). Games can bring out one's emotions and can change a person's mood from gloomy, anxious, and insecure to fun, interesting, and building self-confidence (Putra et al., 2019).

Virtual reality with the technology needed today is a technological disruption (Yung & Khoo-Lattimore, 2019) which gives rise to the phenomenon of virtual cooking learning as if students were experiencing cooking activities. In addition, virtual reality also creates immersive simulations where users interact and feel in a virtual world environment (Jamil, 2018). Virtual cooking learning activities by adopting gamification make learning more interesting (Al Mamun et al., 2022), interactive, and innovative. Students get a new experience in learning to cook (Jasrotia, 2022).

The current condition of society is spoiled by the existence of technology and the work that is done on average prefers to learn virtually rather than learning directly in class, especially for those who are busy and have many activities. As a result of changes in learning patterns, people often do activities online without interacting with many people. Changes in culture and culture due to information technology have positive and negative impacts. The positive impact of all work is easier, faster, more efficient, and effective, while the negative impact of society being too spoiled by technology is that empathy and sensitivity to people around them and the environment become low, children's ability to mix is low because children are more comfortable with online life than mixing with their friends (Ratnaya, 2011). Learning with virtual reality-based gamification is by current student conditions.

The use of gamification with virtual reality can increase student engagement in learning, students are more creative and motivated to follow learning by pursuing points and levels in gamification. Learning to cook with these two methods can significantly raise public awareness after the pandemic to start learning to cook digitally and practice at home according to the guidelines in the application. Post-pandemic, digital solutions are increasingly sought after by many people because they are more efficient, effective and interesting.

The purpose of this study is to create a culinary learning concept using virtual-based gamification. The method used is a literature study from various sources, both from journals, proceedings, research reports, books, and websites. Through virtual reality, learning to cook becomes more interesting, cheap and can be done anywhere and anytime. The virtual reality-based gamification method can help students understand cooking learning materials quickly, interestingly, and enjoyably. Students seem happy because in gamification all students will be involved directly and interactively.

## II. METHOD

Culinary learning with gamification techniques is developed in virtual reality to increase motivation and enthusiasm for learning so that the goal of learning to cook can be achieved optimally (Marisa et al., 2020). In addition, the problems are also clearly visible, there is interactive communication between learning participants, students are enthusiastic to continue completing learning step by step to the highest level, and with gamification, students are more enthusiastic (Asy'ari et al., 2021) and easy to accept the material presented and not boring in delivering learning materials (Pratomo, 2018). The use of gamification in the cooking learning process begins with the selection of recipes to be learned which are guided by culinary lecturers consisting of individual learning and collaborative learning. Student learning outcomes are assessed and assessed based on levels as shown in Figure 1.


Figure 1. Assessment of Learning Outcomes Based on Gamification

Cooking learning by adopting virtual reality-based gamification provides students with the freedom to be more innovative in solving problems in the culinary field with a multidisciplinary combination including

1. Students are challenged and continue to try to complete learning
2. Students will try to complete learning the level to the maximum.
3. There is feedback between students according to the topics studied.
4. Scoring that can make students more motivated to complete each level
5. There are badges as recognition of student abilities
6. Leaderboards so that students focus on the goals they want to achieve.
7. There is competition between students
8. There is collaboration in teamwork to achieve common goals (*Tren Dan Tips Gamifikasi Untuk Pembelajaran Online – BINUS University*, 2019).

Virtual reality is supported by supporting tools as seen in Figure 2

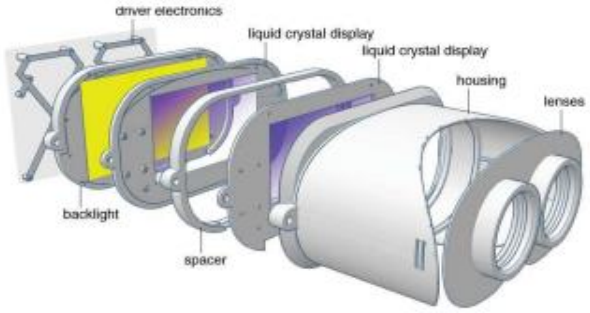


Figure 2. VR Device Components (Huang et al., 2015)

Virtual reality (VR) allows users to interact directly with a computer-simulated environment, as well as a real-world environment adopted in a virtual world. The virtual environment can be presented on a computer screen accompanied by information and sound (Jasrotia, 2022). Initially, virtual reality was widely used for gaming, and currently, virtual reality can be connected to the Internet of Things (IoT) (Dewi et al., 2021) and can be equated with the concept of Artificial Intelligence or AI technology (Ulva, 2022). Learning to cook with virtual reality will give a new impression to users who feel like learning to cook for real. The application runs with a gyroscope feature with additional VR box tools or with Google cardboard and a VR controller so that users can experience virtual reality (Subekti et al., 2021). Cooking learning applications with virtual reality-based gamification will provide complete information and new experiences for users, save practice costs and students can enjoy a new world with cooking recipes (Fernando et al., 2024).

The method used in virtual reality-based culinary learning is to utilize a literature review based on previously conducted research, either in the form of journals, proceedings, and research reports or other literature that can be used as a basis for research (Dewi et al., 2021). The stages of virtual reality-based culinary learning gamification are presented in Figure 3

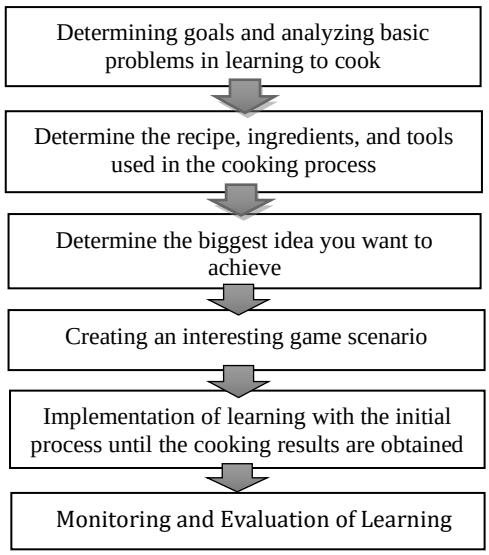


Figure 3 Steps to learning to cook with virtual reality-based gamification

The first step of learning using virtual reality-based gamification methods is to determine the objectives and analyze the basic problems of learning to cook. After finding the problems, the next step is to determine the recipe, ingredients, and tools used. Then determine the biggest idea that you want to achieve so that it doesn't spread everywhere. Create a game scenario that will be applied and choose a game scenario that suits the characteristics of the students and is interesting. The next step is to carry out learning with gamification, and after completion, a learning assessment is carried out.

Table 1. Virtual Reality Support Tools

| No | Supporting Tools | Utility |
|---|---|---|
| 1 | VR Headset | A tool used to monitor the snake's head and view the virtual reality world |
| 2 | Glove | A tool used to move hands and send user movement information in the real world to the virtual reality world |
| 3 | Walker | A tool used to monitor foot movements from the real world to the virtual reality world |

Source : (Backrie, 2024)

Important elements used in virtual reality consist of the Virtual World which is an important element for computer-based simulations with the creation of personal avatars in the form of screenplays (scripts). Immersion is where users feel various sensations of the virtual world with three categories, namely mental immersion (users feel real life in the virtual world), physical immersion (users feel their physical being in a virtual world atmosphere, sensory feedback (users can hear, see and feel touch in the virtual world). Sensory feedback/sensory feedback to convey the virtual world can be felt by the user's senses. Interactivity functions to respond to user actions through objects in the virtual world (Backrie, 2024; Jamil, 2018)

## III. Results And Discussion

Virtual reality is supported by supporting tools such as VR headsets or user head monitors and see the VR world, Gloves to move hands and send movement information in the real world to the VR world, and walker tools to monitor leg movements from the real world to the VR world. Elements in Virtual Reality include:

1. Virtual World, which is the main element, namely a computer-based simulation environment with a personal avatar in the form of a screenplay/script so that users can explore the virtual world.
2. Immersion makes users feel the sensation in the virtual world like the real world consisting of mental immersion, physical immersion, mental immersion, and sensory feedback.
3. Sensory feedback conveys virtual words so that users can hear, see, and feel the touch in the virtual world.

4. Interactivity is an element that responds to actions through objects in the virtual world.

Based on these four elements, learning using the gamification method is more interesting and looks alive as if the user feels the sensation of learning culinary in real life.

Gamification is created to create fun, interactive, innovative, and complete cooking learning, so based on the eight processes that must be carried out in culinary learning with virtual reality-based gamification, it can be explained as follows:

*A. Determining goals and analyzing the main problems of learning to cook*

Determining the purpose of learning to cook with a virtual reality-based gamification method is to facilitate learning to cook (students easily accept learning materials), learning becomes interesting, student motivation increases, participant involvement increases and entrepreneurship in the field increases. Based on these objectives, the basic problems in learning to cook include:

1. Students often experience boredom due to monotonous learning.
2. Lack of student participation in learning (Jusuf, 2016),
3. Teamwork is still low because students tend to practice independently rather than teamwork,
4. Student participation is low because the material presented is monotonous, less interesting, and less interactive (Rahmaniar, 2020).
5. Low student creativity is caused by a lack of student motivation in making culinary innovations, starting from modifying the appearance, combining ingredients, and creating flavors.
6. The ingredients and cooking tools used are generally expensive, so it is necessary to optimize learning outcomes so that ingredients and tools can be used optimally.
7. Students often have difficulty in digesting new material, especially regarding international recipe material that most students have not known before.
8. Student involvement in conveying ideas and creative ideas is still very low because students tend to learn independently rather than in groups (Dhiani Tresna Absari & Andryanto, 2013)

*B. Determine the recipe, ingredients, and equipment*

Determining the recipe is the most important thing because in this recipe all the ingredients, equipment, and cooking process begin. Before determining the recipe, students must first know the cooking categories :

1. Traditional food consisting of subcategories of Indonesian food, Japanese food, Korean food, and Chinese food.
2. International food consisting of subcategories of oriental food and continental food.
3. Comfort food consists of subcategories of fried food (fried foods), indomie, burgers, and fried chicken.
4. Drinks consisting of submenus of fruit juice, coffee, and tea.
5. Snacks consisting of subcategories of Dodol, Keripik, Rengginang, Lemper, and Bakpia. After choosing a recipe, the next step is to choose the ingredients to be used. The basic ingredients of the dishes are shown in Table 2

Table 2. Types of Basic Cooking Spices

| No | Basic Seasoning Types | Information |
|---|---|---|
| 1 | White base seasoning | Shallots, garlic, galangal, candlenuts, and coriander. |
| 2 | Red base seasoning or spicy seasoning | Red chili, shallot, garlic, tomato, shrimp paste, brown sugar, and salt. |
| 3 | Yellow base seasoning | Red onion, garlic, stir-fried hazelnuts, roasted turmeric, coriander, ginger, galangal, and black pepper |
| 4 | orange base seasoning | Shallots, garlic, cumin, anise, coriander, candlenut, turmeric, ginger, galangal and black pepper |

The selection of equipment used is important because different types of cooking do not necessarily have the same equipment. Many dishes use special and different tools. So, in this study, the use of the right tools can determine the quality of the cooking. Cooking equipment includes utensils, plates, utensils for serving food, and utensils for storing food before or after preparation. There are several types of materials used to make cooking equipment.

Table 3. Types of Cooking Utensils Materials
(Nafiah, 2022)

| No | Type | Excess | Lack |
|---|---|---|---|
| 1 | *Stainless steel* | Safe, healthy, and durable. Suitable for high-pressure and large antiques. | It does not contain non-stick ingredients, so it requires a lot of oil if you want to fry or sauté using stainless steel utensils. |
| 2 | Titanium | Lightweight, durable, non-chemical, anti-scratch, anti-break and non-stick | It takes a long time to heat up and cool down quickly, so the cooking process is not energy efficient. |
| 3 | Aluminum | Light heats up quickly, doesn't cool down quickly, doesn't emit harmful chemicals, and is affordable. | TMnds are to be sticky when used for cooking, quickly dented, and not scratch resistant. |
| 4 | *Anodized Aluminum* | Coated with special dyes and substances to overcome lacks aluminum and is easy to clean and non-sticky | Can be dissolved in food |
| 5 | *ceramic* | Do not release harmful chemicals, non-stick and anti-scratch. | Easy to break and slippery when washed. |
| 6 | *Cast Iron* | Durable, heats up quickly, and can retain heat for a long time. | Difficult to maintain (the pan must be coated with special oil to prevent scratches and sticking) |
| 7 | Glass | Does not emit harmful chemicals, can be used in the microwave, is affordable price, and makes it easy to see the condition of the food. | Glass utensils are heavier and break easily and are not non-stick |
| 8 | Carbon Steel | Lightweight and high temperature resistant. | Releases small amounts of metal when heated, long cooking time, not dishwasher safe, may alter taste of food |

Defining the Big Idea of the Culinary Learning Community. Figure 4 shows, culinary learning with virtual reality-based gamification is designed to build and create creativity, motivation, innovation, and student engagement so that culinary learning is further enhanced and maximized. This culinary learning is also able to motivate students to give birth to a technopreneur spirit in the culinary field because culinary is a promising business and one of the pillars of a country's economy.

In addition, there are also many culinary communities and culinary tourism that is currently booming. In all tourist attractions, hotels, and crowded places are indeed identical to culinary. Culinary hunting is currently a trend for all levels of society. Many places have turned into hangouts, cafes, and restaurants that offer a variety of unique food flavors. Added to that is the ease of access to delivery messages where people do not need to leave the house to get food.

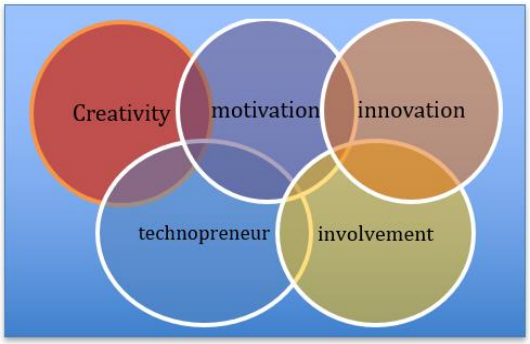


Figure 4 Gamification of learning outcomes

Gamification can create creativity and ideas that emerge from students to the maximum. Through the elements in the game, it can motivate students to learn more optimally with enjoyment and engagement (Juliansyah et al., 2022). Learning is boring, requires a lot of time and money, and there is a gap in the use of media for each school which varies, so gamification is created for more interactive learning (Wibowo & Romdhoni, 2015) with the virtual reality method being one of the methods that needs to be tried. For lecturers and students, the gamification method can improve performance and motivation and support timely input of values (Aini et al., 2018). The use of gamification in e-learning through gamification elements increases students' learning interest and motivation to the maximum (Julianto & Ekohariadi, 2020). Gamification elements significantly affect student achievement when compared to conventional learning methods. The combination of gamification and virtual reality elements is more interesting, motivating, and interactive, and provides personalized and collaborative learning opportunities with real experiences. Positive engagement and changes in attitudes, behaviors, mentality, and social emotions with learning environments integrated with virtual reality and gamification. Increased curiosity, imagination, creativity, focus, and interest of students ultimately emerge with virtual reality, and gamification (Lampropoulos & Kinshuk, 2024). The integration of virtual reality and gamification in learning to cook is a promising business opportunity.

*D. Determine the game scenario*

Creating an interesting game scenario to produce quality dishes with an attractive appearance and varied tastes is not easy. However, with a gamified scenario, culinary learning games become more interesting and fun. The learning process involves students, instructors, and administrators as virtual reality managers. The framework created has been tested for 6 months and is currently in the development stage. The test was conducted by involving students randomly with homogeneous profiles.

1) The trial was applied to two different cooking learning groups to make it easier to determine the best method. One group learned to cook using gamification, and one group learned to cook using conventional methods. Each group created a profile and filled out a questionnaire that had been given by the instructor/teacher/lecturer. The instructor conducted a short interview as initial data before the learning was carried out. The results of the short interview were temporarily summarized as initial data which would later become a guide in determining further learning.
2) The themes raised in this learning are (1) introduction to cooking recipes from basic recipes to advanced recipes which are given in stages according to the level of each student, (2) introduction to cooking ingredients, and (3) introduction to the equipment used. Students learn these three components in detail and detail so that students understand what they will do when learning through virtual reality-based gamification.

*E. Implementation of learning with virtual reality-based gamification.*

Initial preparation begins with preparing the materials to be taught including the selected recipe, the ingredients needed, and the equipment used. All materials are made digitally by students choosing recipes, ingredients, and equipment. Then the cooking process is guided by an experienced instructor or chef. The activity involves students and instructors/chefs as if they were in the real world. Interestingly, in this learning, students can choose recipes and directly choose instructors/chefs according to the mapping based on the competence of the instructor/chef. After participating in the learning, students can upgrade to the type of recipe that is higher level. What starts from simple recipes to more varied recipes? Students who can complete one recipe to the next will get points. These points can be used to buy new recipes, ingredients, and equipment.

*F. Learning evaluation*

Evaluation of culinary learning will be assessed in terms of content, instructors/chefs, and the extent to which students can complete step by step and level by level according to the points obtained. Figure 5 shows, statistical analysis is carried out based on the relationship between the variables used.

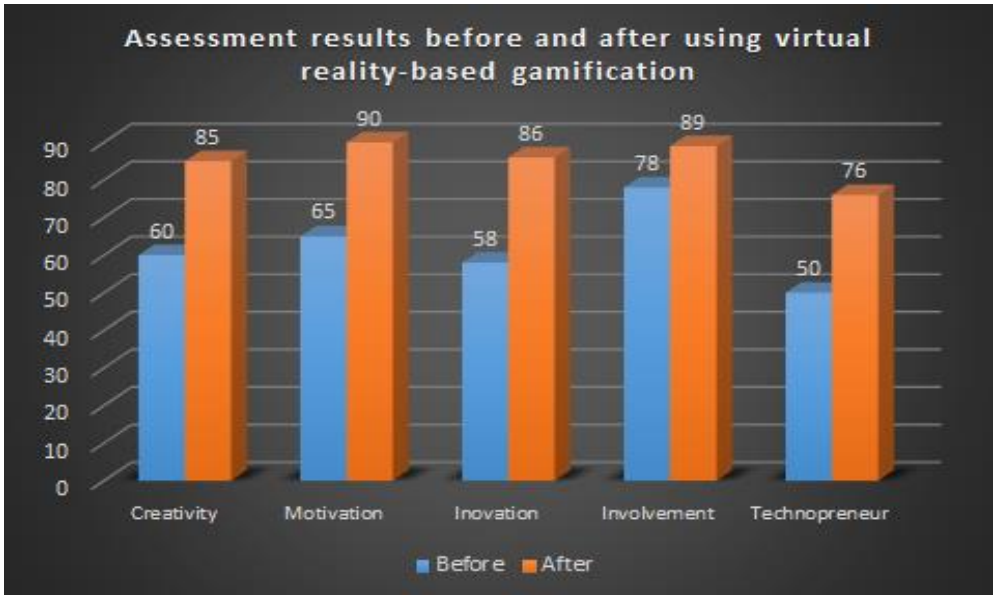


Figure 5. Assessment results before and after using virtual reality-based gamification

From this learning, students become more creative, motivated to complete levels, and pursue points to be exchanged for new recipes, ingredients, and equipment. Students are also more innovative in formulating recipes, combining recipes, and creating new variants of existing recipes. Student involvement is increasing with this Virtual Reality-based gamification. After completing all learning materials, students are expected to be able to practice directly at home to be able to repeat learning to cook with real recipes and try them for consumption by themselves or their families. Culinary learning with this method aims to create new entrepreneurs in the culinary field by utilizing digital technology, at a cost that is not too expensive, students can create new recipes in the virtual world.

## IV. CONCLUSION

Discussing culinary will never end because culinary is a source of energy, basic needs and a very promising business. Learning culinary is not identical to women but both men and women are engaged in the culinary field. Culinary learning with a virtual reality-based gamification method where students seem to be doing the cooking process in real life. The use of virtual reality can save the cost of cooking ingredients whose prices

continue to increase day by day. In addition, the use of gamification can increase student creativity, increase learning motivation, students are more innovative in utilizing recipes, ingredients, and use of equipment, and student involvement is higher, so that learning is more interactive and interesting. Students also do not feel monotonous learning to cook with gamification and most importantly students have a new experience learning with virtual reality-based gamification. There is no need to buy cooking ingredients which are currently getting more expensive. Virtual reality replaces cooking ingredients with images and videos that make users feel like they are in the real world. Learning that is increasingly easy and interesting is expected to increase students' interest in learning more cooking menus and in the future, there will be more and more people interested in culinary majors. Apart from working in the culinary field, graduates can become technopreneurs in the culinary field because culinary is a promising business and culinary is able to support the economy of a country, including Indonesia.

## REFERENCES

Aguilar, E., Bolaños, M., & Radeva, P. (2019). Regularized uncertainty-based multi-task learning model for food analysis. *Journal of Visual Communication and Image Representation*, *60*(March), 360–370. https://doi.org/10.1016/j.jvcir.2019.03.011

Aini, Q., Rahardja, U., Moeins, A., & Apriani, D. M. (2018). Penerapan Gamifikasi Pada Sistem Informasi Penilaian Ujian Mahasiswa Untuk Meningkatkan Kinerja Dosen. *Jurnal Informatika Upgris*, *4*(1), 46–55. http://journal.upgris.ac.id/index.php/JIU/article/view/2263/1883

Al Mamun, M. A., Lawrie, G., & Wright, T. (2022). Exploration of learner-content interactions and learning approaches: The role of guided inquiry in the self-directed online environments. *Computers & Education*, *178*, 104398. https://doi.org/10.1016/J.COMPEDU.2021.104398

Ardianti, P. N. H., Suwandewi, P. A. M., & Danini, D. A. R. (2020). Bisnis Kuliner Online, Solusi Usaha Di Tengah Pandemi Covid-19. *Prosiding Webinar Nasional Peranan Perempuan/Ibu Dalam Pemberdayaan Remaja Di Masa Pandemi Covid-19*.

Asy'ari, R., Rusdin Tahir, Cecep Ucu Rakhman, & Ayu Khrisna Yuliawati. (2021). Penerapan Gamifikasi Dalam Smart Tourism : Studi Literatur. *EDUTOURISM Journal Of Tourism Research*, *3*(01), 13–21. https://doi.org/10.53050/ejtr.v3i01.160

Backrie, U. (2024). *Teknologi VR Adalah Masa Depan? Cari Tahu Selengkapnya Di Sini!* Universitas Bakrie. https://bakrie.ac.id/articles/414-teknologi-vr-adalah-masa-depan-cari-tahu-selengkapnya-di-sini.html

Behlau, M., Madazio, G., Pacheco, C., Vaiano, T., Badaró, F., & Barbara, M. (2021). Coaching Strategies for Behavioral Voice Therapy and Training. *Journal of Voice*. https://doi.org/10.1016/j.jvoice.2020.12.039

Bekraf. (2018). *Data Statistik dan hasil survey Ekonomi Kreatif bekerjasama dengan Badan ekonomi kreatif dan Badan Pusat Statistik*. Badan Ekonomi Kreatif Republik Indonesia. https://bisma.bekraf.go.id/info-kreatif

Dewi, N. K., Mulyana, I., Putra, A. S., & Radita, F. R. (2021). Konsep Robot Penjaga Toko Di Kombinasikan Dengan Pengendalian Virtual Reality (VR) Jarak Jauh. *Jurnal IKRA-ITH Informatika Vol*, *5*(1), 33–38.

Dhiani Tresna Absari & Andryanto. (2013). Pembuatan aplikasi pembelajaran interaktif sebagai alat bantu belajar memasak pada anak-anak. *Seminar Nasional Teknologi Informasi Dan Aplikasinya*, *5*, 1–13.

Fernando, E., Basuki, S., & Suseno, B. (2024). E-LEARNING CULINARY COMMUNITY BERBASIS WEBISITE MENGGUNAKAN METODE PROTOTYPE. *Indonesiann Journal on Information System*, *7*(2), 1–15.

Gaol, F. L., & Prabowo, H. (2022). Exploring Cooking Knowledge through Community-Based Learning Based on SECI Model for Learning Studies in Indonesia. *Design Engineering*, *01*, 1154–1163.

Huang, F. C., Luebke, D., & Wetzstein, G. (2015). The light field stereoscope. *ACM SIGGRAPH 2015 Emerging Technologies, SIGGRAPH 2015*, 2792493. https://doi.org/10.1145/2782782.2792493

Jamil, M. (2018). Pemanfaatan Teknologi Virtual Reality (VR) di Perpustakaan. *Buletin Perpustakaan Universitas Islam Indonesia*, *1*(1), 99–113. https://doi.org/10.1016/B978-0-12-816958-2.00007-1

Jasrotia, A. (2022). *The Groundbreaking Smart Technology Virtual Reality :* 351–353. https://doi.org/10.4018/978-1-7998-8528-3.ch019

Juliansyah, F., Utomo, S., Rachmanto, A., & Budiarto, S. (2022). Aplikasi Quiz Dengan Konsep Gamification Berbasis Web Menggunakan Ruby on Rails & React.Js. *Jurnal Teknologi Informasi Dan Komunikasi*, *11*(2). https://doi.org/10.56244/fiki.v11i2.425

Julianto, A. K. A., & Ekohariadi. (2020). Metode Gamification Pada Pemrograman Dasar Teknik Komputer DanInformatika Di Sekolah Menengah Kejuruan. *It-Edu*, *05*(01), 77–84.

Jusuf, H. (2016). Penggunaan Gamifikasi dalam Proses Pembelajaran. *Jurnal TICOM*, *5*(1), 1–6.

Lampropoulos, G., & Kinshuk. (2024). Virtual reality and gamification in education: a systematic review. In *Educational Technology Research and Development* (Vol. 72, Issue 3). Springer US. https://doi.org/10.1007/s11423-024-10351-3

Marisa, F., Akhriza, T. M., Maukar, A. L., Wardhani, A. R., Irianandа, S. W., & Andarwati, M. (2020). Gamifikasi (Gamification) Konsep dan Penerapan.

*JOINTECS (Journal of Information Technology and Computer Science)*, *5*(3), 219. https://doi.org/10.31328/jointecs.v5i3.1490

Nafiah, A. Z. (2022). *Jangan Sembarangan, Inilah 8 Rekomendasi Bahan Alat Masak yang Aman*. https://yoursay.suara.com/hobi/2022/01/25/144821/jangan-sembarangan-inilah-8-rekomendasi-bahan-alat-masak-yang-aman

Padirayon, L. M. (2019). The designed gamification application architecture and elements for a C# programming course. *ACM International Conference Proceeding Series*, 67–72. https://doi.org/10.1145/3330393.3330414

Pratomo, A. (2018). Pengaruh Konsep Gamifikasi Terhadap Tingkat Engagement. *THE Journal : Tourism and Hospitality Essentials Journal*, *8*(2), 63. https://doi.org/10.17509/thej.v8i2.13740

Putra, A. S., Warnars, H. L. H. S., Abbas, B. S., Trisetyarso, A., Suparta, W., & Kang, C. H. (2019). Gamification in the e-Learning Process for children with Attention Deficit Hyperactivity Disorder (ADHD). *1st 2018 Indonesian Association for Pattern Recognition International Conference, INAPR 2018 - Proceedings*, 182–185. https://doi.org/10.1109/INAPR.2018.8627047

RAHMANIAR. (2020). MODEL PEMBELAJARAN MUATAN LOKAL BERBASIS BUDAYA KULINER DI TINGKAT SMP KOTA PAREPARE. In *MODEL PEMBELAJARAN MUATAN LOKAL BERBASIS ...http://repository.unhas.ac.id*. http://clik.dva.gov.au/rehabilitation-library/1-introduction-rehabilitation%0Ahttp://www.scirp.org/journal/doi.aspx?DOI=10.4236/as.2017.81005%0Ahttp://www.scirp.org/journal/PaperDownload.aspx?DOI=10.4236/as.2012.34066%0Ahttp://dx.doi.org/10.1016/j.pbi.201

Ratnaya, I. G. (2011). Dampak Negatif Perkembangan Teknologi Informatika Dan Komunikasi Dan Cara Antisifasinya. *Jurnal Pendidikan Teknologi Dan Kejuruan*, *8*(1), 17–28. https://doi.org/10.23887/jptk.v8i1.2890

Subekti, K. R., Andryana, S., & Komalasari, R. T. (2021). Virtual Tour Lingkungan Universitas Nasional Berbasis Android Dengan Virtual Reality. *JIPI (Jurnal Ilmiah Penelitian Dan Pembelajaran Informatika)*, *6*(1), 38–48. https://doi.org/10.29100/jipi.v6i1.1711

*Tren dan Tips Gamifikasi untuk Pembelajaran Online – BINUS University*. (2019). https://binus.ac.id/knowledge/2019/09/tren-dan-tips-gamifikasi-untuk-pembelajaran-online/

Ulva, A. F. (2022). 3D Visualisation of Exhibition With Virtual Reality Concept Based on Web and Mobile. *Prosiding SNFT Unimal 2022*, 68–80. https://snft2022.ft.unimal.ac.id/SI/009-SI.pdf

Walls, H., Baker, P., Chirwa, E., & Hawkins, B. (2019). Food security, food safety & healthy nutrition: are they compatible? *Global Food Security*, *21*(April), 69–71. https://doi.org/10.1016/j.gfs.2019.05.005

Wang, T., Lund, B. D., Marengo, A., Pagano, A., Mannuru, N. R., Teel, Z. A., & Pange, J. (2023). Exploring the Potential Impact of Artificial Intelligence (AI) on International Students in Higher Education: Generative AI, Chatbots, Analytics, and International Student Success. *Applied Sciences (Switzerland)*, *13*(11). https://doi.org/10.3390/app13116716

Wibowo, R. P., & Romdhoni, F. H. (2015). Purwarupa Aplikasi Pembelajaran SQL Interaktif Berbasis Web dengan Penerapan Gamification. *Sisfo*, *05*(03), 390–397. https://doi.org/10.24089/j.sisfo.2015.03.018

Winanti, ., Abbas, B. S., Suparta, W., Heryadi, Y., Trisetyarso, A., & Gaol, F. L. (2020). *Gamification Framework for Programming Course in Higher Education*. *05*(02), 2018–2021.

Winanti, Gaol, F. L., Meyliana, & Prabowo, H. (2021). A Proposed Model for the Learning of Culinary Community with Technology Mobile for Culinary in Indonesia. *Journal of Positive Psychology & Wellbeing*, *5*(4), 1437–1452.

Yung, R., & Khoo-Lattimore, C. (2019). New realities: a systematic literature review on virtual reality and augmented reality in tourism research. *Current Issues in Tourism*, *22*(17), 2056–2081. https://doi.org/10.1080/13683500.2017.1417359