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Design of Learning Models and Automated Learning Cases for Educational Application of RPA

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Abstract. This study proposes that the surrounding data in the web environment that learners encounter on a daily basis can be an excellent resource for RPA learning, and aims to design and propose an RPA learning design model and a case that enables automated learning. For this study, automated learning is design in the field of application of 'rules-based decision logic'. In order to design a learning using Brity RPA as an automated learning tool for daily experiences, 6 steps is propose. In addition, it is intended to design and propose a case capable of learning to implement automation under the theme of the ‘Piano Tiles’ game provided through the web, and to use it as basic data for subsequent empirical studies.

Keywords: RPA, Robotic Process Automation, Learning Design Model for RPA Automation, Software Robot, Brity RPA.

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1. Introduction

Recently, in Korea, digitalization of labor is rapidly developing due to reasons such as the corona pandemic, the introduction of the 52-hour work system, and the continuous decrease of the working population. As a result, a means to replace human labor is required. Companies and public institutions are showing a movement to replace human labor with process automation with the introduction of RPA(Robotic Process Automation).

The Megatrend Top 10 for 2020, announced by Gartner (2019), puts humans at the center of technology strategy with the concept of “people-centered smart space”. And as shown in Fig. 1, ten strategic technologies are classified into ‘People-Centric’ and ‘Smart Spaces’. We propose a strategy that includes the concepts of Intelligent, Automation, and Connection in all fields (Choi, 2020:1).

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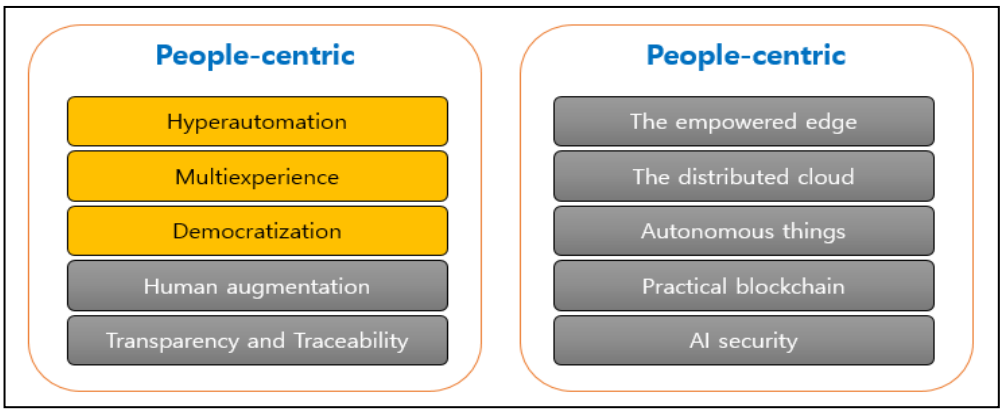


Fig. 1: Top 10 Strategic Technology Trends for 2020 (Gartner, 2019; Schneider, 2019)

Among the 10 strategic technologies proposed, Hyperautomation is described as 'a series of processes that utilize advanced technologies such as artificial intelligence (AI) and machine learning (ML) to automate tasks that were once performed by humans (Gartner, 2019). As an alternative to reducing the labor force, the introduction of robot process automation (RPA) is an issue that should be fully considered in all fields of society in that it can replace some of the tasks performed by human beings by automating them.

Democratization means that users can easily access any specialized technology or business expertise they want to utilize, even if they do not receive extensive and costly training in terms of 'application development, data and analysis, design, and knowledge' four specialized skills (Gartner, 2019). The RPA solution commercial program helps you to automate your work environment by creating data models or generating AI-based code, even if you lack professional knowledge for program development.

Multiexperience means ‘the skill to understand the person who understands the technology’ (Gartner, 2019). Modern people are given the opportunity to use a variety of devices, interactive platforms such as mataverse, or services that combine various IT technologies such as AR (Augmented Reality) and VR (Virtual Reality). The user's experiences accumulated while using these services acts as a catalyst that provides us with a daily environment that is more closely attached to IT technology.

In 2019, Forrester predicted that more than 85% of companies around the world would adopt RPA by 2022 (Choi, 2020:1). Recently, with the active acceptance of these changes, the number of RPA introduction cases in IT, finance, public institutions, and office/administrative fields is continuously increasing. Therefore, the demand for RPA personnel is expected to continue to increase in the process of business innovation. This is the reason why the interest in RPA manpower training is increasing in the education field, and this is why universities that nurture future talents should also pay attention.

Currently, IT-related technologies are permeating our daily lives like air. Already, our daily lives are moving toward helping strengthen individual competitiveness by converging with IT technology regardless of individual major. Now, we need to expand our thinking so that RPA can be used as a daily tool for personal convenience, beyond simply recognizing RPA as an automation tool for business innovation. Now, away from simply recognizing

RPA as an automation tool for business innovation, it is necessary to expand our thinking skills so that RPA can be used as a daily tool for personal convenience. It is necessary to explore the area of RPA utilization in daily life and consider it as a tool to strengthen individual time utilization and creative work competitiveness. Since it is mainly used in the field of business, most of the research related to RPA is related to the automation of office work and administration by companies or public institutions. Research related to cases and utilization plans, effectiveness, and acceptance intentions of RPA to increase work productivity is mainly being conducted. However, now research to use RPA as a learning tool within the curriculum of universities that cultivate future talents should also be considered.

In this study, we intend to examine RPA in terms of automated learning tools of daily experiences. As a prior study, the concept of RPA, applicable fields, and commercialized global Brity RPA solutions are examined. Through this, we would like to design a learning model so that RPA can be used in the classroom within the university curriculum, and to propose an automated design learning case using the surrounding daily environment and data. Ultimately, this study intends to use the Brity RPA solution and the daily experience environment to design cases where RPA learning models and automation implementation learning are possible, and to use them as basic data for later empirical research.

2. Related research

2.1. RPA(Robotic Process Automation)

RPA is a series of processes that minimize manual work by designing web, windows, and applications to operate automatically according to preset scenarios in a PC environment (Ahn, 2021:1). RPA is software that enables process automation by performing repetitive tasks that occur in a work instead (Shim et al., 2021: 94).

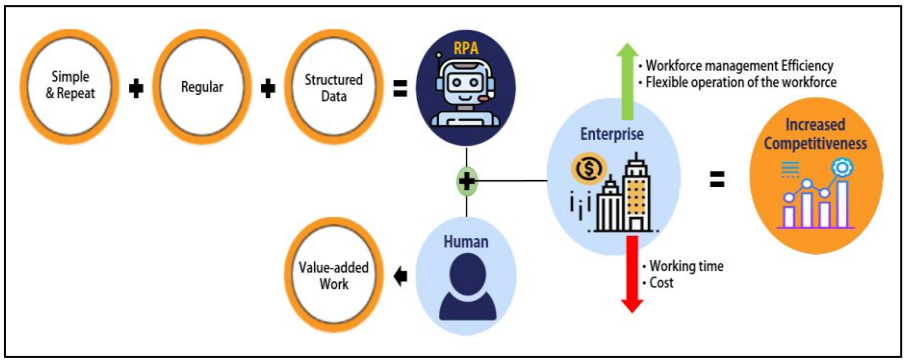


Fig. 2: Concept diagram of RPA utilization (Herald Economics, 2020 (reconstruction))

The RPA concept diagram (Fig. 2) introduced by Korea Securities Depository helps us understand RPA (Herald Economics, 2020). In the case of simple repetitive tasks that do not require human intervention, tasks in which a rule-based standardized process exists, and tasks that deal with structured data such as systems or websites, the effect of using RPA is greater (Choi, 2020:11). If RPA replaces what humans used to do, humans can devote more time to creative and more valuable tasks. From a company's point of view, it can increase the productivity of work and increase the efficiency of manpower management, which ultimately becomes a way to increase the competitiveness of a company. Therefore, the goal of RPA is

to improve work efficiency by helping software robots focus on more valuable and creative tasks by processing time-consuming mechanical and simple repetitive tasks instead. In the future, RPA is expected to will become a realistic execution tool for hyper-automation that leads intelligent process automation combined with artificial intelligence beyond simple and repetitive task automation. (Dialani, 2019; Shim et al., 2021:94).

2.2. RPA application field

RPA has been mainly used in fields to increase corporate work efficiency, such as financial and accounting management, personnel management, inventory management, and system and data management. Recently, it is moving toward expanding individual capabilities, such as using it as a document management and problem-solving tool.

A types of tasks that can increase the application effect of RPA by implementing automation using the surrounding environment and data such as systems and the web can be summarized as shown in Fig. 3. A task in which a decision is made based on a certain rule is more effective in implementing RPA automation.

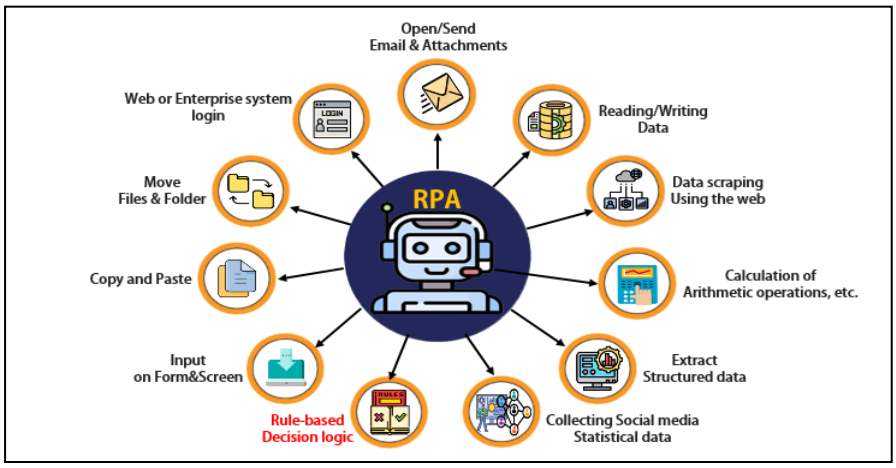


Fig. 3: RPA Implementation work area (Nam et al., 2019:4 (reconstruction))

2.3. RPA market trends

As shown in Fig. 4, the global RPA market expects growth to increase from $1.369.35 billion in 2019 to an average annual growth rate of 45.10%,and is expected to increase to $8.80752 billion in 2024 (INNOPOLIS, 2021:6). It can be largely classified into three processes: "Automation, Decision Support and Management, and Interaction" and the "Automation Solution" process is the field with the highest growth rate.

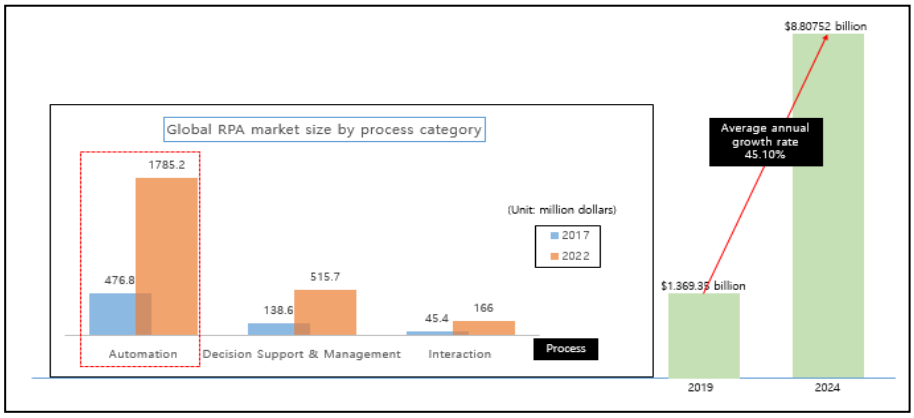


Fig. 4: Global RPA market size and outlook(INNOPOLIS, 2021:6-7 (reconstruction))

Shim et al. (2021:93) thought that the 4th Industrial Revolution was a digital transformation in which people and business processes were organically integrated around data. In Korea, the government has prepared a digital new deal policy to strengthen automation of work to prepare for environmental factors such as the Corona Pandemic situation and rapid digital transformation such as the Fourth Industrial Revolution (Edaily, 2020). Assuming that RPA automates the tasks of administrative organizations such as public project execution, if the work ratio is about 45% of the total and the proportion of simple tasks is about 70%, it is possible to save 2 trillion dollars in cost (Torlone et al., 2016). Positive perceptions of RPA introduction are also gradually spreading at home and abroad through positive experiences of fields and organizations that have already introduced RPA (Baek, 2020). Therefore, it is expected that in the future, there will be a growing demand for talent with the ability to increase efficiency by creatively automating tasks in the field of manpower and jobs for process automation solution development. Therefore, it is expected that the demand for talent with the ability to increase efficiency by enabling automation of tasks in creative ways in the field of human resources and job functions for developing process automation solutions is expected to increase in the future.

2.4. RPA Commercial Solutions and Brity RPA

RPA commercial solutions are being introduced in various ways as shown in Fig. 5, and in Korea, ‘Automation Anywhere’, ‘BluePrism’, and ‘UiPath’ commercial solutions are currently leading the RPA market.

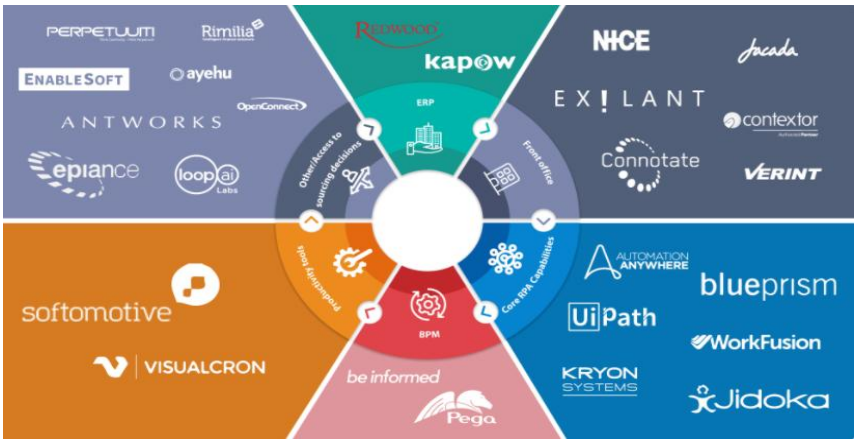


Fig. 5: Types of RPA solutions (Hopetutors, 2020 (reuse))

Recently, AI-based interactive ‘Brity RPA’ solution developed by Samsung SDS is also attracting attention. Brity RPA Solution was listed in the 2020 Gartner Magic Quadrant (MQ) in the RPA category for the first time in Korea (SDS, 2020). Brity RPA is currently being used for customer service, human resources, finance, and manufacturing process management in various industries and public institutions at home and abroad. By applying AI technology, Brity RPA supports functions (‘ChatBot (Bridge Assistant)’, 'Deep Learning-based Image Recognition (AICR)’, and 'Text Analysis') to handle repetitive tasks instead, and supports automation of complex tasks such as decision, examination, and evaluation (SDS, 2020). Samsung SDS is making various attempts such as opening its own academy and operating it for free to occupy the RPA market in Korea, and provides learners with a free license for 60 days (SDS, 2020).

The components of Brity RPA are shown in Table 1. If a task to be automated is designed through ‘Designer’, it is registered in ‘Orchestrator’, and ‘Bot’ has a structure that automatically executes tasks assigned by ‘Orchestrator’.

Brity RPA Designer provides various types of command cards through an embedded library. Therefore, when designing a work with 'Designer', automation can be easily configured with 'Drag & Drop' behaviour even if you do not have programming language knowledge or experience. It can be designed and executed in 'Designer' according to the task scenario to be automated. First, it is possible to test and correct errors on the PC where ‘Designer’ is installed. After being deployed to the server, it is possible to perform secondary automated performance tests through remote bots (SDS, 2020).

Table 1: Characteristics of components

Components	Characteristics
Designer	·Create automation work scenarios. ·Install and use on a PC or Virtual Desktop Infrastructure (VDI) via SW.
Orchestrator	·Scenario registration, scheduling, monitoring ·It is configured in the form of a separate server and interlocked with each other through the Internet network.
Bot	·It performs actual automation tasks ·Install and use on a PC or Virtual Desktop Infrastructure (VDI) via SW.

Learning and automation design using Brity RPA solution

2.5. Learning design model for educational application of RPA automation

In this study, a learning model with the steps shown in Fig. 6 is proposed for RPA automation learning.

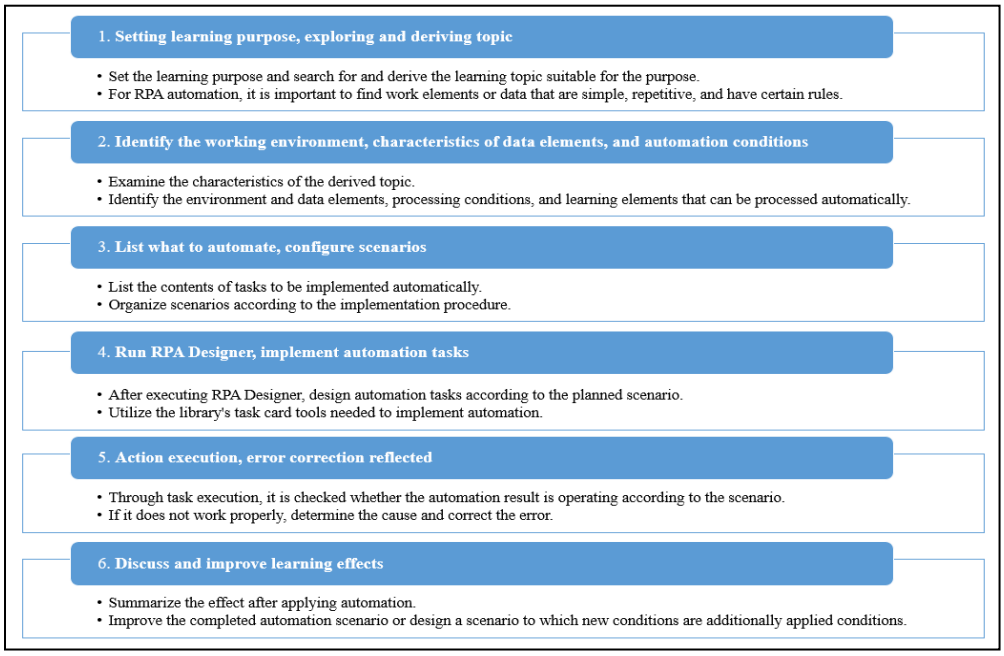


Fig. 6: Learning Design Models for RPA Automation.

2.6. Automation case learning design using Brity RPA solution

This study designs automated learning in terms of 'rules-based decision logic' among the types of tasks that can increase the application effect of RPA examined in previous studies. The ‘Piano Tiles’ game currently being serviced on the web is selected as the subject for this study. A game approached as a play can be a good topic that can keep learners interested and motivate them to learn. In addition, the 'Piano Tiles' game is simple, repetitive, and executed with certain rules, so it is suitable as an RPA learning case.

Automation design and execution utilize Brity RPA solutions. Brity RPA Designer provides command cards through built-in library, so you can easily implement automation without coding through drag & drop operation. Automation case learning using Brity RPA solution is proposed as shown in Table. 2 in line with the 'Learning Design Model for RPA Automation' step in Fig. 6.

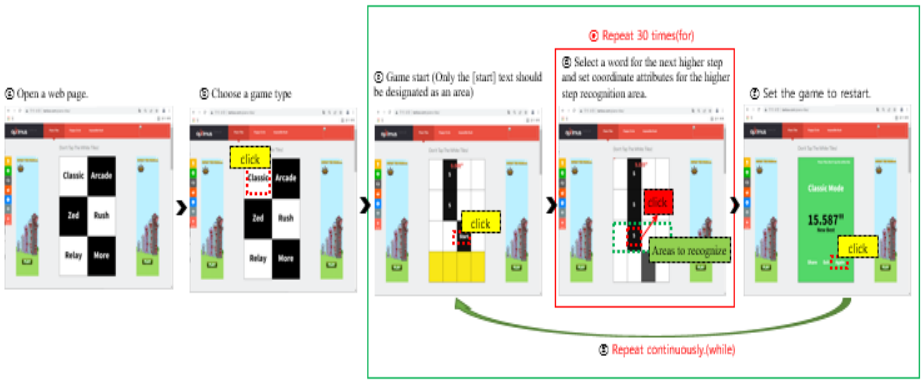
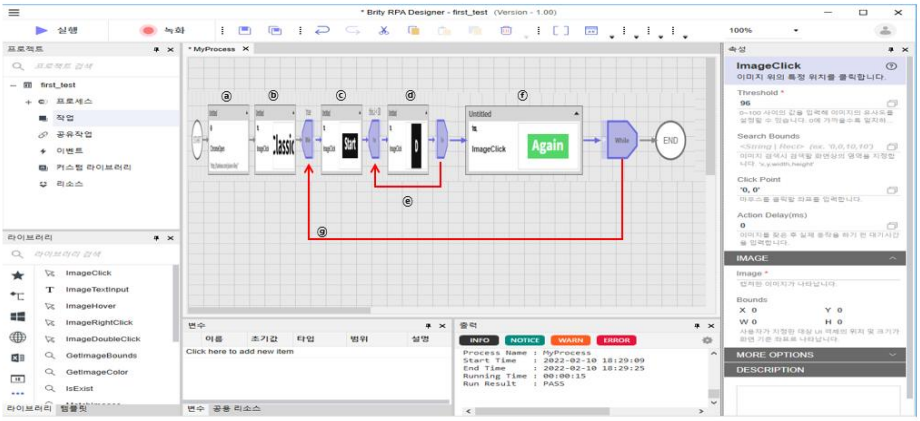
Step-by-step learning design		
1. Setting learning purpose, exploring and deriving topic		
	Purpose	· Motivate learners to learn · Understand how to use Brity RPA and implement automation
	Topic	· 'Piano Tiles' Automating internet games
2. Identify the working environment, characteristics of data elements, and automation conditions		
	Environment	· Chrome web browser, · web page(http://tanksw.com/piano-tiles/)
	Element	· Image data, repetitive work
	Characteristics	· A total of 30 keys are pressed per game to generate sound.
	Processing conditions	· After one game is over, it continues to restart and repeat the game.
3. List what to automate, configure scenarios		
	Automation Content	· Automatically recognizes the words on the piano keyboard randomly presented in the same step area for 30 times and generates the corresponding piano sound. · When the game of one cycle is over, restart the game repeatedly.
	Scenario	ⓐ Access the 'Piano Tiles' game web page ⓑ Choose a game type. ⓒ Game start(Only the [start] text should be designated as an area) ⓓSelect a word for the next higher step and set coordinate attributes for the higher step recognition area. (to automatically recognize words) ⓔ Set properties so that the operation of ⓓ is repeated a total of 30 times ⓕ Set the game to restart ⓖ Set the operation of ⓒ~ⓕ are to be carried out continuously.
	 · The web page that I used 'http://tanksw.com/piano-tiles/'.	

Table 2. Automation Design Cases Using Brity RPA Solutions

4. Run RPA Designer, implement automation tasks	
Utilized Library	· Image recognition, Flow Control, Chrome browser, etc.
· Run RPA Designer, design automation tasks 	
5. Action execution, error correction reflected	
· Run RPA Designer, and check the automation result to see if it works according to the scenario · If there is an error, correct the error and redo	
6. Discuss and improve learning effects	
· Discuss the conceptual and procedural knowledge required to learn to implement automation · Discuss the effect after application of automation · Adding selection conditions to automated design, designing new scenarios, and improving it.	

Conclusion and future work

Recently, in Korea, along with the corona pandemic, the introduction of the 52-hour work system and the continuous decrease of the labor force are promoting digitalization of labor. RPA, which is effective under certain circumstances, such as when the conditions of 'rule based, heavy workload, and repeated' are met, attract attention as a means to replace human labor are receiving. When RPA is combined with the concepts of cognitive, and smart analytics, it becomes a digital workforce, a subject that can perform tasks by complementing humans (Jeong, 2021). Therefore, RPA has been studied and utilized in fields that can improve work efficiency through work automation of companies or public institutions. However, it is now necessary to study its use in educational aspects as a tool to strengthen individual capabilities.

This study proposes that the surrounding data in the web environment that learners encounter on a daily basis can be an excellent resource for RPA learning, and aims to design and propose an RPA learning design model and a case that enables automated learning. For this study, automated learning was designed in the field of application of 'rules-based

decision logic'. In order to design a class using Brity RPA as an automated learning tool for daily experiences, 6 steps as shown in Fig. 6 were proposed. In addition, it was intended to design and propose a case capable of learning to implement automation under the theme of the ‘Piano Tiles’ game provided through the web, and to use it as basic data for subsequent empirical studies.

This study is meaningful in that it proposes a class design model and automation implementation case so that RPA can be used as a tool to combine with daily data and learn. In this study, we designed a class for RPA learning in accordance with the proposed 6 steps, and designed and proposed a case for intuitively realizing automation by using game data on the web. However, in this study, empirical studies such as operating actual classes and analyzing effects and improvements have not been conducted.

In the future, it is necessary to derive effectiveness and improvements after running actual classes within the university curriculum. In addition, it is necessary to continuously search for cases by exploring various topics that can be fused according to the characteristics of the subject and the characteristics of the learner. It is necessary to seek a way to actively utilize the surrounding data in the web environment, which learners are encountering on a daily basis, as a learning resource.

Throughout society, including the labor market, 'convergence' is one of the key competency keywords in the era of the 4th industrial revolution. In addition, in recent years, we are transitioning to a society that evaluates convergence activities with IT technology as individual competency in all fields, separate from the learner's major or professional knowledge. Higher education, such as university education, has important implications for entry and transition into the labor market. (Kim, 2021:887). One of the roles of the university is to nurture future talents required by society, and students may understand their talents, aptitudes, and interests and modify their career paths while experiencing the university education process. Therefore, it is very valuable for universities to provide students with opportunities to use IT technology universally regardless of their major. Therefore, it is also necessary to study the development of various curriculums for learning RPA, which is showing a trend of increasing demand for talent in the future society.

The effect of task automation using RPA is not limited to just the productivity of the task. The additional personal time freed up by automation can lead to the development of competence and concentration on other tasks. And for future talents living in the era of the 4th industrial revolution, the experience of RPA learning can lead to another learning that attempts a new creative fusion with the learner's field of interest. Therefore, it is also necessary to study various methods to utilize RPA as a tool to enrich our lives.

3. Acknowledgements

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