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Improvement Plan Through NONAGREEMENT CONSULTATION Analysis of Small Scale Environmental Impact Assessment

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Abstract

Purpose: *Small-scale environmental impact assessment means an assessment conducted by surveying, forecasting, and assessing the appropriateness of a site location and the environmental impact to provide ecological conservation measures when it is intended to implement a development project in an area requiring planned development. However, there are many cases of raising problems because of environmental information's lack and uncertainty about ecological issues. Therefore, this study aimed to improve the small-scale environmental impact assessment consultation for the development project by analyzing the reasons for the nonagreement of consultation work, focusing on regulations related to the environment and law.*

Method: *This study analyzed 357 cases notified the result of 'nonagreement' consultation of small-scale environmental impact assessments for 9 years from 2012 to 2020. We conducted a one-way ANOVA analysis to determine the differences in the reasons for nonagreement consultation by year, by consulting agency, by project zone, and by project type. Post-hoc analysis was performed by the Scheff test. To conduct statistical analysis, we used Spss Statistics 21 statistical program.*

Results: *The sharp increase in the number of yearly nonagreements in 2018 can be attributed to environmental policy variations following government change in 2017. This increase is because the basis for determining the contents of small-scale environmental impact assessment consultations has become more stringent. We believe that the high rate of nonagreement consultation regarding guidelines and regulations in 2018 and 2019 is also an amendment in environmental policy following the change of government in 2017. The ratio of energy projects was high as the reason for nonagreement consultation by project type. It is believed that this result was inevitable to lead to 'nonagreement' because the Ministry of Environment established the 'Environmental effects evaluation consultation guideline for inland solar power generation' in 2018 to limit the location of solar power plants.*

Conclusion: *To efficiently operate the small-scale environmental impact assessment and achieve the environmental assessment objectives, the Ministry of Environment should apply the relaxed criteria as a detailed guideline for each area in small-scale environmental impact assessments with small areas. Also, the differences in the analysis results by year and by consulting agency seem to be because most of the consultation workers are public administrative officers, and their working departments were changed according to the interchange of personnel every year. Public officials in charge of consultation are bound to rely on consultation review institutions such as the Korea Environment Institute, the Korea Environment Corporation, the National Institute of Ecology, and the National Institute of Environmental Research. They have no choice but to rely on them. Therefore, we suggest that the officials in charge of consultation should be technical officials rather than administrative officials to improve their professionalism. For efficient operation, frequent personnel transfers of public officials in charge of consultation should also be improved.*

[Keywords] ***Environmental Impact Assessment, Small Scale Environmental Impact Assessment, Nonagreement Consultation, Consulting Agency, Project Type***

1. Introduction

Small-scale environmental impact assessment is a precautionary measure against environmental impact. In formulating and implementing a project plan, environmental impact assessment seeks a project plan that considers its economic, technological, and environmental characteristics. It also aims for environment-friendly and sustainable development[1][2]. However, since the small-scale environmental impact assessment is performed before the project, predicting the project's future situation essentially contains uncertainty[3][4]. Small-scale environmental impact assessment is a precautionary action that predicts and analyzes the environmental impacts that may appear in pursuing a development project and devises measures to minimize the expected adverse effects. Therefore, it is necessary to keep pace with social interests and changes in environmental issues[5][6][7].

There are four types of environmental impact assessment: Governmental plan strategic environmental impact assessment, Master development plan strategic environmental impact assessment, Environmental impact assessment, and Small-scale environmental impact assessment. The term 'small-scale environmental impact assessment' means an assessment conducted by surveying, forecasting, and assessing the appropriateness of a site location and the environmental impact of a development project to provide measures for environmental conservation, when it is intended to implement a development project in an area requiring environmental conservation or in an area requiring planned development because reckless development is anticipated[2][8].

With the enactment of the Environmental Impact Assessment Act in 1993, the law stipulates the environmental impact assessment's specific matters, such as the subject scope of the environmental impact assessment, the timing of consultation, and the consultation procedure. Environmental impact assessment has also changed, such as establishing penalty provisions for implementing consultations' contents on environmental impact assessment. Choi et al.(2004) considered that the natural environment and living environment sectors had a high proportion of environmental impact assessments so far and that environmental assessments on social and economic environmental impacts will be necessary for the future. They suggested the improvement direction and the realization of environmental evaluation for social and economic items[8]. Kim(2020) analyzed the environmental impact assessment system and operation status implemented in metropolitan local governments such as Seoul and Busan. This analysis identified the operating system's fruits and limitations of local governments' environmental impact assessment and suggested policy measures to improve them[9].

Lee(2020) analyzed the reasons for the cases of 'nonagreement' in the environmental impact assessment. He suggested improvement measures for consultation decisions in environmental impact assessment for development projects, focusing on land use regulations and environmental grades for the environment[10]. Choi(2008) comprehensively grasped the problems presented about the environmental impact assessment system and suggested improvement alternatives for securing the effectiveness and reliability of the environmental impact assessment[11].

In terms of policy measures to prevent environmental pollution and environmental damage, a small-scale environmental impact assessment can be seen as an ideal method. However, there are many cases of various problems due to lack of environmental information and uncertainty about environmental problems[12][13][14][15]. In most projects that cause environmental problems, some people complain of damage, and others benefit from the project, so the value judgment criteria are sharply opposed. It is not easy to adjust this[16][17].

We tried to contribute to the search for ways to achieve efficient operation and evaluation objectives by analyzing the 'nonagreement' reasons for small-scale environmental impact assessment consultations, and to find ways to improve consultation decisions about development projects.

2. Methods

2.1. Gathering data

With the amendment to the Environmental Impact Assessment Act, the prior environmental examination related to development in the conservation area was changed to a small-scale environmental impact assessment[18]. This study targeted 357 cases that received 'nonagreement' decisions for a small scale environmental impact assessment for a total of 9 years from 2012 to 2020. The data was extracted from the Environmental Impact Assessment Support System(www.eiass.go.kr) and used for analysis <Table 1> and <Figure 1>. The percentage of 'nonagreement' cases by the consulting agency was the highest at Daegu Regional Environment Office with 110 cases(30.8%). Yeongsan River Basin Environmental Office 83 cases(23.2%), Geum River Basin Environmental Office 57 cases(16.0%), Wonju Regional Environment Office 42 cases(11.8%), Han River Basin Environmental Office 35 cases(9.8%), Nakdong River Basin Environmental Office 23 cases(6.4%), and the lowest at Jeonbuk Regional Environment Office with 7 cases(2.0%).

Table 1. Number of research target area.

Target index / Institution in consultation	Number	Ratio
HRBEO	35	9.8
GRBEO	57	16.0
NRBEO	23	6.4
YRBEO	83	23.2
WREO	42	11.8
JREO	7	2.0
DREO	110	30.8
Total	357	100

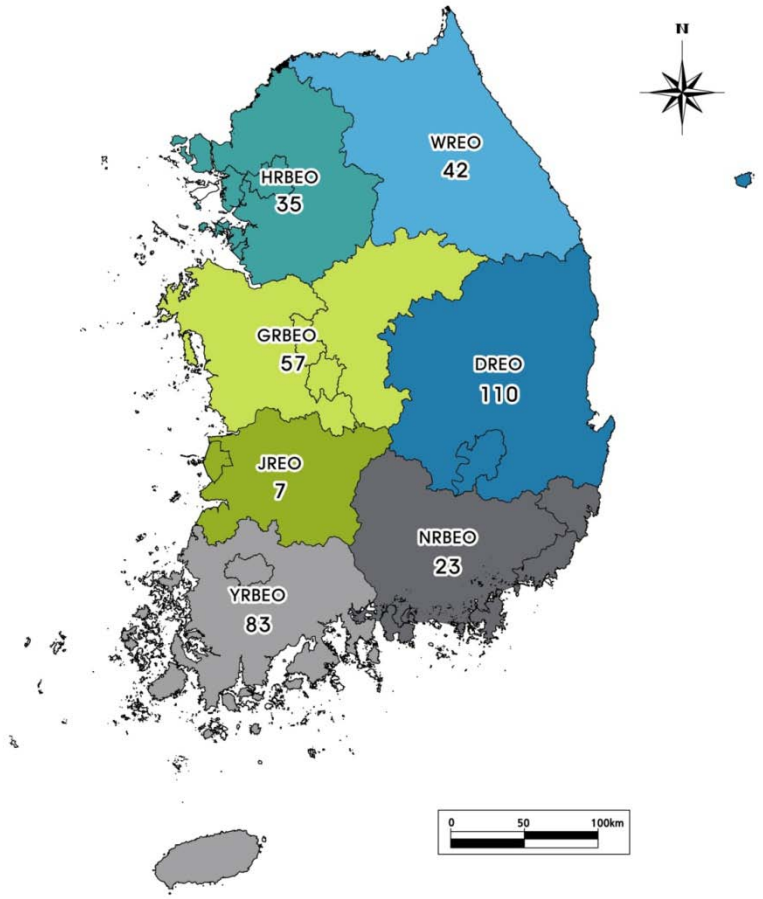
Note: HRBEO: Han River Basin Environmental Office, GRBEO: Geum River Basin Environmental Office, NRBEO: Nakdong River Basin Environmental Office, YRBEO: Yeongsan River Basin Environmental Office, WREO: Wonju Regional Environment Office, JREO: Jeonbuk Regional Environment Office, DREO: Daegu Regional Environment Office.

2.2. Data analysis

This study analyzed data that received nonagreement results of small-scale environmental impact assessments. To determine the difference in the number of nonagreement projects by period, we classified them by year and analyzed them. To determine the difference in the number of nonagreement projects by each city/province, we classified and analyzed them as a consulting agency. To determine the difference in the number of nonagreement projects by project zone, we classified and analyzed them as a use area. The project types were classified and analyzed to determine the number of nonagreement projects by project type. To determine the difference between the nonagreement reasons, we classified them into environmental reasons and legal reasons and analyzed them.

This study conducted a one-way ANOVA analysis to analyze the reasons for nonagreement results and the difference by year, consulting agency, project zone, and project type. Post-hoc analysis was performed by the Scheffe test. Statistical analysis was performed by the Spss Statistics 21 statistical program.

Figure 1. Number of jurisdictions and studies.



3. Results & Discussion

3.1. Analysis of reasons for nonagreement by year

<Table 2> shows one-way ANOVA analysis results to determine the difference in the reasons for the nonagreement consultations by year. The result of checking the F value and significance probability in the reasons for 'nonagreement' was F=13.909, p=0.000. There were differences in the reasons for nonagreement consultations by year.

Table 2. Variance analysis of reasons for nonagreement by year.

One-way ANOVA analysis					
Division	Sum of squares	df	Mean square	F	Significance probability
Between - group	166.901	8	20.863	13.909	.000***

Within - group	521.978	348	1.500		
Total	688.880	356			

Note: *p<.05, **p<.01,***p<.001.

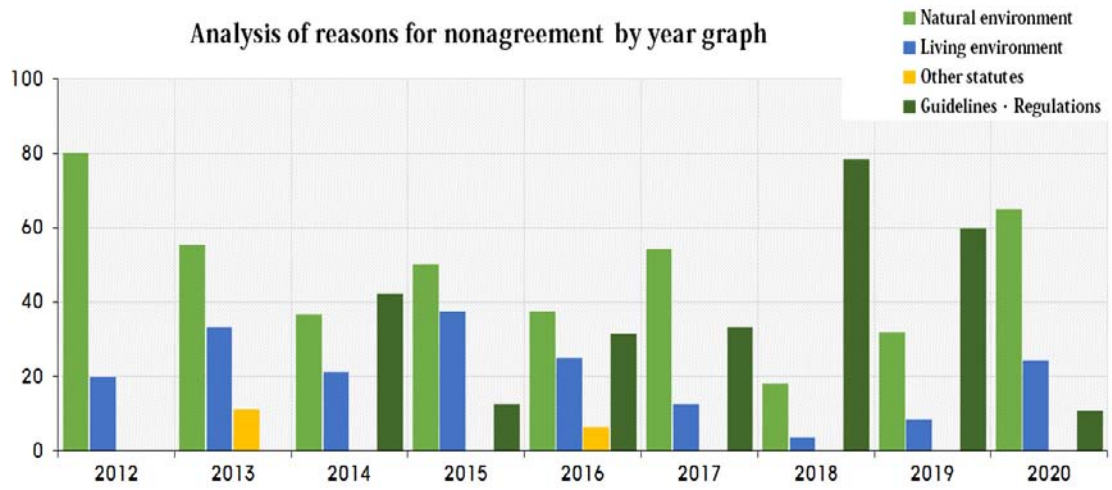
In 2018, the percentage of nonagreement cases was the highest at 167 cases(46.78%). 72 cases(20.17%) in 2019, 37 cases(10.36%) in 2020, 24 cases(6.72%) in 2017, and the lowest with 5 cases(1.40%) in 2012. The sharp increase in the number of nonagreement cases in 2018 can be attributed to the stricter basis for determining the contents of the environmental impact assessment consultation due to the change in environmental policies following the change of government in 2017[10][19][20].

<Table 3> and <Figure 2> show the results of analyzing the reasons for 'nonagreement' by year. In 2012, 2013, 2015, 2017, and 2020, the ratio of 'nonagreement' related to the natural environment was high, and in 2018 and 2019, the ratio of 'nonagreement' related to guidelines and regulations was high. The high percentage of 'nonagreement' related to guidelines and regulations in 2018 and 2019 can also be attributed to the enactment of the 'Environmental effects evaluation consultation guideline for inland solar power generation' as a change in environmental policies following the change of government in 2017[10][19][20].

Table 3. Analysis of reasons for nonagreement by year.

Reasons / Year	N	Environmental reasons				Legal reasons			
		Natural environment		Living environment		Other statutes		Guidelines · Regulations	
		N	(%)	N	(%)	N	(%)	N	(%)
2012	5	4	80.0	1	20.0	0	0	0	0
2013	9	5	55.6	3	33.3	1	11.1	0	0
2014	19	7	36.8	4	21.1	0	0	8	42.1
2015	8	4	50.0	3	37.5	0	0	1	12.5
2016	16	6	37.5	4	25.0	1	6.3	5	31.3
2017	24	13	54.2	3	12.5	0	0	8	33.3
2018	167	30	18.0	6	3.6	0	0	131	78.4
2019	72	23	31.9	6	8.3	0	0	43	59.7
2020	37	24	64.9	9	24.3	0	0	4	10.8
Total	357	116	32.5	39	10.9	2	0.6	200	56.0

Figure 2. Analysis of reasons for nonagreement by year graph.



3.2. Analysis of reasons for nonagreement by consulting agency

<Table 4> shows one-way ANOVA analysis results to determine the difference in the reasons for the nonagreement consultations by consulting agency. The result of checking the F value and significance probability in the reasons for 'nonagreement' was F=7.651, p=0.000. There were differences in the reasons for nonagreement consultations by consulting agency.

Table 4. Variance analysis of reasons for nonagreement by consulting agency.

One-way ANOVA analysis

Division	Sum of squares	df	Mean square	F	Significance probability
Between - group	79.875	6	13.313	7.651	.000***
Within - group	609.004	350	1.740		
Total	688.880	356			

Note: *p<.05, **p<.01,***p<.001.

The percentage of nonagreement cases by consulting agency was the highest at Daegu Regional Environment Office with 110 cases(30.8%). Yeongsan River Basin Environmental Office 83 cases(23.2%), Geum River Basin Environmental Office 57 cases(16.0%), Wonju Regional Environment Office 42 cases(11.8%), Han River Basin Environmental Office 35 cases(9.8%), Nakdong River Basin Environmental Office 23 cases(6.4%), and the lowest at Jeonbuk Regional Environment Office with 7 cases(2.0%).

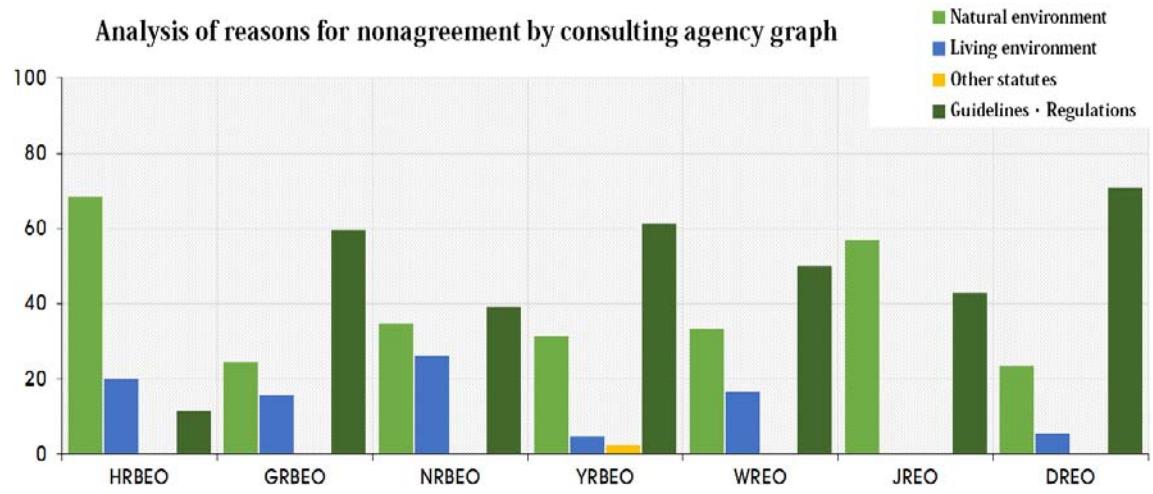
<Table 5> and <Figure 3> show the results of analyzing the number and ratio of cases for 'nonagreement' by consulting agency. The Han River Office and Jeonbuk Office showed a high ratio of 'nonagreement' related to the natural environment. The Geum River Office, Youngsan River Office, Wonju Office, and Daegu Office showed a high ratio of 'nonagreement' related to guidelines and regulations.

Table 5. Analysis of reasons for nonagreement by consulting agency.

Reasons / Consulting agency	N	Environmental reasons				Legal reasons			
		Natural environment		Living environment		Other statutes		Guidelines・Regulations	
		N	(%)	N	(%)	N	(%)	N	(%)
HRBEO	35	24	68.6	7	20.0	0	0	4	11.4
GRBEO	57	14	24.6	9	15.8	0	0	34	59.6
NRBEO	23	8	34.8	6	26.1	0	0	9	39.1
YRBEO	83	26	31.3	4	4.8	2	2.4	51	61.4
WREO	42	14	33.3	7	16.7	0	0	21	50.0
JREO	7	4	57.1	0	0.0	0	0	3	42.9
DREO	110	26	23.6	6	5.5	0	0	78	70.9
Total	357	116	32.5	39	10.9	2	0.6	200	56.0

Note: HRBEO: Han River Basin Environmental Office, GRBEO: Geum River Basin Environmental Office, NRBEO: Nakdong River Basin Environmental Office, YRBEO: Yeongsan River Basin Environmental Office, WREO: Wonju Regional Environment Office, JREO: Jeonbuk Regional Environment Office, DREO: Daegu Regional Environment Office.

Figure 3. Analysis of reasons for nonagreement by consulting agency graph.



3.3. Analysis of reasons for 'nonagreement' by project zone

<Table 6> shows one-way ANOVA analysis results to determine the difference in reasons for the nonagreement consultations by project zone. The result of checking the F value and significance probability in the reasons for 'nonagreement' was F=12.969, p=0.000. There were differences in the reasons for nonagreement consultations by project zone. The percentage of nonagreement cases by project zone was the highest in agricultural and forest areas with 140

cases(39.22%). 81 cases(22.69%) in conservation control areas, 54 cases(15.13%) in planned control areas, 35 cases(9.80%) in river areas, and the lowest in natural environment conservation areas with 7 cases(1.96%). Therefore, agricultural and forest areas can be an essential indicator for nonagreement consultations.

Table 6. Variance analysis of reasons for nonagreement by project zone.

One-way ANOVA analysis					
Division	Sum of squares	df	Mean square	F	Significance probability
Between - group	125.295	6	20.882	12.969	.000***
Within - group	563.585	350	1.610		
Total	688.880	356			

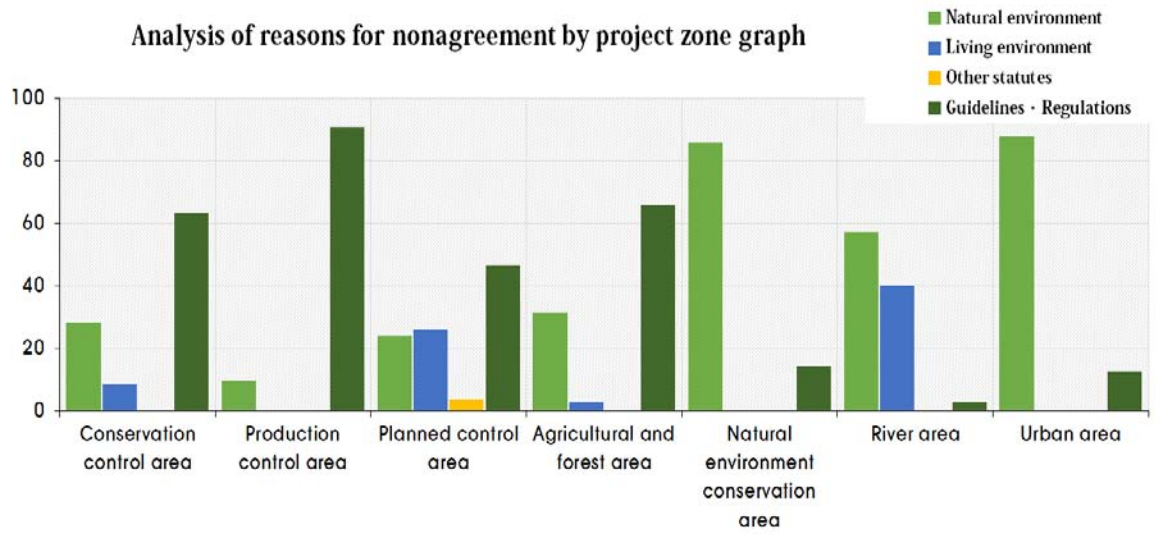
Note: *p<.05, **p<.01, ***p<.001.

<Table 7> and <Figure 4> show the results of analyzing the number and ratio of cases for 'nonagreement' by project zone. Natural environment conservation areas, river areas, and urban areas showed a high ratio of 'nonagreement' related to the natural environment. Conservation control areas, production control areas, and agricultural and forest areas showed a high ratio of 'nonagreement' related to guidelines and regulations.

Table 7. Analysis of reasons for nonagreement by project zone.

Reasons / Project zone	N	Environmental reasons				Legal reasons			
		Natural environment		Living environment		Other statutes		Guidelines・Regulations	
		N	(%)	N	(%)	N	(%)	N	(%)
Conservation control area	81	23	28.4	7	8.6	0	0	51	63.0
Production control area	32	3	9.4	0	0.0	0	0	29	90.6
Planned control area	54	13	24.1	14	25.9	2	3.7	25	46.3
Agricultural and forest area	140	44	31.4	4	2.9	0	0	92	65.7
Natural environment conservation area	7	6	85.7	0	0.0	0	0	1	14.3
River area	35	20	57.1	14	40.0	0	0	1	2.9
Urban area	8	7	87.5	0	0.0	0	0	1	12.5
Total	357	116	32.5	39	10.9	2	0.6	200	56.0

Figure 4. Analysis of reasons for nonagreement by project zone graph.



3.4. Analysis of reasons for nonagreement by project type

<Table 8> shows one-way ANOVA analysis results to determine the difference in reasons for the nonagreement consultations by project type. The result of checking the F value and significance probability in the reasons for 'nonagreement' was F=330.975, p=0.000. There were differences in the reasons for nonagreement consultations by project type.

Table 8. Variance analysis of reasons for nonagreement by project type.

One-way ANOVA analysis					
Division	Sum of squares	df	Mean square	F	Significance probability
Between - group	585.659	6	97.610	330.975	.000***
Within - group	103.221	350	.295		
Total	688.880	356			

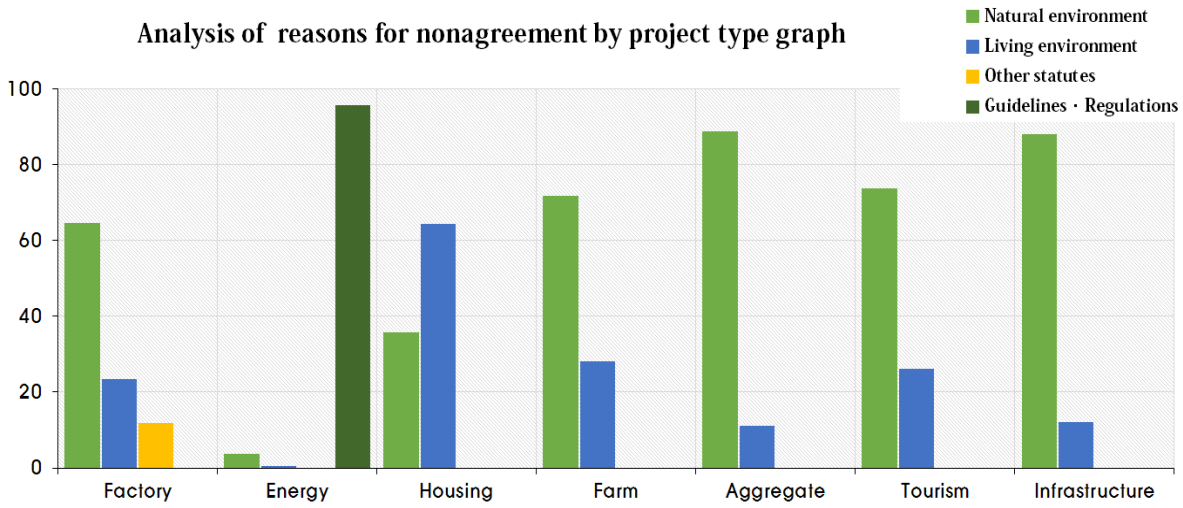
Note: *p<.05, **p<.01, ***p<.001.

The percentage of nonagreement cases by project type was the highest at Energy with 209 cases(58.54%). Tourism 42 cases(11.76%), Farm 32 cases(8.96%), Infrastructure 25 cases (7.00%), and the lowest at Housing with 14 cases(3.92%). <Table 9> and <Figure 5> show the results of analyzing the number and ratio of cases for 'nonagreement' by project type. Factory, Farm, Aggregate, Tourism, and Infrastructure projects showed a high ratio of 'nonagreement' related to the natural environment. Energy projects showed a high ratio of 'nonagreement' related to guidelines and regulations, and Housing projects showed a high ratio of 'nonagreement' related to the living environment. The reason why there are many cases of 'nonagreement' related to the guidelines and regulations in the energy projects can be considered to be that the location of solar power plants was limited by the enactment of the 'Environmental effects evaluation consultation guideline for inland solar power generation' in 2018[21][22][23].

Table 9. Analysis of reasons for nonagreement by project type.

Reasons / Project type	N	Environmental reasons				Legal reasons			
		Natural environment		Living environment		Other statutes		Guidelines · Regulations	
		N	(%)	N	(%)	N	(%)	N	(%)
Factory	17	11	64.7	4	23.5	2	11.8	0	0
Energy	209	8	3.8	1	0.5	0	0	200	95.7
Housing	14	5	35.7	9	64.3	0	0	0	0
Farm	32	23	71.9	9	28.1	0	0	0	0
Aggregate	18	16	88.9	2	11.1	0	0	0	0
Tourism	42	31	73.8	11	26.2	0	0	0	0
Infrastructure	25	22	88.0	3	12.0	0	0	0	0
Total	357	116	32.5	39	10.9	2	0.6	200	56.0

Figure 5. Analysis of reasons for nonagreement by project type graph.



4. Conclusion

Small-scale environmental impact assessment means an assessment conducted by surveying, forecasting, and assessing the appropriateness of a site location and the environmental impact to provide ecological conservation measures when it is intended to implement a development project in an area requiring planned development. However, there are many cases of raising problems because of environmental information's lack and uncertainty about ecological issues.

Therefore, in this study, the results of 357 small-scale environmental impact assessment nonagreement consultations for a total of 9 years from 2012 to 2020 were analyzed by year,

by consulting agency, by project zone, and by project type. We intended to contribute to finding ways to improve the decision to discuss the small-scale environmental impact assessment for development projects, focusing on ecological and legal regulations.

The summary of this study is as follows.

First, in the analysis of the number of nonagreement consultations by year, the sharp increase in the percentage of cases in 2018 can be attributed to the stricter basis for determining the contents of environmental impact assessment consultations because of the variations in environmental policies after the change of government in 2017.

The high ratio of 'nonagreement' with guidelines and regulations in 2018 and 2019 is also seen as an environmental policy amendment due to government change in 2017.

Second, for reasons of 'nonagreement' by each consulting agency, the ratio of reasons related to the natural environment was high at Han River Basin Environment Office and Jeonbuk Regional Environment Office. Geum River Basin Environmental Office, Yeongsan River Basin Environment Office, Wonju Regional Environment Office, and Daegu Regional Environment Office had a high percentage of reasons on guidelines and regulations.

Third, for reasons of 'nonagreement' by project zone, the ratio of reasons related to the natural environment was high at Natural environment conservation area, River area, and Urban area. Conservation control area, Production control area, and Agricultural and forest area had a high percentage of reasons on guidelines and regulations.

Fourth, for reasons of 'nonagreement' by project type, the ratio of reasons related to the natural environment was high at Factory, Farm, Aggregate, Tourism, and Infrastructure. Energy projects had a high percentage of reasons on guidelines and regulations. The ratio of reasons related to the living environment was high at Housing. In the energy projects, many nonagreement cases about guidelines and regulations are because the 'Environmental effects evaluation consultation guideline for inland solar power generation' was prepared in 2018. Since this guideline restricted the solar power plants' location, it seems that it was inevitable to lead to nonagreement consultations.

To efficiently operate the small-scale environmental impact assessment and achieve the environmental assessment objectives, the Ministry of Environment should apply the relaxed criteria as a detailed guideline for each area in small-scale environmental impact assessments with small areas. Also, the differences in the analysis results by year and by consulting agency seem to be because most of the consultation workers are public administrative officers and their working departments were changed according to the interchange of personnel every year. Public officials in charge of consultation are bound to rely on consultation review institutions such as the Korea Environment Institute, the Korea Environment Corporation, the National Institute of Ecology, and the National Institute of Environmental Research. They have no choice but to rely on them. Therefore, we suggest that the officials in charge of consultation should be technical officials rather than administrative officials to improve their professionalism. For efficient operation, frequent personnel transfers of public officials in charge of consultation should also be improved.

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6. Appendix

6.1. Authors contribution

	Initial name	Contribution
Lead Author	CK	-Set of concepts ☑ -Design ☑ -Getting results ☑ -Analysis ☑
Corresponding Author*	HL	-Make a significant contribution to collection ☑ -Final approval of the paper ☑ -Corresponding ☑ -Play a decisive role in modification ☑
Co-Author	WL	-Significant contributions to concepts, designs, practices, analysis and interpretation of data ☑ -Participants in Drafting and Revising Papers ☑ -Someone who can explain all aspects of the paper ☑

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Suggestions for ROK's Building Space Power as PUBLIC VALUES

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Abstract

Purpose: *The study aims to examine the strategies and trends of military space power in neighboring countries and derive implications for ROK's building space Power. This article tackles both conceptual and empirical dimensions of this topic through a series of four linked questions: (1)What is Sun Tzu's "Strategy" and how does it relate to space; (2)What is neighboring state's space strategy surrounding the Korean Peninsula?; (3)What kind of implications can we draw from the neighboring countries space strategy?; (4)What are policy alternatives for the ROK to build space power?*

Method: *For better analysis By using the " Sun Tzu's five fundamental factors(do[道] the way, cheon[天] seasons, chi[地] terrain, cheng[將] leadership, and beub[法] management)," a factor that predicts the success or failure of a strategic plan, this study attempted to draw implications and policy alternatives for the ROK by looking at the cases of military space force construction in neighboring countries. Sun Tzu introduces this as the 'docheonchichengbeub'.*

Results: *The policy options for the ROK military by applying Sun Tzu's Osa(五事) as follows. First, In terms of Do(道), the Moon Jae-in government has a strong will to build a foundation for strengthening space power under the responsible defense policy for the early return of wartime operational control. Currently, Korea's space power remains insignificant compared to neighboring countries. Efforts should be made to lay the foundation for the creation of an advanced space force by sharing such a vision with the leader.*

Second, the construction of space power in the U.S., China, Russia, and Japan surrounding the Korean Peninsula is gradually intensified as the factors of Cheon(天) and Chi(地). Therefore, there is a need for South Korea to create a road map for the construction of space power and implement positive space power building policies. Third, as a factor of Cheng(將), the Korean military has many problems to be improved in terms of organization, institutional maintenance, education, and technology development for space power. Fourth, to develop military space power in terms of the establishment of a policy base, laws and systems supporting space development shall be reorganized, and at the same time, the concept of space strategy and operational doctrine shall be developed, a defensive deterrent alliance strategy suitable for mid-sized countries, and a space power construction plan has to be established to utilize space power centered on the Joint Chiefs of Staff.

Conclusion: *It is required to strengthen the agility of operations by increasing the linkage between unmanned systems and satellites for the enhancement of public values such as saving lives in the emergency. Hence, it is suggested that the launch of a small satellite that are equipped with a high-performance optical camera has to be carried out earlier than scheduled. To respond to North Korea's ballistic missile threats, it is requested to expand high-resolution military reconnaissance satellite assets which are equipped with early warning capabilities.*

[Keywords] ***The ROK Army, Military Satellite, Strategy, Public Values, Space Power***

* This paper was partly extracted and re-quoted from a pilot study on the concept of military space strategy, a task assigned to policy research by the Ministry of National Defense. 2021, Korea National Defense University.

I. Introduction

Military space assets can be dual usage of public values for natural disaster forecast and saving human life in the emergency. The aspects of future warfare include information warfare, precision warfare by long-range precision-guided weapons, space warfare, remote warfare by unmanned equipment, and parallel warfare. In order to cope with this future war, it is time for Korea to establish its national space strategy. In terms of how to carry out this space warfare, strategy refers to tactics(兵術) to determine the skills of command, to lead the war, to deploy in what formation, to fight in what terrain, what tactics should be used to gain an advantage, etc. Robert Green, Art of War.

A military strategy is about how to use military assets as a way of operating military forces. Klauzevitz said, "Running a battle to achieve the ultimate goal of war," Riedelhart defined it as "an act of distributing and operating military assets to fulfill policy goals," and Michael Howard also defined, "Strategy is the operation and use of military force to achieve a given political goal"[1].

The word "strategy" comes from the ancient Greek word "strategos," which means "leader of the military," which means swordsmanship(兵術), which determines the technology of command, what formation is deployed, what terrain to fight, and what tactics should be used to gain an advantage. In this context, a military strategy is a way of operating military forces[2]. Peter Paret defined the strategy as "the use of armed force to achieve the military objectives and, by extension, the political purpose of the war[3].

As countries and groups that dominate the air, including space, are more likely to become winners of the war, the era of space war is coming using space fighter jets equipped with intelligent AI self-learning capabilities. Like the competition for nuclear weapons and satellite development in the past, space militarization competition in preparation for the space war era is intensifying under the water. As the battlefield expands from cyber to space, space weather monitoring, satellite control, satellite forces, and formation operation technologies are required.

Why is it necessary to establish a concept for a military space strategy at this point? This is because the space militarization of neighboring countries is progressing so fast that if the South Korean military fails to balance this trend, it could cause a major disadvantage in security, and if we do not prepare for a military space strategy considering neighboring powers, it will lead to a major security crisis at the end <Table 1>.

Table 1. Advanced developments in the militarization of space[4].

Russia	United States	China	Japan	India
Cosmos 2543 equipped with anti-satellite weapon.	US X-37B equipped with offensive space weapon.	X-37B equipped with offensive space weapon.	Developing ASAT system by using robotic arms, electronic attack, cyberattack	Demonstrated earth-to-space kinetic ASAT weapon.

On the Korean Peninsula, the role of space war is to identify the attack signs of ballistic missiles passing through outer space in advance, detect and intercept them with a KAMD(Korea Air and Missile Defense) system, and strike the attack point with drones or precision-guided weapons if necessary[5]. It also plays an important role in defeating war will by performing beheading missions against enemy leadership[6]. In space, space provides space for defense, denial, interception, and attack in wartime. This is essential for the South Korean military to acquire location information through satellites in the operation of the Korea Air and Missile Defense system, the strategic target strike system, and the overwhelming response system in response to North Korea's threats. The role of space warfare in future warfare shortens the

decision-making cycle from strategic target detection to hitting based on space reconnaissance assets. By using the " Sun Tzu's five fundamental factors(do[道] the way, cheon[天] seasons, chi[地] terrain, cheng[將] leadership, and beub[法] management)," a factor that predicts the success or failure of a strategic plan, this study attempted to draw implications and policy alternatives for the ROK by looking at the cases of military space force construction in neighboring countries. Sun Tzu introduces this as the 'docheonchichengbeub'. The Do(道; Moral Law) is about sharing goals or visions. "The Moral Law causes the people to be in complete accord with their ruler so that they will follow him regardless of their lives, undismayed by any danger."

It is important for both the government to share its vision for military space construction. Cheon(天; Heaven) is an analysis of the external environment, the trend of neighboring countries. Chi(地; Earth) is an analysis of external conditions. It means our capacity analysis. Cheng(將; The Commander) is an analysis of the person in charge of creative strategies for building a military space force. Beub(法: Method and discipline) relates to the organization for the construction of space power. This article tackles both conceptual and empirical dimensions of this topic through a series of four linked questions: (1)What is Sun Tzu's "Strategy" and how does it relate to space; (2)What is neighboring state's space strategy surrounding the Korean Peninsula?; (3)What kind of implications can we draw from the neighboring countries space strategy?; (4)What are policy alternatives for the ROK to build space power? To this end, chapter II will explain the three components of the strategy and explain how Sun Tzu's 'The Art of War' works in space. Chapter III describes the military space strategy of neighboring countries. Chapter IV seeks to draw implications for the construction of military space power in neighboring countries on the Korean Peninsula. Finally, Chapter V will present a policy alternative to strengthen ROK's space assets for public values.

2. Three Elements of Strategy

South Korea's strategic goal for military space is to adopt a defensive deterrence concept as a mid-sized country. A military strategy is simply a way of distributing and operating military assets. The strategic means and methods to do this should strengthen reconnaissance surveillance capabilities and strengthen the space technology cooperation system with India and other Eu partners and the United States to respond to space security threats from neighboring powers such as China, Russia. So-called, the fourth battlefield, space is an important strategic base for achieving the strategic advantage in terms of time, space and speed, which are the three key elements of strategy. This is because in an unexpected space at a time that the enemy does not know, it allows them to identify signs of enemy attacks based on military space strategic assets in advance, buy time to reject them, and neutralize the enemy with preemptive attacks. Space power’s inherent speed, reach, responsiveness, precision, and lethality can create the necessary effect[7].

In this chapter, we would like to divide the strategy of the Sun Tzu's into three components: force(勢), responsiveness(應變力), deceit(詭道).

2.1. Three components of the strategy

The term "strategy" means a method of controlling the other party by utilizing the components to achieve political and military purposes in a war. The Sun Tzu cites three factors that can be used as a way of war: three factors: force(勢), responsiveness(應變力), and deceit (詭道). In general, military strategy refers to the establishment of a plan to achieve political and military purposes through the effective distribution of space strategic assets. In this context, the universe is a useful space that can fully utilize the advantages of being high. The advantage of using space strategic assets is that it can quickly hit the enemy's strategic target at

an unexpected time by efficiently utilizing time-space and, speed, which are three factors in strategic operations.

The military use of a space-based communication system through internal capacity analysis(technology, financial resources), analyzing the external environment(the trends in neighboring countries, necessity), and maintaining confidential information before establishing a military space strategy is a prerequisite for establishing a military space strategy. Traditional strategy-making methods derive optimal solutions by pursuing organic suitability with three factors: external factors, internal strengths, and internal weaknesses. Management strategy analyzes this with SWOT techniques <Table 2>.

Table 2. Comparative analysis between(5 事 7 計) and SWOT[8].

道(Do)		External strategic factors(Chen, Chi: 天, 地)	
		O(Opportunity)	T(Threat)
Internal strategic factors (Cheng, Beub; 將, 法)	S(Strength)	SO Strategy to use internal strength as an opportunity factor (aggressive strategy focused on growth)	ST Strategies to overcome risks through internal strengthening (diversity strategy)
	W(Weakness)	WO Strategies to overcome weaknesses by taking advantage of opportunities (strategic alliance, bypass strategy)	WT Strategies to overcome weaknesses and threats at the same time (defensive strategy)

In terms of modern management analysis techniques, ROK's military space power construction is analyzed in four ways, and first of all, at a time when the powerful nation is competitively commercializing its' military into space in terms of SO, the ROK also needs a growth-oriented aggressive strategy to secure space power assets to balance. Second, to commercialize the satellite business by involving private experts and large companies in terms of ST, diversification strategies to boost private investment are needed. Third, to acquire advanced space military technology in terms of WO, it is required to acquire their advanced skills by establishing a cooperative system through strategic alliances in the space industry with advanced countries with India and Europe. In terms of WT, considering the poor conditions and institutionalization of the ROK's military space assets compare with the neighboring countries, it is necessary to implement a peaceful rise strategy to gradually increase military space power while adopting a defensive deterrence strategy based on the South Korea-U.S. alliance. This is because building space forces for demonstration will bring in checks from neighboring countries. SWOT analysis in the form of S(strengthen), W(weakness), O(opportunity), and T(threat) can be summarized as follows <Table 3>.

Table 3. SWOT analysis of ROK's military space power building.

Strength	Weakness
- Operation of various attack weapon systems linked to navigation satellite information - Enhancing synergy effect through private application of space technology and utilization of private technology - Enhancing effectiveness in cyber warfare, information warfare, NCW and multi-Domain operations(MDO), and space warfare	- Lack of budget and checks of neighboring countries - Lack of space industry base - Lack of source technology and manpower
Opportunity	**Threat**
- Enhancing the effectiveness of the 3 axis system - Activating the private space industry, activating the commercial satellite industry - Establish a foundation for independent space military operations - Strengthen external relations by establishing a cooperative system with advanced countries such as the United States, India, and EU space power - Development of rocket technology for commercial use	- Checks from China and Japan - Check from developed countries in the satellite launch market - North Korea's opposition to the construction of advanced space forces

According to a hypothetical SWOT analysis of the South Korean military's construction of military space power, the South Korean military's opportunity factor is that it can boost the defense industry by laying the groundwork for carrying out its space military operations and strengthening its cooperative system with countries with advanced space technology, Also the ROK can achieve its long-cherished desire of enhancing the effectiveness of the three-axis system at the Joint Chiefs of Staff level by revitalizing the private space industry and entering the commercial satellite industry. However, it is necessary to overcome the limitations of the lack of space industry base, lack of original technology, and shortage of professionals. Also, the checks of China and Japan and North Korea's opposition to the construction of advanced space forces are also important variables to consider as threats.

However, to build military space power, it is necessary to overcome various constraints by the diversification of the space industry out of the existing state-led of old space and adopt a growth-oriented aggressive strategy of the new space. It is argued that the chances of winning can be judged by analyzing the five basic elements that determine the victory or defeat of the war. These five elements, which are prerequisites for the strategic establishment, are politics (道), climate(天), and geography (地), fourth is the commander(將), and fifth is the method and discipline (法)[9]. Sun Tzu's argues that the preconditions and fundamentals for success are Osa(五事), namely "Do(道), Cheon(天), Chi(地), and Cheng(將) Beub(法)." Chilge(七計), ①Which of the two sovereigns is imbued with the Moral laws? ②Which of the two generals has the most ability? ③With whom lie the advantages derived from Heaven and Earth? ④On which side is discipline most rigorously enforced? ⑤Which army is stronger? ⑥On which side are officers and men more highly trained? ⑦In which army is there the greater constancy both in reward and punishment? Sun Tzu forecasts victory or defeat employing these seven considerations.

Sun Tzu said, "If you fully understand the five elements of 'docheonchijanchengbeub' and use it to establish strategies, you can win, and if you ignore these factors, you cannot win." Do(道) is the vision of a political leader, Cheonji(天, 地) means climate geography and conditions, Cheng (將) is related to military leaders and troops, quality of weapons, military training, and the Beub(法) is related to strictness and fairness in law enforcement. By analyzing these five factors, it can determine which side will win the war.

2.1.1. Force(勢)

The combination of power(力) and scheme(謨) is the main focus of Sun Tzu's strategic ideas. It is the strategy that becomes a detailed operational means of combining these two, and from these strategies, power(勢) can be formed to control the enemy. No matter how strong the power is, it cannot be changed to force(勢) without the strategy. No matter how much space strategic assets are developed, it is useless if there is no know-how to operate them in detail. It is Sun Tzu who introduce this force(勢) concept in the military realm. These forces(勢) need to be quickly operated in the course of planning, preparation, progress, and victory in the course of space war to win. In space warfare, victory can be achieved when a force(勢) exerts its power by an excellent strategy.

If we make good use of these forces(勢) in the modern Network Centric Warfare(NCW), we can take control of the battlefield, lead the enemy as our military wants, and will not be dragged around. For example, Sun Tzu defines, "A military leader who makes good use of military forces is like rolling around stone down on high terrain, which is called forces(勢). " These forces(勢) can be divided into a posture(態勢) and drift(趨勢). To put it simply, posture is a situation in which laser artillery is ready to project powerful laser light, and the drift is that strong power is converted into wave energy of light, which can be explained as drift(趨勢). In other words, posture(態勢) means the best preparation to exert physical power, and the drift(趨勢) means using force based on it. In space warfare, readiness refers to the optimal readiness to exercise physical power with space-based military equipment, and the drift(趨勢) means a strong physical blow to the enemy with these space military strategic assets. Space-based strategic assets are the top power in modern warfare. This is because it uses satellites orbiting space to specifically provide necessary information to all three groups of electronic equipment in real-time, making it possible to hit the enemy immediately.

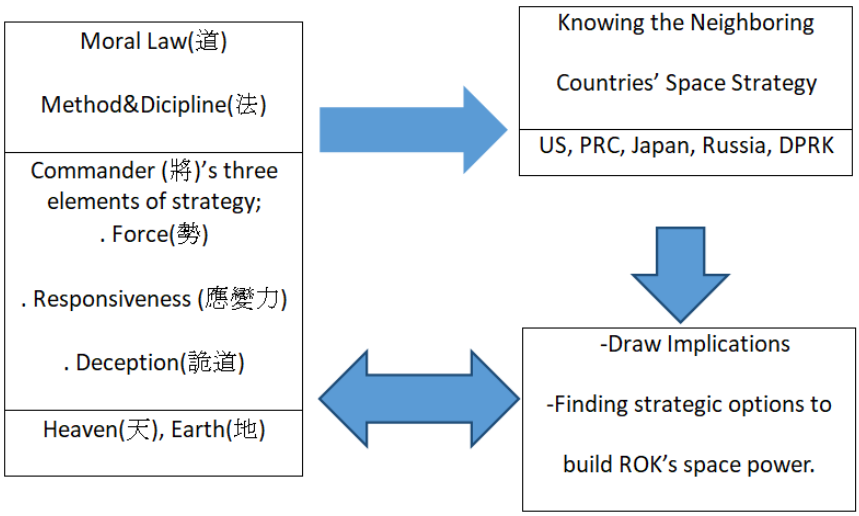
2.1.2. Responsiveness(應變力)

Sun Tzu's strategy, or how to fight, does not just mean pushing to the end as planned. It is necessary to respond swiftly to changes in the surrounding environment, such as climate, terrain, and enemy situations. Just as water changes its shape depending on the terrain, it also means choosing the best way and means to win as the situation changes. In other words, it is necessary to be able to establish various alternatives and plans before distributing military assets. These adaptations require two factors. Firstly, the importance of knowing the enemy(知被). This is a preparatory step to identify and respond to the "opportunities" and "threats" faced by analyzing the trends and, situations of military forces in neighboring countries and other countries. Secondly, the importance of immediate responsiveness. This is to pursue innovative changes to cope with rapidly changing trends in space forces. In other words, to balance with neighboring countries that strengthen space military forces, the ROK military should draw innovative changes in organization, education, and training to develop and utilize space strategic assets while changing its overall perception of space awareness.

2.1.3. Deception(詭道)

A good commander is needed to respond appropriately to changes in the surrounding environment and the enemy's situation. It is necessary to deceive the enemy to achieve its purpose to make the enemy move according to our strategy[10]. To maximize the use of force and response on the battlefield, the enemy must be dispersed through deception(詭道) and our forces must attack the enemy's vulnerability by concentrating troops. "Deceit is an important means for those who are good at war to win, and we must respond appropriately to changes in the situation of the enemy," Sun Tzu stressed the importance of responding to the situation. In deception(詭道), in order to disperse enemies and concentrate allied forces to attack enemy vulnerabilities, proper intelligence and confidential protection must be strictly maintained.

Figure 1. Analysis framework.



In Chapter III, In 'docheonchichengbeub', a factor that can predict victory or failure in setting the direction of the construction of space military power, we will draw implications for the ROK after examining the trends of neighboring countries, which are the environmental factors of the external environment(天) and external conditions(地).

3. Military Space Strategy of Neighboring Countries

The goal of the Space Military Strategy is to secure the superiority of power and information in the military space for national security. Through this, it is to strengthen the infrastructure and operational capacity for the operation of the modern network-centered reconnaissance-attack system. The strategy is to inject that the enemy cannot achieve its purpose by fighting and to win by controlling the battlefield by penalizing the center of the enemy's strength.

Recently, major powers such as the U.S., Japan, China, and Russia are fiercely competing to preoccupy Space Domain[11]. This aspect is preparing for the High-Tech War, which has emerged since the Gulf War in 1990, a precision strike(PGM) by monitoring and command control(C4ISR) using the space of each country, and changes in future warfare. In addition, research on areas such as the use of cyberspace and the increase of ISR capabilities equipped with various advanced sensors and space weapon development are clearly described in the concept of military strategies. The neighboring states are increasing the proportion of space security in national crisis management. The neighboring countries of the Korean Peninsula are establishing a space force apart from the Army, Navy, and Air Force to take control of the space area.

Sun Tzu argues that pre-acquisition of victory(先勝戰略) should be attained before setting the strategy. Winning means winning a victory from an already defeated enemy by having a situation in advance that is bound to win. The winning army first creates a winning situation, and then fights, attacks the enemy's loopholes, and takes control of the battlefield. There are conditions for the establishment and verification of these strategies: Seonji(先知), Myosan(廟山) and Gunjaeng(軍爭). First, the meaning of Seonji is to fully grasp the enemy's situation through intelligence before the battle. Second, Myosan is a process of discussing strategies by comparing and analyzing our power with the enemy using the Osachilgye(五事七計) for victory.

This is the same as using SWOT analysis before strategic establishment in management. Third, the military means preoccupying favorable terrain to get a head start before the battle

begins. In modern warfare, space is an important strategic place to preoccupy in the era of space warfare. The mission of numerous military satellites already orbiting space is to take the initiative on the battlefield by preoccupying a favorable strategic base in advance. In the U.S. Joint Doctrine 3-14 Space Operations Concept, space power is a combination of space and, terrestrial systems, equipment, facilities, organization and, personnel. In performing space operations, there are three kinds of systems that connect ground equipment, space equipment, and link system between space and ground equipment.

An indispensable element of the joint space strategy is the support of orbiting satellites. Space is closely connected to other areas such as ground, sea, air and, cyberspace, so it is important to properly connect with other military activities for successful operations. The concept of a joint space strategy may be defined as the monitoring and control of the land, sea, and air force, to achieve political and military purposes using space power in the event of an emergency. There are three kinds of satellites in space. Firstly, the communication satellite. It has anti-disaster capabilities by enhancing security. Secondly, an early warning satellite. This is a satellite for detecting intercontinental ballistic missiles(ICBMs) and the US DSP(Defense Support Program) satellite is representative. Thirdly, it is a reconnaissance satellite. It takes pictures using high-resolution optical radar(SAR) and transmits data while circling over the destination at low altitude to identify military facilities. Examining the trends and strategies of military space power construction in neighboring countries on the Korean Peninsula is essential to setting the strategy for the ROK military. In this chapter, I would like to briefly review the military space strategies of the neighboring countries of the Korean Peninsula, such as the United States, China, Japan, Russia, and North Korea, and draw implications for ROK.

3.1. The U.S.

3.1.1. Space organization

The U.S. Space Force was established as the US Air Force Space Command(AFSC) under the U.S. Air Force on Sept. 1, 1982, but as of Dec. 20, 2019, it became an independent force separated from the Air Force under the 2020 U.S. Defense Authorization Act. The U.S. Space Force was set up under the U.S. Air Force, and the top responsibility is also headed by the Air Force Secretary. Currently, the top position is the Chief of Space Operations(CSO), and CSO will be the senior officer of the space force unless the general of the space force is vice chairman of the Joint Chiefs of Staff or deputy chief of the Joint Chiefs of Staff. CSO also participates as a member of the Joint Chiefs of Staff. The U.S. Space Force was founded on December 20, 2019. It was founded on September 1, 1982(US Air Force Space Command). The responsible areas are space and space warfare, consisting of 2,500 active-duty astronauts and 13,590 U.S. Air Force dispatches. It has 77 spacecraft and its headquarters is located at Arlington County, in Virginia. The U.S. Space Force's superior agency is the US Air Force.

The United Space Force is one of the eight U.S. troops responsible for operations in the space area and is the latest in the battle ranks among the commissioned officers of the U.S. Army, the U.S. Navy, the U.S. Air Force, the U.S. Coast Guard(USCG), the U.S. Public Health Service, and the U.S. Federal Oceanic and Atmospheric Administration(NOAA), followed by the Army, the Marine Corps, the Navy, and the Air Force. In the past, all U.S. Air Force Space Command personnel were converted to space forces, and all U.S. Army and U.S. Navy space-related personnel will be integrated into the Space Command in the future. Currently, 16,000 members are assigned to the space force, and all Air Force personnel dispatched will begin the transition from the year 2020, and Army and Navy personnel will be converted from 2022.

Space is a key area of American security, prosperity, and scientific achievement. Space-based capabilities are an integral part of the real-life connection between the United States and the world and are an integral part of the United States' military power. Space is now a distinct warfighting domain demanding strategies. Space is not a safe place from attacks and its

system is a latent military target. China and Russia, in particular, pose a major strategic threat to the United States by deploying space weapons.

U.S. President Donald Trump created the space force as the sixth army following the Army, Navy, Air Force, Marine Corps, and Coast Guard. According to the U.S. Department of Defense, a space force is a "military that can carry out operations through various military activities using space more than 100 kilometers above the ground." The U.S. is planning to maintain its overwhelming military advantage based on its space capability <Table 4>. The main characteristics of the Trump's space policy is the promotion of the private space sector[12].

Table 4. The U.S. space capability.

Division	Contents
Satellite	800 of reconnaissance, surveillance, early warning, navigation satellite
Satellite carrier	Developing and operating 17 types of space shuttles
Launch station	Four launch sites, a total of 1,460 satellite launches
Space weapons	Developing ground and space deployed laser weapons, deploying ASAT, and space-based Jamming satellite
ICBM	About 600 intercontinental ballistic missiles
Surveillance	Electronic optics and radar space surveillance system, operation of 9 ground early warning stations

3.1.2. Space strategy

There is growing concern within the U.S national security due to potential US adversaries, such as China and Russia which pursue counters-space capabilities that threaten US space assets. The purpose of the U.S. space forces to carry out the space war in the future is to use or retain the space information system and to maintain the U.S. space force's dominance to gain operational benefits in short-term war or crisis. Moreover, the U.S. strategy revealed in the basic textbook is to ultimately maintain its superiority in space competition with China, and Russia through the specific task and role of the U.S. space force to maintain its information dominance in space.

The Defense Space Strategy first describes the "desirable state" that the U.S. Department of Defense thinks, "The space field should be safe, stable and accessible. The U.S. and U.S. allies and their partners' use of space is supported by continuous and comprehensive U.S. military power. The U.S. can use space to generate, project and use power across all areas through the spectrum of conflict." Regarding power, the defense strategy defines the concept of space power as "the sum of the nation's ability to use space for diplomacy, information, military, and economic activities to achieve national goals." The statement appears to be the Defense Ministry's determination to go beyond defending the peaceful use of space and to make full-fledged military use of space. Meanwhile, the strategy states that it aims to maintain superiority in space to provide space-level support for national operations, joint operations, and to secure space stability.

The core of the Defense Space Strategy is that it presented a strategic approach at the Pentagon level. The strategy presents the key ideas of the strategic approach as follows. "The Department of Defense will improve its space capacity over the next decade to secure superiority in space and gain America's vital benefits. The Department of Defense will work closely with its allies, partners, and industries to take advantage of the United State's power and opportunities." To implement this idea, the defense space strategy proposes four key initiatives.

The US DOD tries to set up strategy by four lines of effort: "(1)build a comprehensive military advantage in space; (2)integrate space into national, joint and combined operations; (3)shape the strategic environment; and (4)cooperate with allies, partners, industry, and other U.S. governments and agencies[13]. "

The first area of focus is "building a comprehensive military advantage in space." This comment reflects an earlier perception that space will be the main stage of competition among great powers, and can be seen as expressing its willingness to achieve U.S. dominance in all areas related to the military use of space[14]. To that end, the Ministry of National Defense will reform the organization to counter the hostile use of space and transform the space-related system by developing doctrines and operational concepts along with expertise related to space power. Specifically, 1)it aims to complete the U.S. space force, to develop and document the doctrinal foundation of military space power, 3)to develop and expand the expertise and culture of space combat, to develop(field, 5) the ability to respond to the hostile use of space and to improve intelligence and command control to achieve a military advantage in the space battlefield.

The second area of focus is "integration of military space forces into joint operations". This shows that space forces have become key in all areas of military operations. The defense strategy illustrates that military space forces can be maximized when it combines all forms of military forces and that the launch of the Space Command has made it possible to carry out operations at all times. Under this recognition, it aims to allow the U.S. Space Command to plan, practice, and implement joint and combined space operations, 2)updating rules of engagement, 3)integrating personnel into military plans and personnel, 4)updating the security classification of the U.S. Department of Defense's space program, and 5)integrating allies into planning, exercise, participation, and espionage activities. The third area of focus is "creating a strategic environment". This shows that it is essential to create favorable conditions to secure victory at a strategic level beyond victory in the space battle. Also, it can be seen that these conditions are still insufficient. The defense strategy states that the U.S. Department of Defense should deter invasions and attacks in space and that if deterrence fails, it should be able to win a war that expands into space. It also says it will take action to improve the stability of the universe as a battlefield and reduce the possibility of misjudgment. However, since there is not a possible action and the international community's view of the universe as a battlefield, it emphasizes cooperation with the State Department on this part. Specific goals include 1)informing the international community and the public of growing hostile threats in space, 2)enhancing U.S. space capabilities, 2)constraining enemy attacks against commercial interests, 3)coordinating space messages, and 4)promoting behavioral norms and standards in space friendly to the interests of the U.S. Allies and its partner countries[15].

The fourth area of focus is "cooperation with allies, partner countries, industry and, other U.S. government departments and agencies." The space defense strategy points out that not only cooperation with other government ministries and agencies, but also cooperation with international partners and companies through burden-sharing should be made. Specific goals for this include 1)expanding information-sharing relations with competent allies and partners, 2)partnering with allies and partners in space policy, 3)working with allies, partners, and other U.S. ministries and agencies to favorably establish space behavioral norms and standards, 4)expanding cooperation with allies and partners in research and development and acquisition (RD&A), 5)utilizing technological progress and acquisition procedures in the commercial sector, and 6)improving the Ministry of National Defense's approach to commercial licensing procedures[16]. The US secretary of defense ensures that space capabilities are of sufficient capability and capacity to enable decisive offense and defensive space operations critical to defending the United States, allied, and partner interests in space while continuing to sustain support to joint operations.

3.2. The PRC

3.2.1. Space organization

The background of China's space power development lies in achieving defense modernization through space development. China's space development is based on close cooperation with the military to secure an advantage in space. China's military space strategy is very diverse, First of all, government-led private research institutes and companies are involved in satellite development and projectile development, typically led by CASC(China Aerospace Science and Technology Corporation)-affiliated CAAA(China Academy of Aerospace Aerodynamics) or various other national-level research institutes, universities and Chinese military research institutes. Currently, the main agents leading China's military space strategy are known as the Chinese Army's Strategic Rocket Force, and they are known to be in charge of the hardware and software fields that make up the military space strategy[17].

The newly renamed Rocket Command from the 2nd Artillery Command, which was in charge of China's conventional and nuclear ballistic/missile missiles in January 2016, directly operates and manages intercontinental ballistic missiles, medium-range ballistic missiles, hypersonic projectile missiles, and short-range ballistic missiles. It operates seven ground bases and several mobile projectiles(TEL) bases. In particular, it was renamed the rocket command in January 2016 and is known to have established a separate 67 missile brigade on Mount Taibai(太白) to take charge of storing, managing, and training nuclear warheads. Established in January 2016 to take charge of the software field of the Chinese military space strategy, the Chinese military's Strategic Support Command is known to be in charge of software, cyber and electromagnetic fields, and operates the Space Development Support Department and the Network Development Support Division under its wing. First of all, the Space Development Agency is mainly in charge of C4ISR, has 15 research institutes and several satellite launch bases in China, and is known to have built five overseas satellite tracking bases. Among them, the Tarawa satellite tracking base built-in Kiribati in the South Pacific was reportedly closed in 2003 at the request of the Kiribati government under pressure from the U.S.

The Ministry of Network Development Support mainly focuses on managing space and has 11 schools and research institutes & development of the 6 bases and 11 cyberspace networks. They are known to support China's military space strategy in software under the rocket command and mainly preparing for cyber warfare. The Strategic Support Command and the Rocket Command are both under direct command and control of the Joint Chiefs of Staff under the CCP's Central Military Commission. Similar to the U.S. military command, the Strategic Support Command, which is in charge of space, cyber and electromagnetic fields, is only known to be under direct command and control by the CCP's Central Military Commission, and various weapon development is known to work with the Department of Equipment Development under the Joint Chiefs of Staff.

Military experts say that the rocket command, renamed under the 2015 "National Defense Reform(國防軍隊改革)," led by President Xi Jinping, operates the Chinese military's DongFong missiles on the ground, underwater and in the air.

The Annual Report of 2019 assessed that it conducted defense and offensive drills related to the Luyang(洛陽)-2018 Space War hosted by the Chinese Military Strategic Support Command in 2018. The China Daily reported, "On January 4, 2016, the Chinese People's Liberation Army established the Three Functional Command of the Ground Command, the Rocket Command and the Strategic Support Command under the supervision of President Xi Jinping of the Central Military Commission, which means reform in the highest strategic space. "

3.2.2. Space strategy

China has multifarious perspectives of the strategic purposes of space. One is for national wealth and prestige and the other is fielding new military space systems to enable a more global set of national defense[18].

Military experts predict the principles for implementing China's military space strategy as follows. First, it is integration(空天一致) between the air and outer space on the ground. In 2015, China's military strategy defined the space as a separate core battlefield domain and emphasized that it has the same status as the protection of national interests. In particular, this is summarized as the implementation of space-based information warfare and the establishment of a C4ISR system to support DF-21D or DF-26, a means of implementation of the A2/AD strategy operated by the Chinese Rocket Command. In other words, it supports GNSS(Global Navigation Satellite System) and PNT(Positioning, Navigation, and Timing) space functions so that A2/AD strategic means launched from the ground can be effectively and successfully operated. This system supports precise navigation and maneuver in the battle space[19].

Second, it is the integration of defense and offensive(攻防兼備型). The space domain is a defense network and the only domain that can be used as an offensive area that can disable the opponent at once. When the Chinese military executed the ASAT test on the failed weather satellite in 2007, space emerged as an offensive domain, no longer a defensive domain[20]. In response to China, the U.S. Air Force also tested ASAT missiles in 2008, showing the space domain as an offensive means. Third, Space is a domain where China's advanced military science and technology can be developed and applied for weaponization especially in the field of C4ISR. Currently, the Chinese military is developing science and technology and operating systems related to space, the cyber and electromagnetic domain under the leadership of the Strategic Support Command. This is due to the establishment of the BeiDou system, the successful flight between the Earth and the moon by Cheonghae-3, the establishment of the trajectory of a separate communication satellite to build a communication network to Earth from the back of the moon. This is a trend in space-related military science and technology research, which is different from the previous Changjeong(長程) satellite rockets. Fourth, it is an area that revives the unique roles and functions of the Chinese military. Although it has limited space, it is considered a broad and comprehensive area that can display the unique characteristics of the Chinese military as there is no country with the capacity and ability to actively participate other than the U.S. and Russia. "In 2015, the Chinese Military Strategy(2015) expects the Chinese military to play an active role in space, such as the concept of offshore water defense carried out while protecting China's national interests in the navy's open sea protection."

The Chinese Military Space Strategy Goals can be defined as follows. First, a victory in the intelligence war. Since the Chinese military thinks it can never win a hardware war against the U.S. military, it wants to dig into the vulnerability of the U.S. military and end its military race with the U.S. by an asymmetric attack that temporarily paralyzed the C4ISR of the U.S. military. As a result, PLA continues to prepare for information warfare with tactics to protect poor Chinese military forces and respond to the U.S. military[21]. Second, China was relatively inferior to the U.S. in building a ballistic missile defense network by adopting the Second Strike Strategy in strategic weapons competition with the U.S., but recently, military experts say the Chinese military's second strike strategy has changed based on the Chinese military's space weaponization and militarization, which is considered to temporarily neutralize the U.S. military by aggressive space operations such as anti-satellites and the deployment of high-energy weapons in space. The Chinese military is planning to build a strategic early warning system in space centering arounds the newly established Chinese Strategic Support Command. Third, it is the establishment of a missile defense system in the air and space. Since the Chinese military's satellite test in 2007, the Chinese military has continued to develop various anti-satellite weapons. It has established its GNSS and PNT in space to establish a defense system that intercepts ballistic missiles and the Multiple Reentry Vehicle(MRV) that passes through space. Fourth, it is an improvement in the ability to perform cyber warfare in space. This is an exercise of power in cyberspace under the premise that existing space dominance or cosmic power can be projected as a force in cyberspace, a virtual space. Some military experts define it as a

more comprehensive concept in existing information warfare or information operations(IW/IO).

The Chinese Anti-satellite weapon(ASAT) is a kind of A2/AD strategy in space, and that the Chinese military is currently working on four anti-satellite plans[22]. First, it is a ground-launched satellite interceptor missile. The Chinese military tested its first ground-launched anti-satellite missile SC-19 on Jan. 10, 2007, and military experts assessed it as using the DF-21 KT-1 SLV. In 2013 and 2014, the Chinese military continuously developed KT-2/2A SLV and went through the fifth round of tests. In 2018, the Rocket Command operates a special unit that separately operates and trains the anti-satellite missile SC-19, and currently able to intercept a low orbit(LEO) satellite. Second, it is to disable satellites using robots in space orbit. This is not yet known, but it is known that space robots equipped with artificial intelligence(AI) are being developed by the Chinese leadership's emphasis on space. Third, it is a high-energy strike in space, which is known as a way to paralyze its function by firing an extremely small amount of energy from the opponent's satellite flying in the same orbit, which is known to have reached a certain level. Fourth, it is a means of disrupting the frequency of the other satellite, the U.S. military is seeking countermeasures against it by disrupting the frequency of the U.S. GPS-related satellite network, which is mainly used by the U.S. military, but the Chinese military is approaching it by identifying and attacking the vulnerability of the U.S. GPS. It is a kind of "Space People's War." In particular, military experts carefully assessed that additional satellites are being delayed to supplement the GPS of the U.S. military by COVID-19, comparing it to China's successful launch of the BeiDou 30th satellite on June 23, 2020.

Regarding the concept of space military strategy, Chinese Army General Xu He Tsun(許和震) said, "Space military strategy was established to successfully carry out space operations and lead space wars to victory" According to the PRC’s space force development plan, there are three stages. In the first stage, It independently builds a military information and communication system covering land, sea, air, and space(1998-2015), In the Second Stage, it establishes the ability to intercept the other party's space weapons system through an effective satellite weapons system(2015-2030), In the third stage, it completes a space weapons system that can directly hit ground targets in space in the third stage(after 2030).

3.3. Japan

3.3.1. Space organization

Japan established the Defense Acquisition Equipment Administration in October 2015. Just like the functions of ROK's ADD, and Defense Acquisition equipment Administration, it oversees the overall policies, strategies, and projects related to defense and military science and technology. The Defense Equipment Administration manages related projects through the defense industry, technology-based strategy and is striving to acquire related technologies and secure an edge in domestic production-based capabilities through international joint research, joint development, and production, including the U.S. Besides, to further improve its management capabilities and foster related talent, it strengthens cooperation with research and education institutions and regularly

To effectively operate defense capabilities in drafting defense policies and responding to various situations, it is necessary to identify mid-to-long-term military trends around Japan, while detecting signs of various situations early at the same time. For this reason, the Defense Ministry and the Self-Defense Forces are trying to collect information quickly and accurately through various means.

Examples of specific information collection activities by the Ministry of National Defense and the Self-Defense Forces include the collection, processing, and analysis of military communication radio waves flying over Japan and radio waves emitted from electronic weapons. The Japanese government's information collection satellites are operated by the Cabinet Sa-

tellite Information Center, and the Ministry of National Defense uses video information obtained through information collection satellites along with other ministries.

These include collection, reading, and analysis of video data, collection and arrangement of various official publications through the vessels, aircraft, etc., exchange of information with defense agencies. From this point of view, it is important to reflect not only the aforementioned Space Situation Awareness(SSA) but also the overall linkage between project management-oriented targets such as information collection capabilities and combat equipment. Japan is pushing to revise its military strategy by the end of this year, including the possession of enemy attack capabilities to actively respond to military threats from North Korea and China.

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3.3.2. Space strategy

Japan first introduced the "peaceful use principle of the universe" in 1967 abide by the "peace constitution" spirit and expressed its opposition to the militarization of the universe. However, in 2008, space law was launched to open up the possibility of space used for defense purposes. They expressed the policy for the military use of space in defense planning, and reinforcement. Japan Modified the 'non-military' position by the threat of North Korea's ballistic missile attack capability. The main goal of the Self-Defense Forces is to establish a multi-layered and continuous protection system. It also enacted the Framework Act on Space Development for National Security Purposes and it laid the groundwork for the defensive use of space military just as high-performance reconnaissance satellites, missile surveillance, communication monitoring satellites, and other space forces.

Japanese Prime Minister Shinzo Abe founded the Space Operation Unit under the Air Self-Defense Forces. Japan's Space Operations Unit has taken its first step with about 20 people and will expand to 120 by 2023. Regarding the stable use of outer space, Japan explained that the risk of collision with satellites is increasing as there are many floating debris such as rocket parts and space debris in space. However, the actual intention is to respond to military threats against satellites currently in operation.

China is currently developing ground-based Anti-satellite weapons and developing killer satellites equipped with 'robot arms' to be put into practical use soon. In response, the Japanese government plans to develop a disruptive satellite that can disable the enemy satellites by the Agency for Aerospace Research and Development(JAXA). In promoting space development for Japan, it is essential to promote cooperation with related countries such as the United States, which has advanced knowledge. Japan is pushing to unify its space strategy with the United States[23]. Space Situation Awareness(SSA) does not have a system to measure the location of debris over Asia, so accuracy is falling in tracking the trajectory of the debris. Also, monitoring of antisatellite(ASAT), which will be placed on a geostationary orbit over Asia, is desirable in Asia. The U.S. Defense Department's missile defense agency(MDA) also needs to collect information around the West Pacific, East, and the South China Sea. Under such circumstances, Japan is in a good position and close cooperation with the U.S. is expected in terms of obtaining information. Second, If U.S. satellites are destroyed or lost in function, Japanese satellites could replace U.S. satellites.

U.S. military activities are now unable to fully function without space assets, and the destruction or breakdown of space assets reduces to a failure in defense. Japan's satellite takes its place as an alternative to U.S. space strategic assets. Third, the fact that Japan is cooperating with other countries is a deterrent to attack. In partnership with several countries in space use, for example, in the case of using a joint development satellite, attacking the assets will be

an enemy to not only the U.S. but also its partners, which will lead to deterrence. This may be why the U.S. is strengthening its ties with Australia as well as Japan. Fourth, one of the U.S. space industry markets is Japan. Currently, Japanese security agencies purchase about 10 billion yen in high-resolution images from US commercial satellite companies of Digital Globe every year. The U.S. has also changed its law to allow high-resolution images of 30cm to be sold overseas. There is an expectation that part of the industrial market in the United States is Japan. Fifth, the establishment and deployment of Japan's concept of the Japanese version of a small satellite. Micro-satellites will become the logical response due to launch costs per kilogram are decreased. It is enhancing the connection between the U.S. and Japan in the use of small satellite assets.

Japan's Ministry of National Defense and Self-Defense Forces have so far participated in multilateral SSA field training of the 'Global Sentinel' and multilateral field training of the 'Schriver' training hosted by the U.S. military. By doing so Japan is sharing threats about outer space and collaborating with other countries on Space Situation Awareness(SSA) while focusing on accumulating experience in guaranteeing the function of the space system. In terms of promoting cooperation between defense authorities in the field of military space, the U.S. and Japan established the U.S.-Japan Space Cooperation Working Group(SCWG) in April 2015 and have held regular meetings so far. The issues of major discussions include the promotion of consultations on space-related policies and the implementation of cooperation, virtual training to foster and secure overcrowding, experts in information sharing. Japan has been participating in the multilateral virtual training "Global Sentinel" hosted by the U.S. Strategic Forces since 2016, and Japan's Defense and Self-Defense Forces have been strengthening cooperation with related countries through information sharing, consulting, practicing, and enhancing capabilities, while actively carrying out activities related to the establishment of international norms at the same time.

3.4. Russia

3.4.1. Space organization

The Russian space sector is consist of two government organization: Roscosmos, a state corporation responsible for civil spaceflight, and the Russian Aerospace Forces the branch of the Russian armed services tasked with military operations in the space domain[24]. Russia established a space force in 1992. In 2015, the space force merged with the Russian air force. Russia established the Aerospace Force in 2015 and is making all-out efforts to update its space operational capabilities. To enhance the efficiency of aerospace power on August 1, 2015, scattered military organizations such as the Air Force, Air Force, and anti-aircraft missile units are integrated into the ADF, Aerospace Defense Forces, and the Russia Aerospace Guard(VVKO, Voyska, Vozdushno-Kosmicheskoy), and the Aerospace Defense Command: the Air Force, the Space Force, and the Aerospace Defense Force. Space operations are undertaken by the Space Force under the Aerospace Defense Forces. The Space Force is supposed to carry out surveillance reconnaissance, navigation, and communication satellites, and the Air Force is in charge of launching, operating and managing, and protecting satellite assets, while the Aerospace Defense Forces are in charge of ballistic missiles, surveillance, and early warning, missile intercepts, and monitoring and tracking air and space areas.

The Russian Space Agency was established as an independent authority of executive power on 30 September 1992. The main tasks are to implement space policy developed by the government, coordinate and govern the implementation of the Federal Space Program, and manage space infrastructure. The agency was headed by Yury N. Kopterv. He overcame the difficulties of the 'Perestroika' and became an export branch of industry for Russia. The Russian Space Agency joined the International Space Station(ISS) Program, steering Russia into becoming a fully-fledged partner in the ISS and holding out its commitments in relationship with other agencies such as ESA, NASA, NASDA, and the Canadian Space Agency. Under the Federal

Program, "Global Navigation Systems" three Glonass-M satellites were launched in 2006, and another six satellites in 2007.

The Russian government has increased the output of the country's space sector by 2.8-3times by 2015 as compared to 2004. The new strategy for developing a space industrial complex that would meet all current requirements of military security, and the scientific potential of the industry. Russia initiated several variations on organizational models for the space industry. Russia established the United Rocket and Space Corporation, using leaders from the Russian automobile industry. URSC has separated from the state space agency right after inheriting property rights over space enterprise assets. URSC has suffered another reorganization due to hardware failure, cancellations, and additional delays. Russia's space resurgence reached its peak in 2014 when Roscosmos's annual budget totaled $4.2 billion, and Russia conducted 35 successful launches[25].

In 2016 Russia made Roscosmos a state corporation rather than a government agency. Roscosmos is now taking charge of most key organizations in the Russian aerospace industry. The Kremlin's supreme goal was to make the space industry more competitive and profit-oriented. There has been little change in management and organization of such core programs as the Soyuz, Progress, and International Space Station. Russia's latest Federal Space Program for 2016--2025(FKP 2025) illuminates the long-term crisis faced by the Russian space sector since it decreases the scope of effort. FKP 2025 effectively prioritizes the preservation of Russia's existing satellite constellation, consolidation and streamlining of the decaying space industry, and minimizing delays in the Russian program for lunar exploration[26].

3.4.2. Space strategy

Russia has proposed three missions for its 2030 space development strategy goal. First, develop and properly utilize aerospace facilities, technologies, and services. Second, it also includes several rockets used to research and builds aerospace tools for manned spaceships, cargo transportation, and flying planets. Third, it is to establish Mars Rovers and the next-generation space station through manned spacecraft. Russia has been under a lot of restrictions on space technology development and space system modernization due to the collapse of the Soviet Union and the economic recession. The Russian Federal Defense Doctrine, revised in December 2014, evaluated securing dominance in space as one of the critical requirements for achieving defense goals. Russia recognizes that the use of space is the power and status of the country, and Russia recognizes the military value of space. It is also trying to bridge the gap with the United States, which has superior capabilities and operational power in space security.

The goal of Russia's military space security strategy is to secure its superiority in space for national security and to secure intelligence superiority. Unlike the emphasis on military advantage in the past, the key is to secure superiority and secure information superiority in space, as seen in the "information-strike operations" carried out today. Accordingly, it aims to secure information superiority in aerospace, a space-based command, and control system for victory in modern warfare, a complex system of communication, early warning, and missile strikes, and the ability to block enemy missiles and to realize the intelligence of information and command control systems. By securing full defense information reconnaissance capabilities, it aims to develop a C4I system that allows various reconnaissance surveillance methods deployed in the ground, sea, air, and space to detect and identify all military targets and support them quickly and accurately through the development of new means of communication.

The Russian National Security Strategy, approved in December 2015, identified the deployment of U.S. space weapons as a factor that hinders international and regional stability. In March 2016, It strives to leap forward as a space power by establishing and promoting the 2016-2025 National Space Program. In the 2016 Foreign Policy Concept, Russia considers the United States and NATO as potential enemies and emphasizes maintaining nuclear deterrence. Russia regards the U.S. military capabilities in space to neutralize Russia's nuclear deterrence

as a fatal security threat. Russia also recognizes space as a strategic area for strengthening the ground's military capabilities, providing surveillance and communication capabilities, and maintaining its international status as a space power. Regarding the creation of the U.S. Space Force in 2019, Putin stressed the need for Russia's development of space forces, fearing that the development of U.S. space capabilities is a direct threat to Russia.

In 2018, Putin introduced a new space weapons system, 'Peresvet'. Under Western sanctions, Russia is a show off its military capabilities and also means it will not let go of competition with the West as a powerful nation. Putin is firmly committed to acquiring "ASAT(Anti-Satellite)" capabilities to establish its status as a powerful country and keep the U.S. in check. Russia has been pushing for a series of programs for more than a decade to restore the capabilities of the Soviet Union. It is focusing on developing a series of counter-space weapon systems, including the Directed Energy Weapon(DEW), which aims to disrupt communication and navigation systems as well as ground and aviation-based kinetic weapons that can destroy satellites in orbit, and neutralize the use of space-based images. Russia is rapidly recovering its capabilities based on the technological heritage of the former Soviet Union. Moreover, Russian President Putin is also expressing his political will to maintain his international status as a powerful nation and to acquire counter space weapons for the balance of military power with the United States.

Russia has recently taken advantage of the electronic warfare capabilities in the military conflict in Ukraine and Syria, Russia appears to have used various space-based electronic warfare measures. This means that space military capabilities are closely integrated and applied to military operations. Over the past two decades, Russia has tried to minimize cost efficiency to restore its most efficient space military capabilities. Electronic warfare capabilities and Directed Energy Weapons(DEW), which are currently most effective in the war, have been intensively developed. It is also developing a kinetic weapon system that can destroy satellites in orbit. In response to the U.S. military success on space military capabilities, Russia, which is relatively asymmetrical in terms of space military forces, is seeking ways to reject U.S. dominance.

3.5. The DPRK

3.5.1. Space organization

North Korea's National Space Development Agency(National Aerospace Development Administration, NADA) adopted a decree of Space Development Act and decision to create the National Space Development Bureau at the 12th seventh meeting of the North's Supreme People's Assembly in April 2013, following its predecessor Korean Committee of Space Technology(KCST). That year, North Korea reorganized its space development organization. The activities of the Joseon Space Technology Committee(KCST) have been known since the 1980s. The DPRK also applied for membership in the Registration Convention on March 5, 2009, but it has not been ratified. In 2015, when the NADA is active, it applied for membership with the International Aerospace Federation(IAF), but it was rejected because it needed to be confirmed for peaceful purposes. North Korea's NADA is expected to have close ties with the Missile Guidance Bureau under the North's General Staff under the direct control of the National Defense Commission(Supreme Command). The missile Guidance Bureau has the Scud Division(range 1,000km), the Rodong Missile Division(1,300 km), and the Intermediate-Range Missile Division(4,000 km). Among them, The missile Guidance Bureau is expected to maintain a closer relationship with the Intermediate-Range Missile Division and provide mutual technical support and test evaluation.

3.5.2. Space Strategy

It has been confirmed that North Korea is studying logic and justification aimed at the international community regarding satellite launches. North Korea is determined not to give up

space development even if the internal community opposes it. As a result, attention is being paid to whether Gwangmyeong-Seong No. 5 will be launched in the future. It emphasizes the peaceful use of space, saying that the purpose of space development is to solve science and technology problems that are essential to the economy and people's lives using space science and technology while sticking to national interests. In 2012, when Kim Jong-un took power, he set up a "five-year space development plan," and the following year established a space development agency and declared the space development law. In February 2016, the Earth observation satellite 'Gwangmyeong 4' was successfully launched into orbit.

North Korea is equipped with space launch facilities capable of launching ballistic missiles in the East Sea and West Sea, respectively. North Korea keeps a strict secret about space organizations and doctrines. North Korea is also accelerating its space development in conjunction with its missile program. North Korea is believed to implement space development in the name of peaceful use of space to upgrade its missile launch technology. North Korea is still trying to upgrade its nuclear and ballistic missile capabilities, although the number and intensity of threatening actions have weakened through the recent inter-Korean summit and the U.S.-North Korea summit. EMP weapons using nuclear bombs are affected by Earth's magnetic field. The distribution of magnetic fields on the Korean Peninsula has a slope of 53.8 degrees to the south, making it a very advantageous environment for North Korea to use EMP. In 2009, the Atomic Energy Research Institute simulated the explosion of a 10Kt nuclear bomb 100Km above Seoul and concluded that all electromagnetic equipment and facilities in the southern direction of 170Km would be incapacitated. Assuming that North Korea has achieved the miniaturization of its nuclear weapons, it is highly likely to use EMP at a strategic, operational, and tactical level <Table 5>.

Table 5. North Korea-Wohlstetter's nuclear attributes[27].

Nuclear weapon system	Reliable, affordable, sustainable	Survivable	Credible perception of retaliation	Capable of reaching adversary	Penetrate active defenses	Destroy target/passive defense
ICBM/IRBM	Negative	Positive	Positive	Positive	Negative	Positive

In other words, if it explodes at 100Km on the Korean Peninsula and nuclear weapons are used outside the atmosphere to attack the U.S. and other allies internationally, low-altitude rotating satellites will suffer a huge blow, but the EMP effect on other satellites is expected to be insufficient. This is because EMP electromagnetic pulses generated in outer space spread to outer space with an unknown end, making it difficult to obtain EMP effects such as those generated on Earth.

North Korea is likely to develop and launch missiles at any time if negotiations break down or things go against it. In particular, it could pose a significant threat to the international community if North Korea secures the range of missiles, the development of onboard technologies, and the re-entry technology by disguising satellite launches. This is expected to pose a serious threat to South Korea's security, especially as it causes an imbalance in space and missile capabilities between the two Koreas.

4. Implication for the ROK Defense Space Strategy

4.1. Implications

The neighboring countries of the Korean Peninsula are focusing on space militarization and weaponization, prioritizing the space sector as important for national security <Table 6>. Waltz argues that great powers always counter the weapons of other great powers by intro-

ducing a new weapon. They attempt to obtain a favorable position through offensive and defensive military means.

Table 6. Major countries' space force construction and strategy to the space threat.

Division	Agent of building space industry	Strategy to space threat	Natural space threat
US	Transition from the state to the private sector (Old space→ new space)	Active defense strategy against China and Russia(possession of satellite destruction weapons and satellite Jamming weapons)	Space debris space collision electromagnetic pulse by sun
PRC	National and private convergence	Checking India, active defense strategy against the United States (holding satellite destruction weapons)	
DPRK	State-led	Limited offensive strategy against the United States(cyber warfare, EMP attack capability)	
RUSSIA	State-led	Active defense strategy against the United States(holding satellite destruction weapons)	
Japan	State-led	Defensive deterrence strategy (integration of space operations with the United States)	
ROK	Transition from state-led to the private-led transition period	Passive defenses strategy based on alliances with the U.S.(response to North Korea's ballistic missiles)	
INDIA	State-led	Active defense strategy against China (based on ASAT)	

In space protection, there are a number of active and passive defensive capabilities against kinetic-kill ASATs and jammers. Passive defense technologies include measures to make jamming more difficult. Active defenses can be employed to disrupt, deny, degrade, and destroy attacking adversary systems and their supporting system.

The People's Liberation Army of China is setting up a strategic support command with the Rocket Command, trying to gain an edge in space competition with the United States, and is pushing for a niche strategy to target the vulnerability of the United States as a military space strategy. In particular, China is promoting space power through the construction of military space power as a key area for great powers and is expected to have a strong influence on China's neighboring countries such as South Korea in the future with the BeiDou navigation system and the Global Positioning System(GNSS). Therefore, the Chinese military space strategy should be accurately analyzed and developed into a new field of strengthening the Korea-U.S. alliance to minimize China’s military influence in the future. Also, there is a need to strengthen the surveillance function of electronic warfare to cope with North Korea's ballistic missile threats, spy satellites circling over the Korean Peninsula, and space debris falling.

To strengthen the ROK-US alliance system, ROK could consider taking part more actively in space exercises led by the U.S[28]. The U.S. is also unlikely to demand cost-sharing from the beginning, and it is likely to be a priority for South Korea to expand its participation as it is recognized as a capable ally in the space sector. Of course, the South Korean military has also been working with the U.S. military at a certain level, participating in the "Global Sentinel," a joint space recognition operation, but it needs to acquire more advanced experience to maximize its advantage as a latecomer in the space field. For example, Japan has participated in the Schriver War Game in 2018 as well as the Global Sentinel. The exercise is a virtual exercise that the U.S. has conducted since 2001 under the theme of military operations in outer space. Through this, it is expected to find out how the concept of military operations covering space, discipline, and command control will evolve and to what level the U.S. assumes cooperation with its allies. The ROK should also consider its approach to space as a battlefield area in establishing and implementing national space strategies or policies. In particular, it is necessary to specify pan-government and defense-level space strategies for the growing need for the protection of South Korea's space assets and the military use of these assets.

4.2. The reality of ROK military space power

The South Korean military has launched Anasis 2 military communication satellite to foster independence in military operation under the banner of responsible defense, but it still lacks early warning capability against North Korea's unknown ballistic threats and lacks military reconnaissance capability with a clear resolution to monitor North Korea. The Korean-style 425 project plans to launch a 'super-small satellite system' by mid-2020. The Korean ultra-small satellite, which will be launched in the future, is for monitoring and detection and is designed to read 0.3 to 0.5m objects in high definition from space.

According to the Space Treaty(OST), space prohibits the deployment of WMDs or nuclear weapons under the principle of peaceful use for the pursuit of the common interests of mankind. Member States are 102, including China, France, India, Israel, Pakistan, and Russia. However, Russia was criticized by the U.S. and the U.K. for conducting a non-destructive test of a satellite attack weapon to launch a new object into orbit from the Cosmos 2543 satellite on July 15, 2020.

Meanwhile, the United States announced that it has acquired initial operational capabilities by launching satellites that can disrupt enemy satellite communications in practice. The competition between spear and shield between these space powers effectively proves that international treaties are not binding and shows that space is turning into an arms race.

4.3. Suggestion for ROK’s building military space power.

Sun Tzu holds the Osachilgye(五事七計) as the standard to estimate the outcome of the war. Under the need to cultivate military space power, the readjustment of the legislative system for the construction of military power falls under the Beub(法) in the Osachilgye(五事七計). Is the law strict and fair in the military organization? Which side is fairer and clearer for the prize and punishment? Beub(法) is a factor that determines the motivation of the organization that builds space power and an efficient organization for management.

Currently, the construction of space forces is a very important task at a time when China and Japan's neighboring powers dominate space. Given North Korea's ballistic missile threats, it is very timely for South Korea to expand its space power, strengthen its operational capabilities, build organizations and missions to support it, and build a high-level space power operating system.

In building military space power, space threat analysis on the Korean Peninsula should first be preceded. In addition to a threat analysis to the Korean military's space power in orbit, it should analyze the threat of reproduction or physical damage by killer satellites and threats to satellite operating strategic assets related to space power on the ground in the establishment of a space security strategy. This can lead to a variety of risk response measures against space

threats. The current government emphasizes 'responsible defense theory'. What this means is to build key capabilities against all-round security threats, including space threats, and to develop its operational capabilities in space in the long term based on the Korea-U.S. alliance[29][30][31][32].

Against this backdrop, the alternatives for the ROK's construction of military space force in the future abide by t Sun Tzu's index of Beub(法) as follows. First, to develop military space power in terms of the establishment of a policy base, laws and systems supporting space development shall be reorganized, and at the same time, the concept of space strategy and operational doctrine shall be developed, a defensive deterrent alliance strategy suitable for mid-sized countries, and a space power construction plan has to be established to utilize space power centered on the Joint Chiefs of Staff[33]. Although it is a mid-sized country regardless of the budget in boosting its military, it should have a space-based jamming system and an offensive weapons system that can hit the enemy's vital point in the event of an emergency through a satellite that can be used for both commercial and military purposes from a mid-to-long-term perspective[34].

Second, in terms of the development of the operating system, it is necessary to establish a top-down military space force operating system, to strengthen the mission-sharing and cooperative system for space operations, and to organize human resources management for space operations. Third, to strengthen its own "space operations support" capabilities to actively respond to space threats in terms of strengthening military space capabilities, it is required to build the Surveillance, Reconnaissance, and Korea Positioning System(KPS), which is free from U.S. dependence. Also, it needs to expand high-resolution military reconnaissance satellite assets and build an electronic warfare system that can respond quickly through early warning capabilities. In terms of diplomacy and security, dependence on other countries on navigation systems is expected to cause huge national losses if the use of information is restricted due to failures or conflicts of interest between countries. This is because modern Warfare is based on information technology(IT) called 'Network War', or ' Reconnaissance-Strike system.' Fourth, there is a need to integrate civilian, government, and military cooperation through the so-called Civil, Government, and Military Space Development Committee to enhance the Space Situation Awareness(SSA).

5. Conclusion

According to Sun Tzu's five fundamental factors of Osa(五事), (do[道] the way, cheon[天] seasons, chi[地] terrain, cheng[將] leadership, and beub[法] management), which is applied to the establishment and implementation strategy of ROK's space strategy, as follows. The moral law(道) is the leader's political vision. The current government reflects its strong will to build military space forces under the banner of responsible defense. Cheon(天) Chi(地) corresponds to external conditions and environments in the construction of space power such as cases of neighboring space powers. cheng(將) includes the capability and incompetence of the Space Strategy Commander, the strength of space forces, and the ability of combatants to utilize space power through training. The Beub(法) includes the fairness of the military's legislation in charge of space operations, the fairness of awards and punishments, and the motivation of members of the organization. The policy options for the ROK military by applying Sun Tzu's Osa(五事) as follows. First, In terms of Do(道), the Moon Jae-in government has a strong will to build a foundation for strengthening space power under the responsible defense policy for the early return of wartime operational control. Currently, Korea's space power remains insignificant compared to neighboring countries. Efforts should be made to lay the foundation for the creation of an advanced space force by sharing such a vision with the leader. To this end, the establishment of a space development organization directly under the president is needed. If the strong will of the political leaders is reflected in building military space assets, it may be able to advance the strategic foundation to lead the Multi-Domain Operation. The success of

military innovation for the construction of military space power is possible when there are inherent factors such as the change in the mind-set of military leaders.

Second, the construction of space power in the U.S., China, Japan, and Russia surrounding the Korean Peninsula is gradually intensified as the factors of Cheon(天) and Chi(地). Therefore, there is a need for South Korea to create a road map for the construction of space power and implement positive space power building policies. To this end, it is suggested that the launch of a small satellite equipped with a high-performance optical camera has to be carried out earlier than scheduled. It is expected that this will further improve the space operation by linking space-based assets and ground or link system. Third, as a factor of Cheng(將), the Korean military has many problems to be improved in terms of organization, institutional maintenance, education, and technology development for space power. Conducting an attack and defense in the space domain requires substantial investment to develop, acquire, operate, and sustain needed shooter, sensor, and command and control systems.

It is proposed that the 'Space Command' be established directly under the Joint Chiefs of Staff. At the same time, it is required to strengthen the agility of operations by increasing the linkage between unmanned systems and satellites for the enhancement of public values. Fourth, in terms of Beub(法), systematic education and motivation are required. Hence, the creation of a space force differentiated from the Air Force is direly needed.

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7. Appendix

7.1. Authors contribution

	Initial name	Contribution
Author	SL	-Set of concepts ☑ -Design ☑ -Getting results ☑ -Analysis ☑ -Make a significant contribution to collection ☑ -Final approval of the paper ☑ -Corresponding ☑ -Play a decisive role in modification ☑ -Significant contributions to concepts, designs, practices, analysis and interpretation of data ☑ -Participants in Drafting and Revising Papers ☑ -Someone who can explain all aspects of the paper ☑

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Analysis of Properties of Deconstruction & Hair Expression Components in Maison Margiela COLLECTION

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Abstract

Purpose: *Art, fashion, and beauty in modern society are changing the trend of fashion with the development of the fourth industry. As the self-beauty method through SNS such as YouTube and Instagram is widely known, the social value of hair designers is decreasing. In order to increase the value of hair designers, it is meaningful to analyze the characteristics of deconstructionism and hair expression elements in the Maison Margiela collection to understand the modern trend and to present a method of creating creative hair design. The purpose is to increase the value of the hair designer.*

Method: *Maison Margiela Collection 2015 S/S-2019 F/W photographs are extracted from professional fashion magazines Livingly, First View, and Vogue for analysis. Three experts participated in the analysis to reduce subjective views of the data and increase reliability, and analyzed using the SPSS WIN 25.0 program.*

Results: *Property cross-analysis of the Maison Margiela collection & Properties of Deconstruction suggests that 2019 F/W for Differance, 2016 S/S for Uncertainty of Meaning, and 2018 S/S for Decomposition are significant to each other. The hair expression component results were highest in form 2016 S/S, texture 2019 F/W, color 2016 F/W, and object 2018 F/W. We can find the significances between these groups. Although object accounted for the largest portion in Uncertainty of Meaning, and Decomposition, and also Differance accounted for the largest proportion in deconstruction Hair Expression Components per properties, we found that there was no significance between them.*

Conclusion: *Deconstruction & the expression components expressed in Maison Margiela are related with each other, and objects were high in all categories of deconstruction and Hair Expression Components. objects can be seen as enough to express individuality as a hair expression element. In order to enhance each individual's personality and expand the hair expression elements, hair designers should increase the social Value of the individual hair designer by presenting various directing methods tailored to the customer during styling.*

[Keywords] ***Hair, Deconstruction, Design, Collection, Expression***

1. Introduction

Our society has developed remarkably in politics, economy, society, and science[1]. The information is rapidly transmitted to almost all people based on the development of computers and the Internet in the fourth industry beyond the 3rd industry with this flow[2]. With the fast transmitted information, there is also a big change in the fashion. The cycle of fashion is shortened and the trend is as a way to express individuality, not just mimicking, and this flow can be quickly seen in the field of beauty and fashion[3]. Modern beauty and fashion disorganize the existing standards of beauty. But they try to be defined as expressing uniqueness, and creative design. This contemporary art is viewed as a part of deconstruction and female subjectivity. Deconstruction began in the 1960s by Jacques Derrida(1930-2004)[4].

Deconstruction was introduced in the fashion industry in the 1980s, more than 20 years later. The perspective of designs, aesthetic Values, expression characteristics, and fashion is developed in colorful and dynamic ways beyond the existing perspective[5]. Beauty also changes as the fashion changes. Deconstruction in beauty can be understood as the concept of a historical trend and seen as penetration & diffusion throughout the society[6]. Deconstruction produces various expression methods & designs beyond the existing concept.

There are several studies related to deconstruction in the field of fashion and beauty that develop quickly and variously in contemporary society. However, almost all researches related to fashion and beauty focus on the makeup, and there are a few researches for Hair Expression Components in the fashion collection. Thus, the purpose of our study is to examine and analyze the concept of deconstruction and Hair Expression Components based on the Maison Margiela collection, and to analyze the association after the derivation of properties. In this study, we are going to study the lack of fashion collection and hair design in the previous study. Our research will be meaningful to be used as the data of creating hair designs& finding trends through the analysis.

2. Theoretical Background

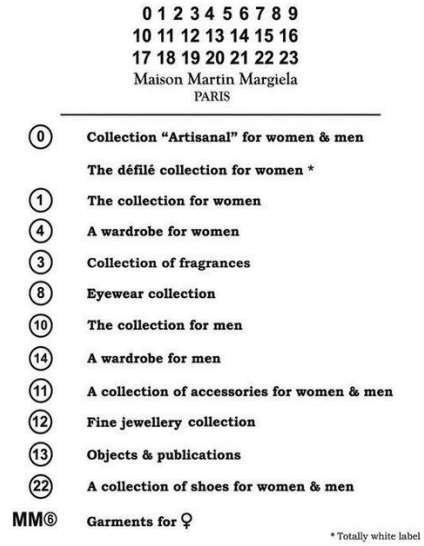
2.1. Masion margiela

Maison Margiela was born in 1988 by Martin Margiela(1957.4.9~). The brand name was 'Masion Martin Margiela' in the early days, and introduced a costume called 'Deconstruction'. Mainly, it focuses on the clothes that emphasizes the items veiled in the clothes, e.g. seam lines. Maison Martin Margiela tried to show the seam lines on their clothes, breaking down the existing general design methods which try to hide the seam lines on the clothes. Also, because Martin Margiela is reluctant to expose himself on the society, the public except some his close friends has never seen him. He is famous for handling the interviews or instructions by mail or fax and not standing on their own TV shows[7]

Margiela's personality also appears on his label. Unlike other brands that display their labels largely, Margiela only uses the label of muslins printing number 1~23 like <Figure 1>, and these numbers have different meanings like <Figure 2>. On the 20th anniversary of Maison Margiela, Martin Margiela announced his retirement, and the design team operated all the collections until joining John Galliano(1960.11.28.~) as creative director in 2014. John Galliano worked at Maison Margiela in 2014 and successfully ran the brand, establishing his brand as a couture house. The fashion industry spotlights the John Galliano's show at every season, inspiring the design and creative world[8].

Figure 1. Label 1.

Figure 2. Label 2.



2.2. Deconsturction

Deconstruction is the idea that criticizes the Western structuralism with the open view, not with a closed perspective[9], which seeks a new form by disorganizing the concept 'structure' itself after making the unstable states, not by constructing a new structural system[10]. The deconstruction is being interpreted and expressed in various fields of art, including sculpture, fashion, and architecture, as well as literary criticism.

The Properties of Deconstruction are divided into various things depended on researchers, e.g. Jung-im Jang and Yeon-hee Lee(2006) divided them into Differance, Inter-textuality, Uncertainty of Meaning, and Decomposition to study the deconstruction fashion in Margiela's works[11]. Ji yeon Kim and Hyu joo Kim(2008) classified the deconstruction shown in costumes, makeup, and hairstyles as four categories: Differance, Intertextuality, Uncertainty of Meaning, Decompostion of Dis-De[12]. Joo hyun Kim(2018) classified the deconstruction in John Galliano fashion make-up as Writing, Differance, Deputy Supplement, and Decomposition[13]. Therefore, in this study, we'll classify the Properties of Deconstruction as Differance, Uncertainty of Meaning, and Decomposition, incorporating the things addressed several times in the preceding researches.

First, Differance is a word defined by Derrida which is changed from the spelling of Difference to the spelling Differance, i.e. from "e" to "a". In doing so, the meaning of Differance became "to differ" and "to defer", containing several meanings such as "defer" in the temporal view, and "other" objects in the spatial view[11]. Differance, reborn by changing the existing word, cannot describe the existence and the non-existence as adversarial terms, nor can it exist at the same time[12]. Therefore, Differance constantly "differs" the meanings, and "defers" the essences as the temporal-spatial space changes by the Difference, Differance, and existence, non-existence. In other words, it suggests that something exists and the essence of something is an illusion like <Figure 3>.

Figure 3. Difference 2016F/W.

Second, Uncertainty of Meaning refers to the infinite diffusion of the elements within text. It is formed under the dissolution strategy of Differance. Uncertainty of Meaning not only disorganizes the system, but also maintains the system under a relative concept[14]. It is defined as disorganizing the meaning structures, making the unstable states, and diffusing them like <Figure 4>.

Figure 4. Uncertainty of meaning 2019F/W.

Third, Decomposition is the work of deconstruction by breaking/deviating the orders, and specifying it[15]. Decomposition creates various, new beauties by presenting new attempts and periodic images[16]. Decomposition express newly the subjects and balance deviating from the existing forms like hair expressions, and makeup in <Figure 5>.

Figure 5. Decomposition 2016F/W.

2.3. Hair expression components

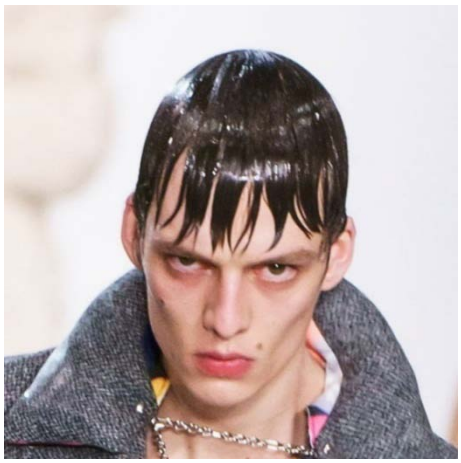
Hair expression is the creation of hair forms and images, which does not account for much of the body, but plays an important role in expressing oneself. Various factors play a role in completing hair design[17]. The hair expression component is a condition for completing hair design from the formation view.

Ju Yeon Lee (2010) divided the form, texture, and color from her research on hair comparing with the architecture[18]. In the study of deconstruction expressed in hair design by Seo Hee Kim(2015), hair design was classified as shape, texture, and color[19], while Young Sun Hwang(2013) classified the hair design into shape, texture, and color as the basic components of hair design[20]. Bo Min Yoon(2013) decided the method of hair expression as an object in the formation study of hair objects in the hair collection[21]. Therefore, in our research, we try to classify the hair design into form, texture, color, and object.

First, form can be said to be an outline of a shape, and a form is 3 – dimensional expression as an essential that has a shaped outline, an inner form, and a structure. It is basically divided into dots, lines, and sides. Some points are gathered to form a line, and the face is made through the movement of the lines, and a volume is made of faces[22].

Second, we can divide the texture of the Hair Expression Components into the texture that can be felt by hand and the visual texture that can be seen by the eyes. The texture expressed on hair is expressed overall or partially in the design as rigidness, softness, gloss, roughness, etc[19] <Figure 6>.

Figure 6. Texture 2019F/W.



Third, the color is one perception that the eye feels through the light. Color plays a major role in determining texture and volume. Also the essential important thing is that colors are not just visual transmission but also 'emotional sensations' which allow various expressions[23]. <Figure 7> also expresses colors using bright contrast characteristic.

Figure 7. Color 2017F/W.

Fourth, some association effects or bizarre effects can be obtained through object, referring “the form” to some objects that have been artworks of these symbolic functions. Modern object is assigned the existence Value of the artwork, including the material of things and the meaning of their production[24]. <Figure 8> show the expression using hats.

Figure 8. Object 2017S/S.

3. Results

3.1. Research methodology

We analyzed the properties of Decomposition and Hair Expression Components shown in the Maison Margiela collection by referring to Vogue US and Vogue France. We used total 595 pictures collected from 15S/S ~19F/W, especially at least 50 pictures per fashion seasons. For data analysis, we used the SPSS WIN 25.0 program[25][26].

In order to reduce subjective views and increase reliability, three experts participated in the analysis of images. In calculating the overall reliability, the conformity degree between the three mutual analysis was calculated by “the number of matching codes / the total number of coding”, and the results are as shown in <Table 1>. It can be seen that the conformity degrees for each major item are 0.989 or higher.

Table 1. Reliability.

Analysis item	Comprehensive reliability
Maison margiela collection	1.000
Deconstruction types	1.000
Hair expression component	0.989

3.2. Frequency analysis

<Table 2> is the result of conducting a frequency analysis to find out the survey target characteristics. The frequency analysis of the Maison Margiela collection is as follows. According to the frequencies of 2015S/S to 2019F/W, 2019S/S was the highest 66 cases, and 2017F/W was the lowest 54 cases, indicating an average of 9%-10%. Looking at the frequency analysis of reconstruction properties, Differance accounts for 52.8%, followed by 25.5% of Uncertainty of Meaning and 21.7% of Decomposition. Looking at the frequency analysis of Hair Expression Components, the object accounts for 44.7%, followed by 33.3% of the form, 12.6% of the texture, and 9.4% of the color.

Table 2. Frequency analysis.

Division		Frequency	Percent
Masion margiela collection	2015S/S	59	9.9
	2015F/W	56	9.4
	2016S/S	56	9.4
	2016F/W	59	9.9
	2017S/S	55	9.2
	2017F/W	54	9.1
	2018S/S	61	10.3
	2018F/W	65	10.9
	2019S/S	66	11.1
	2019F/W	64	10.8
Deconstruction property	Differance	314	52.8
	Uncertainty of meaning	152	25.5
	Decomposition	129	21.7
Hair expression components	Form	198	33.3
	Texture	75	12.6
	Color	56	9.4
	Object	266	44.7
Total		595	100.0

3.3. Cross analysis of properties of deconstruction per maison margiela collection

<Table 3> represents the classification table of Maison Margiela collection using Properties of Deconstruction. Among the Properties of Deconstruction, Differance accounts for 52.8%, followed by the Uncertainty of Meaning 25.5%, and Decomposition 21.7%. Among the Properties of Deconstruction, if we trace the weight change of Differance in Maison Margiela collection, then 2019F/W was the highest at 79.7% and 2015S/S(76.3%) and 2019S/S(75.8%), and 2018S/S was the lowest at 19.7% respectively.

For the weight change of the Uncertainty of Meaning in Maison Margiela collection, 2016 S/S was the highest at 42.9%, followed by 2016 F/W(40.7%), and 2015 F/W(32.1%) in the decreasing order, but 2015 S/S was found the lowest at 10.2%.

For the weight change of Decomposition in Maison Margiela collection, 2018 S/S was the highest at 68.9%, followed by 2017 F/W(33.3%), and 2015 F/W(26.8%) in the decreasing order, but 2019 S/S was found the lowest at 0.0%, thus it means there is no appearance in Maison Margiela collection.

Table 3. Cross analysis of properties of deconstruction per maison margiela collection(N=595).

Cross analysis			Decomposition property			Total
			Differance	Uncertainty of meaning	Decomposition	
Masion margiela collection	2015S/S	Frequency	45.0	6.0	8.0	59.0
		% in 2015 S/S	76.3%	10.2%	13.6%	100.0%
		% in deconstruction property	14.3%	3.9%	6.2%	9.9%
		% in total	7.6%	1.0%	1.3%	9.9%
	2015F/W	Frequency	23.0	18.0	15.0	56.0
		% in 2015 F/W	41.1%	32.1%	26.8%	100.0%
		% in deconstruction property	7.3%	11.8%	11.6%	9.4%
		% in total	3.9%	3.0%	2.5%	9.4%
	2016S/S	Frequency	29.0	24.0	3.0	56.0
		% in 2016 S/S	51.8%	42.9%	5.4%	100.0%
		% in deconstruction property	9.2%	15.8%	2.3%	9.4%
		% in total	4.9%	4.0%	0.5%	9.4%
	2016F/W	Frequency	25.0	24.0	10.0	59.0
		% in 2016 F/W	42.4%	40.7%	16.9%	100.0%
		% in deconstruction property	8.0%	15.8%	7.8%	9.9%
		% in total	4.2%	4.0%	1.7%	9.9%
	2017S/S	Frequency	29.0	12.0	14.0	55.0
		% in 2017 S/S	52.7%	21.8%	25.5%	100.0%
		% in deconstruction property	9.2%	7.9%	10.9%	9.2%
		% in total	4.9%	2.0%	2.4%	9.2%
	2017F/W	Frequency	19.0	17.0	18.0	54.0
		% in 2017 F/W	35.2%	31.5%	33.3%	100.0%
		% in deconstruction property	6.1%	11.2%	14.0%	9.1%
		% in total	3.2%	2.9%	3.0%	9.1%
	2018S/S	Frequency	12.0	7.0	42.0	61.0
		% in 2018 S/S	19.7%	11.5%	68.9%	100.0%
		% in deconstruction property	3.8%	4.6%	32.6%	10.3%
		% in total	2.0%	1.2%	7.1%	10.3%
	2018F/W	Frequency	31.0	18.0	16.0	65.0
		% in 2018 F/W	47.7%	27.7%	24.6%	100.0%
		% in deconstruction property	9.9%	11.8%	12.4%	10.9%
		% in total	5.2%	3.0%	2.7%	10.9%
	2019S/S	Frequency	50.0	16.0	0.0	66.0
		% in 2019 S/S	75.8%	24.2%	0.0%	100.0%
		% in deconstruction property	15.9%	10.5%	0.0%	11.1%
		% in total	8.4%	2.7%	0.0%	11.1%
	2019F/W	Frequency	51.0	10.0	3.0	64.0
		% in 2019 F/W	79.7%	15.6%	4.7%	100.0%
		% in deconstruction property	16.2%	6.6%	2.3%	10.8%
		% in total	8.6%	1.7%	0.5%	10.8%
Total	Frequency		314.0	152.0	129.0	595.0
	% in Maison margiela collection		52.8%	25.5%	21.7%	100.0%
	% in deconstruction property		100.0%	100.0%	100.0%	100.0%
	% in total		52.8%	25.5%	21.7%	100.0%

3.4. Cross analysis of hair expression components per maison margiela collection

According to Table 4, object accounted for 44.7% of hair expression elements, followed by 33.3% the form, 12.6% the texture, and 9.4% the color. For the weight change of the form in Maison Margiela collection, 2016 S/S was the highest at 76.8%, followed by 2015 F/W(64.3%), and 2016 F/W(54.2%) in the decreasing order, but 2018 F/W was found the lowest at 0.0%, thus it means there is no appearance in Maison Margiela collection.

For the weight change of the texture in Maison Margiela collection, 2019 F/W was the highest at 25.0%, followed by 2017 F/W(24.1%), and 2018 S/S(19.7%) in the decreasing order, but 2015 S/S was found the lowest at 10.2%.

For the weight change of the color in Maison Margiela collection, 2016 F/W was the highest at 18.6%, followed by 2018 F/W(15.4%), and 2019 S/S(13.6%) in the decreasing order, but 2015 S/S was found the lowest at 0.0%, thus it means there is no appearance in Maison Margiela collection.

For the weight change of object in Maison Margiela collection, 2018 F/W was the highest at 81.5%, followed by 2017 S/S(74.5%), and 2018 S/S(60.7%) in the decreasing order, but 2016 S/S was found the lowest at 16.1%.

Table 4. Cross analysis of hair expression components per maison margiela collection(N=595).

Cross analysis			Hair expression components				Total
			Form	Texture	Color	Object	
Maison margiela collection	2015S/S	Frequency	18.0	11.0	0.0	30.0	59.0
		% in 2015 S/S	30.5%	18.6%	0.0%	50.8%	100.0 %
		% in hair expression components	9.1%	14.7%	0.0%	11.3%	9.9 %
		% in total	3.0%	1.8%	0.0%	5.0%	9.9 %
	2015F/W	Frequency	36.0	1.0	8.0	11.0	56.0
		% in 2015 F/W	64.3%	1.8%	14.3%	19.6%	100.0 %
		% in hair expression components	18.2%	1.3%	14.3%	4.1%	9.4 %
		% in total	6.1%	0.2%	1.3%	1.8%	9.4 %
	2016S/S	Frequency	43.0	1.0	3.0	9.0	56.0
		% in 2016 S/S	76.8%	1.8%	5.4%	16.1%	100.0 %
		% in hair expression components	21.7%	1.3%	5.4%	3.4%	9.4 %
		% in total	7.2%	0.2%	0.5%	1.5%	9.4 %
	2016F/W	Frequency	32.0	3.0	11.0	13.0	59.0
		% in 2016 F/W	54.2%	5.1%	18.6%	22.0%	100.0 %
		% in hair expression components	16.2%	4.0%	19.6%	4.9%	9.9 %
		% in total	5.4%	0.5%	1.8%	2.2%	9.9 %
	2017S/S	Frequency	6.0	3.0	5.0	41.0	55.0
		% in 2017 S/S	10.9%	5.5%	9.1%	74.5%	100.0 %
		% in hair expression components	3.0%	4.0%	8.9%	15.4%	9.2 %
		% in total	1.0%	0.5%	0.8%	6.9%	9.2 %
	2017F/W	Frequency	20.0	13.0	5.0	16.0	54.0
		% in 2017 F/W	37.0%	24.1%	9.3%	29.6%	100.0 %
		% in hair expression components	10.1%	17.3%	8.9%	6.0%	9.1 %
		% in total	3.4%	2.2%	0.8%	2.7%	9.1 %
	2018S/S	frequency	8.0	12.0	4.0	37.0	61.0
		% in 2018 S/S	13.1%	19.7%	6.6%	60.7%	100.0 %
		% in hair expression components	4.0%	16.0%	7.1%	13.9%	10.3 %
		% in total	1.3%	2.0%	0.7%	6.2%	10.3 %
	2018F/W	Frequency	0.0	2.0	10.0	53.0	65.0
		% in 2018 F/W	0.0%	3.1%	15.4%	81.5%	100.0 %
		% in hair expression components	0.0%	2.7%	17.9%	19.9%	10.9 %
		% in total	0.0%	0.3%	1.7%	8.9%	10.9 %
	2019S/S	Frequency	11.0	13.0	9.0	33.0	66.0
		% in 2019 S/S	16.7%	19.7%	13.6%	50.0%	100.0 %
		% in hair expression components	5.6%	17.3%	16.1%	12.4%	11.1 %
		% in total	1.8%	2.2%	1.5%	5.5%	11.1 %
	2019F/W	Frequency	24.0	16.0	1.0	23.0	64.0
		% in 2019 F/W	37.5%	25.0%	1.6%	35.9%	100.0 %
		% in hair expression components	12.1%	21.3%	1.8%	8.6%	10.8 %

	% in total	4.0%	2.7%	0.2%	3.9%	10.8 %
total	Frequency	198.0	75.0	56.0	266.0	595.0
	% in maison margiela components	33.3%	12.6%	9.4%	44.7%	100.0 %
	% in hair expression components	100.0%	100.0%	100.0%	100.0%	100.0 %
	% in total	33.3%	12.6%	9.4%	44.7%	100.0 %

3.5. Cross analysis of hair expression components per properties of deconstruction

<Table 5> represents the analysis table of Hair Expression Components per Properties of Deconstruction. Among the Deconstruction Properties, the object accounts for 43% in Differance, followed by 34.4% the form, 14.3% the texture, 8.3% the color in the decreasing order. Deconstruction Properties, the object accounts for 40.1% in the Uncertainty of Meaning, followed by 37.5% the form, 11.2% the texture, 11.2% the color in the decreasing order. Among the Deconstruction Properties, the object accounts for 54.3% in Decomposition, followed by 25.6% the form, 10.1% the texture, 10.1% the color in the decreasing order.

Table 5. Cross analysis of hair expression components per deconstruction properties(N=595).

Cross analysis			Hair expression component				Total
			Form	Texture	Color	Object	
Deconstruction property	Differance	Frequency	108.0	45.0	26.0	135.0	314.0
		% in differance	34.4 %	14.3 %	8.3 %	43.0 %	100.0 %
		% in hair expression components	54.5 %	60.0 %	46.4 %	50.8 %	52.8 %
		% in total	18.2 %	7.6 %	4.4 %	22.7 %	52.8 %
	Uncertainty of meaning	Frequency	57.0	17.0	17.0	61.0	152.0
		% in uncertainty of meaning	37.5 %	11.2 %	11.2 %	40.1 %	100.0 %
		% in hair expression components	28.8 %	22.7 %	30.4 %	22.9 %	25.5 %
		% in total	9.6 %	2.9 %	2.9 %	10.3 %	25.5 %
	Decomposition	Frequency	33.0	13.0	13.0	70.0	129.0
		% in decomposition	25.6 %	10.1 %	10.1 %	54.3 %	100.0 %
		% in hair expression components	16.7 %	17.3 %	23.2 %	26.3 %	21.7 %
		% in total	5.5 %	2.2 %	2.2 %	11.8 %	21.7 %
total		Frequency	198.0	75.0	56.0	266.0	595.0
		% in deconstruction properties	33.3 %	12.6 %	9.4 %	44.7 %	100.0 %
		% in hair expression components	100.0 %	100.0 %	100.0 %	100.0 %	100.0 %
		% in total	33.3 %	12.6 %	9.4 %	44.7 %	100.0 %

3.6. Correlation between maison margiela collection, deconstruction properties, and hair expression components

We found the causal relationships between variables through the correlation analysis. <Table 6> is the result of correlation verification to find correlations between each variables.

As a result of analysis, Maison Margiela collection and Deconstruction Properties have negative correlations, but it is not statistically significant($p>.05$), and Maison Margiela collection and hair expression component have positive-significant($p<.01$) correlation. The correlation between deconstruction property and hair expression property is positive, and significant($p<.05$).

Table 6. Correlation analysis of maison margiela collection, deconstruction property, hair expression componet.

Classification		Maison margiela collection	Deconstruction property	Hair expression component
Maison margiela collection	Pearson correlation	1		
Deconstruction property	Pearson correlation	-.049	1	

Hair expression component	Pearson correlation	.223**	.083*	1

Note: *p<.05, **p<.01.

4. Conclusion

This study found the Deconstruction Properties and Hair Expression Components in the fashion collection. For the purpose of the study, we analyzed after reliability verification of pictures with 3 experts, followed by collecting pictures by limiting to Maison Margiela collection. The frequency analysis was introduced to identify the characteristics of Maison Margiela, and cross, and correlation analysis were introduced according to Maison Margiela collection, deconstruction property, and Hair Expression Components. The results from our analysis are as follows.

According to the cross-analysis of Maison Margiela collection and Deconstruction Properties, the Properties of Deconstruction were shown in Differance, Uncertainty of Meaning, and Decomposition in the decreasing order. Differance has the largest weight in 19 F/W, Uncertainty of Meaning in 16 S/S, and Decomposition in 18 S/S. We found that there are significant differences between groups, and are correlations between each types.

The results of the cross analysis of the Maison Margiela collection and Hair Expression Components showed that the object is the highest among hair expression elements, followed by form, texture, and color. The form has the highest weight at 16S/S collection, the texture at 19F/W, the color at 16F/W, and the object at 18F/W. Also, since there are the significances between groups, we can find the differences between each Hair Expression Components.

In reconstruction properties, especially Differance, Uncertainty of Meaning, and Decomposition, the object has the highest weight. We can find there is no correlation and no difference since there is no significance between these groups.

Therefore, there is a correlation between the deconstruction expressed in Maison Margiela and Hair Expression Components. In deconstruction & hair expression component, the object is higher at all cateogories. Therefore, as shown in the results, there is the diversity shortage of Hair Expression Components when expressing the deconstruction, although the object is enough to express individuality in the deconstruction. This, we suggest that there is a necessity to proceed the research and design. Because this research is limited to Maison Margiela Collection, we hope for other hair design research for Hair Expression Components and Deconstruction Properties in other fashion collection.

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6. Appendix

6.1. Authors contribution

	Initial name	Contribution
Lead Author	JL	-Set of concepts ☑ -Design ☑ -Getting results ☑ -Analysis ☑
Corresponding Author*	JC	-Make a significant contribution to collection ☑ -Final approval of the paper ☑ -Corresponding ☑ -Play a decisive role in modification ☑
Co-Author	JY	-Significant contributions to concepts, designs, practices, analysis and interpretation of data ☑ -Participants in Drafting and Revising Papers ☑ -Someone who can explain all aspects of the paper ☑

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A Study on the Artistic Value of DUNHUANG Patterns

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Abstract

Purpose: *Through theoretical considerations such as literature and research data on the pattern of Dunhuang, this study presents the academic systematization, a study on the artist value of Dunhuang patterns and a new possibility of application in the field of design utilizing the pattern of Dunhuang as a motif.*

Method: *Through the collection of data on the design patterns of Dunhuang art, the materials of Dunhuang art are being used the most in the design field and can be used easily. By analyzing the literature and classifying the components of the Dunhuang art pattern, the value was analyzed.*

Results: *The expression of the value of the Dunhuang pattern is analyzed into four characteristics which are artistic value, aesthetic value, cultural value, and economic value. Dunhuang pattern design tradition highlights the artistic expression form. The historical and economic value of traditional culture which satisfies both mental, visual and aesthetic effects were increased. Also analyzing the artistic value of the pattern of Dunhuang will help in the development and creation of the modern design field.*

Conclusion: *By presenting the classification and artistic value of Dunhuang pattern design academically when attempting to develop a variety of designs for the Dunhuang as a formative art in the field, it is highly utilized as a formative art and exhibits fusion creative ability. It is a design material that combines both art techniques, and the number of numbers is theoretically systematized.*

[Keywords] ***Dunhang, Pattern Design, Aesthetics, Culture, Economy***

1. Introduction

Dunhuang Cave Art is a treasure of ancient Chinese art and is registered in a World Heritage Site and the Dunhuang Cave is a unique Buddhist art system in which multiculturalism is mixed. This is a great value in studying design patterns, including ancient politics, economy, culture, religion, commerce, and commercial trade. In addition, along with the continuous development of Dunhuang art, the Dunhuang pattern is also expressed as a completely new art[1].

In the 5,000-year civilization history of the Chinese people, Dunhuang occupied an important historical position and in Ji-Ji Anlin's research about the Donhwang cave art, it was rated that 'The history is long, the region is wide, and it has its own system to help people The cultural systems that have had a great influence are China, India, Greece and Islam.' And the places where the four cultural systems were mixed are Dunhuang and Xinjiang As a region, Dunhuang murals and patterns are one of the most remarkable achievements of Dunhuang cave art. In the Dunhuang cave art, the pattern is an important component.

The Dunhuang pattern is diverse, and the colorful colors and shapes are elaborate. It is a high research value in inheriting the cultural context, traditional arts and cultural heritages to explore artistic characteristics and evolution. The pattern of the design goes beyond the dimension of expressing

*This Paper Summarizes Xin-Xin Cai's Kwangju Women's University Doctoral Thesis.

the combination and expresses the unique charm of Dunhuang stone cave art by mixing with the foreign art style.

Chinese culture which has a long history of more than 5,000 years, is a treasure trove of artistic inspiration in the interest of today's global artist. Because of its exotic sentiment and symbolism. Modern arts in various cultural fields such as crafts, arts, thoughts, customs, beauty are being used for design development. Therefore, by exhibiting fashion for the popularization of Chinese culture, beauty, culture arts in the arts area and products that are related to culture. The traditional element's interest is increased and the world is paying attention to new values and influences[2]. Research on the Dunhuang pattern is being conducted in various fields, but the establishment for the formative arts is insufficient[3].

Therefore, in this study, by analyzing the existing data The rapid growth of the beauty industry establishes a systematic academic foundation and divides the artistic value of the Dunhuang pattern. This study intends to present new application possibilities in the field of design[4].

2. Method

This study was conducted in the field of design by collecting data on the pattern of Dunhuang art. It is based on the design materials of Dunhuang art that is the most handled and easy to use. Studying the value of art by reviewing the literature and classifying the constituent elements of the Dunhuang art design.

To collect data on the patterns of Dunhuang art, we visited the Dunhuang Cave and Dunhuang museum and collected photos and materials related to the patterns of Dunhuang art. We have put together a theoretical review, a literature study, and an empirical review. Also, in Korea and abroad literature-related professional books, articles, prior studies, books, Internet search, Chinese art. Through data from thesis and books related to history, Chinese cultural history, etc.. We classified and systematically analyzed Dunhuang art patterns, artistic value, aesthetic value, cultural value, economic value for symbolic and periodic features, religious thoughts, and forms of composition.

3. Result

3.1. Features of the dunhuang pattern

The Dunhuang pattern is like the entire stone cave art. These are all art works of each era and It has the characteristics and styles of each era. The innumerable and excellent design pattern reflects art and technique and has the basic characteristics of religious art. It contains rich imagination and symbolic features.

The Dunhuang pattern is a part that cannot be separated from the Dunhuang art. It is a decorative pattern that includes architecture, murals, and colors, and has its own independent form. First, the flow of time and the rise and fall of culture, the replacement of the dynasty period, various types of caves are determined according to the periodic background such as regional stability. Changes in design patterns such as figure sculptures, mural materials, and stone cave decoration reflect the situation of the times. In addition, the structure of the pattern of the stone cave changed according to the shape, exterior and interior setting of the cave. Lastly in terms of aesthetics religions and values, in the aspect of daily life, the characteristic meaning was reflected in the design pattern.

The specific features are as follows: First, the characteristics of the period of the Dunhuang pattern are the change of dynasty, social stability, It depends on the degree of development of the ritual, etc.. China and Western countries' economy, culture and religious exchanges are also reflected. During the early Northern Dynasty of Dunhuang development, political disputes, dynasty changes, rulers changes in local areas, and a new artistic style were brought to the Dunhuang Cave. During the changes of the times The art of Jung-Won and western had formed a unique stone cave art by exchanging and mixing. The design pattern uses the concept of pragmatism and is concise, it was the

grandeur of religion[5]. Also, people had suffered from the pains of a wandering life due to a long war, they came to pursue and yearn for a stable heavenly world. Therefore, the Buddhist idea that could be reborn and reborn after training became the spiritual support for people. Buddhism materials that had the form of graceful,soft and serene patterns were out of the customs and became the subject of major works of patterns in the North-South Dynasty period[6].

During the Su-Tang era politics were stable and materials were abundant. The exchange between Dunhuang and Joongwon was smooth. As the transportation center of the Silk Road, Dunhuang art was at its peak. The pattern was a mixture of art elements from the nomadic peoples, the Korean peoples, and the western regions. The rich and vivid colors were used a lot as a material that symbolized human warmth and happiness. For example Gown Chomun(卷草纹) with various flowers and leaves, Comfortable and gentle auspicious beast(瑞兽), flower branches and seocho(瑞草: auspicious grass in ancient times), Youngnak(璎珞: mainly bead necklaces), a reward painting that synthesizes the characteristics of various flowers and calligraphy painting that symbolizes a good harvest The shape was full, the curves were smooth, and the colors were gorgeous, they reflected the spirit of a prosperous and peaceful world.

Second, the form of construction of the Dunhuang pattern was closely related to the structure of architecture. Ancient artists used patterns according to the shape of the building structure. In particular, for buildings in the time of sib-yuggug, bug-wi and seowi the decorative parts of the design mainly included the flat design of the ceiling, the gamsil munmi design of the bulgam, the herringbone design of the hall, and the frame decoration of the beam of the central pillar. it was used in this era. In addition, according to the changes of architectural form after the Sui and Tang dynasties, the adjustment pattern of the ceiling, the pyeonggi pattern, and the tile pattern on the floor were reflected[7]. As the core of the Dunhuang pattern, its structure was strict and delicately expressed, and it emphasized harmonious unity. This was how the ancient Chinese people absorbed foreign culture and created a unique world of art by reflecting decorative patterns and colors. In the third aspect of ideology, it was expressed that it had a specific meaning by combining images of religious thought, politics, ethics, morality, values, and everyday life and patterns. In other words, a pattern or picture gave its meaning and has an auspicious meaning. It was expressed as a gilsang pattern(吉祥纹样). The Gilsang pattern was a symbol, meaning, metaphor, posterity, and overtones through artistic techniques. it expressed a symbolic meaning.

The symbol expressed the specific idea by nature, such as the shape, color, and function of some flowers. For example there are many grains in the pomegranate, which symbolizes multi-prospect. Peonies are a symbol of wealth because of their large sizes and colorful colors. The fruit quality of grapes and pomegranate symbolizes the meaning that the vines grow steadily, flowers bloom, bear fruit, and the descendants prosper[8].

The implications were based on myths and oral literature that the public welcomed it contained a specific idea. For example, in the "Hanmu Civil War" Dong Bang Sak(东方朔) stole and ate the peach of Seo Wang-mo(goddess of mythology) After that, peaches became a symbol of longevity[9].

The parable characterizes and gives the object of a subject. For example, in Buddhism, the lotus flower is not stained even when it comes out of the mud, and the lotus flower is clear but not bewitching. It was compared to a good dignity[10].

The code used a material as a sign with a special meaning. For example, 卐 is an ancient religious sign and a symbol of sun and fire. It was used in ancient India, Persia, Greece and other countries. In Buddhism, it was a symbol of Mandeok and Gilsang. Overtones were concatenated with the homophone to create a specific gilshark(吉祥语).

For example, bats and incarceration symbolize good fortune. The old deer symbolizes green(禄: the salary of ancient Chinese officials, green, green peak), and the goldfish symbolizes gold jade. Also, letters directly expressed meaning. For example, intuitively, 'bok(福)', characters such as 'rock(禄)' and 'hee(喜)' were used directly[11]. Minority ethnic patterns are created and handed down by the people of minorities in long-term production and life. It indicates that each has a pattern of national characteristics[8].

3.2. Classification of dunhuang pattern design

The Dunhuang pattern has been handed down a lot of patterns, and its classification is based on period. Various methods vary for each document or book depending on the type, meaning, and composition method. appears and classified. Depending on the era, type, meaning, and composition Various methods appeared and categorized in each document or book.

Also there was hardly any classification by the expression method according to the subject's motif. The classification of traditional patterns, which was used for the first time in the history of the East, is largely divided into natural patterns and geometric patterns. It was true that the design patterns of Dunhuang cave did not have a unified classification system and showed various styles according to the understanding of researchers. Therefore, the theoretical systematization of the Dunhuang design pattern must be established urgently. 乌密风(1983)'敦煌图案的组织结构과纹样'[7], 王贵民(1989) '敦煌图案研究'[12], 常莎娜(2009)‘中国敦煌历代装饰图案’[13], 关友惠(1980)'敦煌石굴全集·图案卷'[14], 刘敏(2015) '敦煌装饰图案色彩在现代平面设计中的应用'[15] Using the data contents of literature , books and research papers. The artistic value of the Dunhuang pattern was analyzed and classified into four categories: cultural, artistic, aesthetic, and economic.

3.3. Analysis of the art value of the pattern of dunhuang pattern

3.3.1. Cultural value

Culture is kind of a social value phenomenon. It is a product that is created by people for a long time[16]. At the same time, it is a historical phenomenon and an accumulation. Cultural value research is to establish rational devotion and positing. First of all, cultural value has a fundamental meaning, is the most basic value and is a cultural phenomenon at the same time. Values depend on real life and a certain cultural system. It is pointless to speak of value itself apart from the process of human development and security. The various values of our lives are related to cultural values, and we can view them as concrete forms of cultural values in a certain sense. Therefore, the Dunhuang pattern, which occupies an important position in Chinese art history, its existence provided various materials such as ancient Chinese politics, economy, culture, military, geography, transportation, social life, ethnic relations, religious history, art history, and cultural exchange history between China and foreign countries. it can be said that it has an incalculable history and cultural value.

First, the Dunhuang cave originally provided a place of practice and worship to Buddhists. The Dunhuang pattern is a product of Buddhist art and is related to Buddhism. Most of the paintings of the Dunhuang murals are monks, the Dunhuang murals were also expressed in a pattern to promote Buddhist culture, and many Buddhist materials remained. Buddhism has gradually become a religion with the characteristics of the Chinese people through successive developments and changes. Confucianism and Taoism, which are native to China, were divided into three parts, becoming an important part of traditional Chinese culture. The birth of Buddhism had a great influence on the social and historical trends. Not only Asia, but also the social life and cultural beliefs of people around the world.

Second, the Dunhuang pattern occupies a very important place in the cave art. It contains rich contents of the theme of the mural. As a type of superstructure in ancient society, the Dunhuang pattern changed with the evolution of the times. During the dynamic development process, traditional patterns such as Chinese traditional patterns were exchanged and mixed in India, Persia and Central Asia. During the northern dynasty Hoin, who took control of the northern regime through national migration and cultural fusion, gradually became like the Han Chinese, and the Han Chinese in Jung-Won too absorbed the culture of Hoin. Therefore, the pattern of Dunhuang in this period The Jung-Won Han culture and the Western Huang culture are mixed with each other and have artistic characteristics that are reflected[17]. The design is concise and the color is simple, and the pattern is mainly expressed in geometric patterns and artificial patterns. In the Sui Dynasty, The state of the 200-year division of the North and South Dynasty was ended and they were united into one country. The was mixed with the Jung-Won culture and the western art, and based on this,novel patterns began to appear. The Tang Dynasty was the maturity period of the development of Dunhuang patterns

and rich content and sophisticated art expression methods. it surpassed the previous era. In the five generations due to the Jung-won war, exchanges were restricted and the Dunhuang buddhist Cave was ruled by Cho's army. it was large and a lot of dragon and rod patterns were used as a design to symbolize imperial power.

Finally, the recorded the formation, change, and development of Chinese decorative arts. The development of decorative styles and crafts such as ancient architecture, weaving, clothing, and accessories was also influenced. At that time, economic, cultural, and religious exchanges through the Silk Road between China and Western countries were reflected, reflecting the relationship between China and Western cultures' mutual fusion development. By studying the pattern of Dunhuang, not only you can understand the cultural characteristics of Dunhuang art, but also It is a great value in the succession and innovation of traditional Chinese culture.

3.3.2. Artistic value

Artistic value mainly includes artistic characteristics, forms, style combinations, colors, etc.. Artistic value increases as ethnicity, regionality, and personality are reflected.

Dunhuang art is a religious art based on Buddhism. It was created around the contents of Buddhist stories such as murals and coloring of each period. but in art form, Chinese art clearly shows the process of inheriting the tradition and development of the nation. Dunhuang art accepted and mixed the foreign culture of the West. Through successive developments, each historical period has created true art with national characteristics and time period. The artistic value of the Dunhuang pattern is not only a unique sentimental value, but also It exists in the creative system.

First, the Dunhuang pattern is based on the traditional color rule. By intentionally expressing the intrinsic color of an object and not pursuing complex hues. It emphasizes the decorative beauty of color. In addition, the infectious power of the Dunhuang pattern, the expressive power, the diversity of hues, and the regularity of the color structure represent a high level of artistic value and reflect the development and evolution of the color field of traditional Chinese paintings. In particular, during the Sui and Tang period, it has already developed to a quite mature stage, forming the peak of Dunhuang art development. it was a remarkable miracle in the history of world art, color has an irreplaceable, historical and aesthetic value are an artistic achievement and important content of this peak.

The Dunhuang pattern combination pursues a sense of volume, the content of the pattern is rich and the composition form is complex. The space is small but the order of expression is full. Each cave material goes well with each other and is symmetrical, balanced and unified. The Strict and rhythmic decorative three-dimensional art's structure was constructed according to the changed aesthetic laws <Table 1>.

Table 1. The artistic value of the dunhuang pattern.

Artistic value	Characteristic	Representative pattern
Color	- Variety of shades - Unification and change - Symmetry and balance - Color regularity - Harmonious effect	

Combination	- Symmetry of the pattern - Balance and unity - Changed aesthetic characteristics	

The Dunhuang pattern has a wide and profound influence on contemporary art, it transcends the concept of art and continues to nurture the development of modern national art.

Dunhuang art goes beyond the form of pattern, provides various principles and forms of composition for many formative arts such as architecture, painting, craft, equipment, and costume. The combination has the basis of the theory and practice to exchange contemporary Chinese and Western paintings with compositional characteristics such as flatness, decoration, and scattered perspective. The thousand-year-old stone cave pattern art is a friendly, natural, and ideal Buddhist world of paradise with excellent expression techniques, and has high artistic value such as creation and transmission of techniques.

3.3.3. Aesthetic value

The aesthetic value of art refers to the aesthetic meaning and psychological efficacy of art to people. All objects and phenomena that can evoke subjective aesthetic sense have aesthetic value. Excellent works of art can overcome historical hardships. It has aesthetic value that transcends ancient times, ethnicities, and classes. The most striking aesthetic value of Dunhuang pattern is in a rich symbolic connotation. The Dunhuang pattern went through the process of abstraction leading to the formal beauty of religious art in the lifestyle. It contains rich ideological connotations, especially religious ideologies. For example, the indong pattern symbolizes the worship of life in religious concepts, the lotus pattern is a symbol of the Buddhist Pure Land[18].

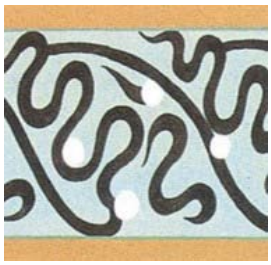
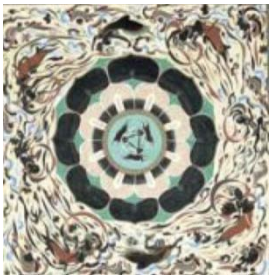
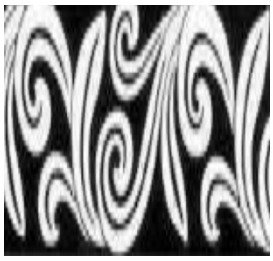
Most of the patterns of Dunhuang have religious symbolisms with beautiful pursuits and religious ideas. Thanks to the abstract art form, adjustment patterns of Dunhuang patterns and Decorative border patterns, etc express a sense of freedom and beautiful rhyme. It has reached a high artistic level, expressing the desire and pursuit life of artists. Among the patterns the indong pattern, the branches of grapes and pomegranates, the cloud pattern drifting along the wind, the burning flame pattern, and the rain cloth pattern dancing with long sleeves fully expressed the beauty of music in a changing rhyme.

All the images of the pattern originated from life, but the figure that is abstract and simple was composed of a complex decorative pattern according to the specified law of formal beauty. It fully reflects the aesthetic features that combine simplicity and complex beauty. through a single pattern, the realistic object was simplified and abstracted A single pattern was continuously repeated to form a complex pattern. For example the combination of realistic phenomena, such as the North Dynasty's indong pattern and the Tang Dynasty's adjustment pattern, and the repetition of simple colors and patterns harmonized well, bringing out a sense of rhythm. The patterns are elaborate and diverse, so they well expressed the people of life and well reflected the aesthetic preference of people. In addition, Dunhuang Stone Cave art is designed to build the world of God and at the same time fuse the human’s world with the world of God. It expresses the beautiful human world that shows the beauty of heaven and the state of heaven <Table 2>.

The intrinsic aesthetic transition of the Dunhuang art experiences the transition from decoration to god and man. It contains the process of passing people's aesthetic ideas from the separation of humans and nature to the integration of nature and society. Dunhuang's art gradually changed from the divine art to the art that was shared by humans and gods. It contains the meaning of gradually

transitioning from pure conceptual art to practical art. At the same time, by combining traditional patterns and modern aesthetic preference, they constantly fusion and innovate, eventually forming a unique aesthetic value system.

Table 2. The aesthetic value of the dunhuang pattern.

Characteristics of aesthetic value	Representative design patterns	
- Various symbolic meanings - Religious ideas - Mixture of human's world and paradise - Secular beauty and heavenly beauty	 Indongmun	 Indongmun Yeonhwa Bicheonmun
- Freedom - Beautiful rhyme	 Bicheonmun	 Samto Yeonhwa Bicheonmun
- Simple color - Simple pattern repetition - Sense of rhythm	 Sampan Indongmun	 Tang Dynasty Adjustment Patten

3.3.4. Economic value

The economic value of art is mainly a comprehensive value of art. It occurs when people pay for and consume art by providing services to society and the public. it is the economic effect. also, for art to develop, it must realize its economic value.

The Dunhuang Caves have a long history and a brilliant culture, and in December 1987. The Su Dunhuang Caves are listed as a World Heritage Site. In addition, the Dunhuang Museum and Nanzhou University established Dunhuang Research Center to study civilization and archeology.Many researchers contributed to the protection and development of civilization. In 2014, the "One Belt One Road"(一带一路) was proposed, and the Silk Road(Dunhuang) International Cultural Expo settled in Dunhuang. Cultures from all over the world were gathered, providing a new opportunity for development and transmission. The economic value of Dunhuang art has been further enhanced. In 2016, Changsana(常莎娜) Dunhuang Pattern Lab was opened to create innovative designs and traditions of Dunhuang patterns and contemporary creations. Cultural elements characteristic of Dunhuang

through the reunion of culture and modern ideas was created as a work of art. it contributed to the development of Dunhuang culture.

Dunhuang City opened the Dunhuang Culture and Arts Exhibition and Tourist Information Center, and held various events such as international cultural festivals successfully. As Dunhuang Cave Tourist Market grew, the economy has grown and the tourism industry such as foreign tourists had a profound impact on the economy. It also provided jobs to local residents,raised tourist's income and increased economic value[19]. Now, the tourism business of Dunhuang City has become the main economic value industry for the economic and social development of Dunhuang City. According to the government of jiuquan City, Dunhuang City has 13,373,300 tourists in 2019. It raised tourism income of 14.9 billion won and achieved both social and economic effects[20] <Figure 1>.

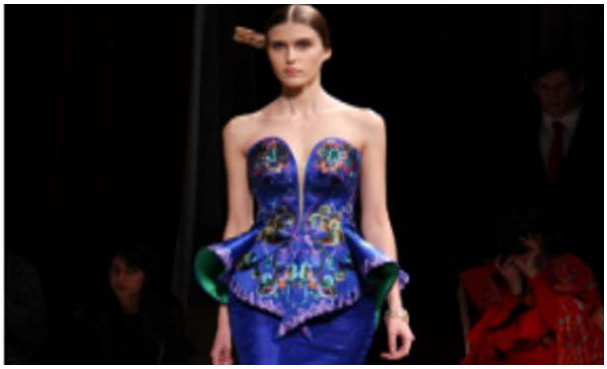
Figure 1. Tourist attractions in dunhuang city(http://www.baidubaike.com)[21].

In addition in the new era of Dunhuang, other forms of derivative work such as crafts, dramas, and comedies were introduced into industrial production and created new values. Other derivatives show objective publicity effects as carriers of local culture. Dunhuang City's reproduction arts developed like other reproduction arts, and formed as the center of the new art industry of Dunhuang Stone Cave Art. It gained domestic and foreign reputations, it was also reborn as an art brand.

In 2015, the designer lawrance xu played a bridge role in connecting the contemporary fashion art with the millennium Don Huang costume art by incorporating the elements of Don Huang's clothing into the Paris fashion stage. Famous Chinese designer VIVIENNE HU used pumpkins, blue dynasties, greens, and spears on the murals of the stone caves at New York Fashion Week, under the theme of Donhwang Bicheon. The image of 'Bicheon Fairy' in Dunhuang Cave was applied. dresses were well received both domestically and internationally. The economic value of the reproduction of Dunhuang art was highlighted <Figure 2>.

The unique value, rich pattern style, and deep historical implications of Dunhuang art constantly inspire designers. By applying the Dunhuang pattern to architectural design, clothing,craft design, and beauty design works, derivatives of Dunhuang s can be developed in various aspects such as the technique, form, material, and color of the pattern. because of the fashion of traditional culture and the fashion of retro, The economy is also one aspect of Don Huang's modern design that shows its value. It has traditional national characteristics and distinct characteristics that move forward with era. The elements of the Dunhuang pattern are expected to develop further in modern design and are expected to create higher economic value.

Figure 2. Fashion show(http://www.baidubaike.com)[21].



4. Conclusion

Dunhuang cave art has innumerable patterns in four hundred caves throughout a thousand years. It is like an Seoul art center in China. The Dunhuang pattern is the art of the entire cave art and all of the areas. it has the characteristics and styles of each era. The provides a glimpse into the life, faith, and ideology of ancient society, as well as outstanding artistic value and culture of the times. Therefore, as part of the development of new designs for each field, it presents the possibility of application in new design fields by analyzing the artistic value(culture, art, aesthetics, economy) of the Dunhuang pattern and academic systematization through theoretical considerations such as literature and research data.

As a result, the classification of Dunhuang patterns according to the period during the early years of Dunhuang development Dunhuang Influenced by the northern nomadic peoples and the aesthetic ideology of the dark period, the pattern was concise and clear, and the magnificence of religion was expressed. The Tang Dynasty is the golden age of Dunhuang development. Variety, sophistication, and splendor appeared through their pattern's design, form and color. Seoha, Jung-Won in the fifth period. Due to the war, the pattern of Dunhuang went through a period of decline but artists had accepted Western culture and created a new pattern art of Dunhuang. in the value expression of the Dunhuang pattern pattern, it was analyzed into four categories: artistic value, aesthetic value, cultural value, and economic value. The Dunhuang pattern has shown a greater possibility of application by highlighting the traditional artistic expression form. while satisfying mental, visual, and aesthetic needs, traditional culture has further enhanced the historical and economic value. It was also found that the artistic value of the Dunhuang pattern can be helpful in the development and creation of modern design.

Therefore, through this study, By presenting the classification of the Dunhuang pattern and the artistic value, the Dunhuang pattern can be used in various design fields. and It was theoretically systematized. In addition, I assumed that it will be highly utilized as a formative art in the design field when attempting to develop various designs in the future and establish itself as a design material incorporating the Dunhuang pattern art technique with mixture creativity.

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6. Appendix

6.1. Authors contribution

	Initial name	Contribution
Lead Author	MH	-Set of concepts ☑ -Design ☑ -Getting results ☑ -Analysis ☑
Corresponding Author*	XC	-Make a significant contribution to collection ☑ -Final approval of the paper ☑ -Corresponding ☑ -Play a decisive role in modification ☑
Co-Lead Author	EC	-Significant contributions to concepts, designs, practices, analysis and interpretation of data ☑ -Participants in Drafting and Revising Papers ☑ -Someone who can explain all aspects of the paper ☑

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Directions for the Korean Social INTEGRATION Policy Index Development

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Abstract

Purpose: *As South Korea enters a multicultural society, the importance of a reasonable and effective social integration policy system has been emphasized. The evaluation of social integration policies can promote policy improvement and improve policy effects. The purpose of this study is to analyze the limitations of the application of MIPEX in the evaluation of the Korean social integration policy and to give suggestions about the developing direction of South Korea's social integration policy index.*

Method: *This study starts with the MIPEX's analysis of South Korea to understands the advantages and disadvantages of Korean immigrant social integration policy. On the other hand, there are certain limits in MIPEX's evaluation and practical application in South Korea, so by observation and analysis of MIPEX and comparison of integration policies of South Korea and other countries, suggestions are made for the development of a social integration policy index that meets the conditions of South Korea.*

Results: *Although South Korea's immigrant social integration policy is in a leading position in Asia especially in multicultural education area but compared to the Top countries in MIPEX, some improvement still need to be made. It was showing a trend of regression with increased difficulty in obtaining permanent residency. MIPEX's completely Europe-centered evaluation standards, ignoring illegal immigrants and only focusing on legal immigrants, and ignoring the actual implementation of policies are all reasons for its limitations of application in South Korea.*

Conclusion: *It is necessary to consider the conditions of South Korea and formulate policy indicators that conform to the society during the development of the Korean social integration policy index. The targets of the social integration policy should include all immigrants, and the actual implementation of the policy should be reflected in the evaluation. According to the specific conditions of the country, citizen participation, gender equality, and social security are policy elements that can be added to the index.*

[Keywords] ***MIPEX, Social Integration Policy, Multicultural Society, Multicultural Education, Anti-Discrimination***

1. Introduction

1.1. Research purpose

As Korea enters a multicultural society, the number of foreigners staying in Korea is increasing, and according to statistics from the Korea Immigration Service, the number of foreigners staying in Korea was 2,077,053 as of October 2020 - 1.65 times the number of foreigners staying in Korea 10 years ago.

In terms of nationalities, among foreigners in South Korea, 44.2% are Chinese, 10.2% are Vietnamese, 8.8% are Thais, 7.0% are Americans, and 3.2% are Uzbekistan. In terms of types, whether it is marriage immigrants, foreign workers, immigrant youth, international students,

* This work has revised and supplemented the poster presentation of the academic conference at Dongguk University's Institute for Multicultural Integration on December 4, 2020.

refugees, the number is increasing annually[1]. The multicultural characteristics of Korean society are becoming ever more obvious.

As a global phenomenon, the problem of population aging is also very serious in South Korea. By 2050, about 36% of the population in South Korea will be composed of elderly people, so it is estimated that one-third of the total population will be elderly[2]. Although the government is working hard to increase the birth rate, the demographic issue has been unavoidable[3]. The influx of immigrants eliminates the impact of aging and low births to a certain extent or at least slows this trend, so as a countermeasure to the impact of low births and aging population[4], the number of immigrants will continue to grow and the multicultural features of Korean society are expected to be more significant in the future.

In such a society composed of members of diverse races, ethnic groups, and nationalities, how to cultivate a stable, safe, and respectful society with equal opportunities and participation for everyone through a reasonable and effective social integration policy system has become a vital issue that affects social harmony and determines social development.

Therefore, starting from MIPEX's evaluation and analysis of the social integration policy of South Korea, on the one hand, we can understand the advantages and disadvantages of Korea's social integration policy for immigrants. On the other hand, as a social integration policy index developed mainly for Europe, MIPEX has definite limits for its evaluation and practical application in South Korea. Hence suggestions are made for the development of the social integration policy index that meets the conditions of South Korea through the analysis of MIPEX.

1.2. Previous studies

Social integration of immigrants refers to the full participation of immigrants in the receiving society[5], and some scholars interpret it as achieving equality between immigrants and natives[6]. The literature on social integration of immigrants defined it as a two-way interactive process involving the acceptance and accommodation of both immigrants and the receiving society[7]. As a process of creating unity, tolerance, and participation at all levels of society in the diversity of personal attributes, social integration is a very ideal result that can reflect the existence of social cohesion, a strong institutional foundation, and a culture of acceptance. If society can promote social integration through inclusive policies that reduce economic inequality and poverty and promote sustainable and equitable development, then society will be better[8].

The concept of integration is widely used in immigration policies around the world, especially among immigration policy experts and researchers in Europe[9].

Some scholars defined integration policy as a multidimensional social policy that can increase protection, economic integration, and participation in social life[10] while some thought that social integration policy aims to provide equal opportunities, fight against social and economic disadvantages, implement affirmative action plans, protect immigrant culture, religion, and identity, and promote anti-discrimination legislation[11]. There are major transnational differences in the development of national and regional approaches and measures that shape migration policies[12]. The integration policies of the European Union, North America, and Australia invoke the concepts of cultural diversity and tolerance to describe the types of societies that can maintain social cohesion in the context of immigration and cultural diversity[13].

As for Japan, tabunka kyosei(multicultural coexistence) has become the slogan of Japan's integration policy, especially in local governments. Japan's tabunka kyosei policy is different from Canada and Australia's multiculturalism where the main targets of multiculturalism are race and ethnic minorities. The social integration policies of Japan have some similarities with the integration policies of European countries[14] since it mainly deals with foreign residents and covers citizens with immigrant backgrounds[15].

2. Analysis of MIPEX Output

2.1. MIPEX

MIPEX(The Migrant Integration Policy Index) is a tool that measures the social integration policy of immigrants. As a powerful tool for evaluating and comparing the government's measures to promote the social integration of immigrants with its rigorous and strongly relevant indicators, it is widely used by policymakers, NGOs, researchers, and European and international institutions to understand and compare social integration policies of immigrants and to improve the standard of equal treatment.

In 2020, MIPEX created new core indicators on the previous basis[16] in the eight areas to test the levels of social integration policies for immigration in 52 countries including all EU member countries and Australia, Canada, the United States, Japan, South Korea, and New Zealand.

MIPEX identifies the highest European and international standards aimed at achieving equal rights, responsibilities, and opportunities for all residents. The highest standards used by MIPEX during the measurement are drawn from Council of Europe Conventions or European Union Directives. The following are several highest standards used in MIPEX.

- Immigration Law Practitioners' Association and the Migration Policy Group, The Amsterdam Proposals: Proposed Directive on family reunion, 2000
- EC Council Conclusions of 26 November 2009 on the education of children with a migrant background 2009/C 301/07
- Starting Line Group, Proposals for legislative measures to combat racism and to promote equal rights in the European Union, 1998
- UN International Covenant on Civil and Political Rights(ICCPR)
- UN International Convention on the Protection of All Migrant Workers and the Members of Their Families

As shown in <Figure 1>, MIPEX includes eight policy areas of Labour market mobility, Family reunion, Education, Political participation, Permanent residence, Access to nationality, Anti-discrimination, Health.

Figure 1. MIPEX policy areas.

2.2. Output analysis of MIPEX 2020

According to the results of MIPEX in 2020, Korea is one of the rare countries which the social integration policy has regressed from 2014 to 2019. During these five years, it is a significant improvement that teachers' multicultural powers had been strengthened through training but the immigrants have faced greater difficulties in obtaining permanent residency since 2018.

Korea scored 56 points and ranked 18th among all 52 countries measured by MIPEX. MIPEX recommends that South Korea should remove key barriers and provide targeted support for immigrants in all aspects of their lives. Although South Korea has adopted a comprehensive integration method similar to that of the top ten countries for social integration, it falls behind the top ten countries because its policy is halfway through the three aspects of ensuring equal power, opportunity, and safety, which are all emphasized by MIPEX. In terms of immigration policy, South Korea is the leader in Asia, and compared to any other Asian countries included in MIPEX, immigrants in Korea enjoy more favorable policies. South Korea's social integration policy is similar to the average level of OECD countries but lower than that of traditional immigration destination countries such as the United States and Canada.

In terms of labor market mobility, legal residents can self-employ and work in public sectors and obtain targeted support, but for some temporary workers and family immigrants, they are still facing difficulties in improving their skills and working conditions.

Regarding family reunion, the reunion of multicultural families benefited from South Korea's family reunion and social integration legal framework. Sponsors can immediately apply for a nuclear family reunion, and in some special cases, they can apply for adult children and parents who need care.

As for multicultural education, South Korea has surpassed many other countries in helping immigrant children to enter school and succeed in all kinds of schools. All immigrant children have access to- educational opportunities. Under the influence of the Multicultural Family Support Act, multicultural families can get language guidance and educational assistance in each education stage.

Health is the weakest aspect of South Korea's social integration policy for immigrants. Although immigrants have access to health services, their health rights are weaker than in most other countries. Under the influence of such social integration policies, immigrants are more likely to have poorer health conditions than non-immigrants.

South Korea's immigration political participation policy is ahead of most new destination countries. Immigrants have the opportunity to vote, but they still can not participate in elections as candidates, and they also are rejected for joining political parties.

In terms of permanent residence, like many European countries, after 5 years of living in South Korea, eligible immigrants can apply for permanent residence. Starting in 2018, immigrants need to complete the social integration project course or pass a comprehensive evaluation as part of the condition for their application for permanent residence.

As a new destination country, South Korea's nationality acquisition policy has not kept up with the international trend of granting Korean nationality to the children of immigrants born in South Korea and dual nationality for foreigners.

Although Korea's definition of discrimination seems to be slightly stronger when compared with Japan's, South Korea's discrimination protections are relatively weak. However, the enforcement of anti-discrimination laws in Japan and South Korea is equally weak and falls far behind the standards of most countries.

3. Issues of MIPEX

As a powerful tool for measuring the level of social integration policies for immigrants, MIPEX has done various researches in 8 areas and developed a set of core indicators. However, MIPEX also has the following issues.

First, MIPEX measures the social integration policies of 52 countries in Europe, Asia, America, Australia, etc. completely from a Europe-centered perspective and MIPEX 's evaluation of all countries is conducted based on the Council of Europe Conventions or European Union Directives standards. However, it only reflects the European systems of government and policies, which does not necessarily translate to laws and policies of other countries in other parts of the world[17] and it is not reasonable since each country's actual situation is different. Besides, the particularity of the political system of the European Union determines that most other countries can not adopt social integration policies which similar to the European Union's.

Second, MIPEX only discussed the social integration of legal immigrants. MIPEX mainly focuses on legal immigration, so it can not be used to fully understand the impact of immigration policies on illegal immigrants who should be included in comprehensive immigration reform[17]. As of October 2020, there are 393,045 illegal immigrants in Korea, and the illegal staying rate is as high as 18.9%. With such a high rate of illegal stay, it is unreasonable to evaluate the social integration policy only for legal immigrants. It is not only unreasonable to ignore the nearly 400,000 illegal immigrants, and evaluate the social integration policy only for legal immigrants but also possibly increases the phenomenon of illegal stay so the rate may later further increase due to the negligence.

Third, MIPEX only analyzed the social integration established policies and laws. The actual implementation of social integration policies and laws in each country is excluded from the evaluation. During the implementation of policies, there may be a gap between the actual effect and the expected effect or even the opposite of the expected policy effect. It is unreasonable to only evaluate the established policies but ignore the actual implementation. For the social integration of immigrants, the implementation of policies is no less important than policy formulation.

4. Suggestions for Improvement

Thus MIPEX has certain limitations in evaluating South Korea's social integration policies. To understand and analyze the social integration policies of immigrants better, and promote social integration and social development, it is necessary to develop a social integration policy index that fits the situation of South Korea. By analyzing MIPEX, several suggestions for the development of Korea's social integration policy index can be raised.

Firstly, the highest standards must meet the country's specific conditions. The highest standards and policy indicators conducted by MIPEX cannot accurately evaluate and reflect the actual situation of the Korean social integration policy. So the actual situation of Korean society should be considered, and standards and policy indicators that conform to Korea should be formulated during the index development. MIPEX is a Europe-centered social integration policy index developed with the highest standards of the European Council and the European Union Directive. However, the multicultural society in Korea is fundamentally different from the multicultural society in Europe. These countries accept the settlement of the formal immigrants in the current law and accept immigrants with certain qualifications and conditions, immigrants of these countries are family-based immigration with certain qualifications. However, current laws in South Korea do not accept formal settlement, so family-based immigration is very limited. Also, in South Korea, the short-term employment of migrant workers and marriage immigrants living in rural areas are the main groups of immigrants and they became the main reason for the formation of the multicultural society in South Korea. This suggests that the reasons and circumstances for the formation of a multicultural society in South Korea and Europe and the United States are completely different[18] so Korea's immigrant integration policy cannot be evaluated from the same perspective as Europe and America's.

Secondly, according to the statistics of the Immigration and Foreigners Statistical Annual Report issued by the Korea Immigration Service, as of November 2020, a total of 2,059,900 fo-

reigners are staying in Korea. Among them, 392,575 foreigners have exceeded the legal period of stay and became illegal immigrants, accounting for 19.1% of the total foreigners staying in the country, an increase of 1.9% compared to the same period last year[1], which means that at least one out of 6 foreigners stayed in Korea illegally.

From the 1990s to the early 2000s, the number and proportion of illegal immigrants continued to increase until the implementation of the legalization of the status of illegal immigrants in 2003[19]. The number of illegal immigrants dropped to 154,000 by the end of that year and since then the number of illegal immigrants has remained at about 200,000 and has remained relatively stable until 2016. After 2017, the number has risen to 250,000, and at the end of 2020, it had exceeded 390,000[1]. The current situation of illegal immigrants in South Korea is unprecedentedly severe. Faced with an illegal stay rate of nearly 20%, how to adopt a reasonable and effective social integration policy, regardless of their status and qualifications, to promote the social integration of immigrants, improving the effectiveness of social integration, and reducing the rate of illegal stay are urgent issues for South Korea. Therefore, the targets of social integration policy have to include all immigrants whether they have legal status or not during the development of the policy index.

Thirdly, the actual implementation of the policy should be reflected in the policy evaluation. While pursuing multiculturalism and formulating multicultural policies, South Korea has a tendency of cultural assimilation in the process of social integration. Although the integration efforts of the government and community groups with the Multicultural Family Support Center are commendable, it seems that still more work needs to be done for social integration from a different perspective[20]. Currently, South Korea's social integration policy for immigrants provides conditions and support for immigrants to adapt to Korean society, but it remains at the institutional level and does not make social integration compulsory for immigrants. If the social integration of immigrants is defined to adapt to Korean society and the Korean language support education and Korean social adaptation support are the goals, there will be restrictions on improving educational efficiency and expanding participation[21]. Hence there are limitations in the actual implementation of social integration policy and even violations of the purpose of policy formulation. If only evaluate the established policies and ignore the actual implementation results, it will not reflect the level of social integration policies in related fields. Only when both formulation and implementation of social integration policies are equally considered during evaluation can the level of social integration policies be correctly compared and evaluated.

Finally, although MIPEX already has the rigor and logic policy indicators that include all 8 areas, according to different conditions of each country, it is necessary to consider the following elements for policy evaluations in the development of the social integration policy index.

4.1. Citizen participation

Citizen participation is defined as individual and collective actions designed to identify and address issues of public concern[22].

Through the level of citizen participation of citizens in a society, the level of democracy can be detected[23][24]. Since one of the vital components of a well-functioning democracy is citizen participation[25], citizen participation can be seen as an essential part of democratic life. With the increase in the proportion of immigrants in society, immigrants continue to affect the scope, style, and direction of the civic life in the destination country[26]. As South Korea enters a multicultural society, the constituents of the society have become more diverse. Finding ways to integrate people with different backgrounds into Korean society and to have a better understanding of the differences between immigrants is important for formulating social integration policies and setting future development goals. Besides, there is a positive association between the specific policy of inclusion of immigration in politics and citizen participation[26]. So the status of citizen participation can not only reflect the degree of participation of the immigrants in democratic life but also reflect the degree of inclusion immigration policies. As a

consequence, it is necessary to include the review of citizen participation in relevant policies during the evaluation of social integration policies.

4.2. Gender equality

Gender equality is one of the basic human rights stipulated in many international, regional, and national legal documents and frameworks. Gender equality has become a general standard for measuring whether the government adheres to fairness and justice in various fields. Global Gender Report 2020 points out that gender parity has a fundamental impact on the economy and societies' prosperity[27]. The report measures gender equality and ranks 153 countries worldwide according to scores. Korea ranks 108 out of 153, respectively ranks 127th, 101st, and 1st, 79th in four sub-indicators of economic participation and opportunity, education, health and survival, and political empowerment. In terms of gender equality, Korea still has a lot of progress to make while it has made economic progress in the past few decades, patriarchal values still exist in its gender system and family practice[28]. The gender system may affect the process of immigrants' integration into marriage, family, and social acceptance.

It is an undeniable fact that the promotion of gender equality is an important part of the social integration of immigrants, especially in the face of the current situation of severe gender inequality.

The number of Korean female marriage immigrants is on the rise with the increase of multicultural families, and they often face problems like human rights violation caused by domestic violence, insufficient social activities participation due to information alienation and childcare and economic difficulties[29]. These are all consequences of the unequal gender system and even further exacerbate gender inequality. So starting from the policy level, it is necessary to promote the conversion of an unreasonable gender system to a more reasonable one and promote the formation of a harmonious social atmosphere of gender equality. Consequently, it is very vital to add the element of gender equality to the social integration policy index.

4.3. Social security

Since social security has huge effects on the level of their vulnerability, it is very important to immigrants. However, there are many situations in which immigrants are not included in the social security system. In some countries and regions, if immigrants want to join the social security system. they must meet the requirements of nationality or minimum residence time[30].

The Framework Act On Treatment Of Foreigners Residing In The Republic Of Korea passed in 2007 provides a legal basis for the rights of foreigners with legal status in Korea. It has a positive impact on improving social welfare and providing immigrants with a part of social security. However, a large number of illegal immigrants are still excluded from the social security system, and their basic rights are not guaranteed. More than that, the main target of this law is still immigrants who have settled in Korea like married immigrants, and the social security issues of migrant workers still need more attention[31].

Immigrants may lose or cannot get social security due to their immigration and encounter difficulties and cause unsuitability. For this reason, whether being able to enter social security in time, or how to join social insurance, whether being able to obtain necessary social security when it is needed, and whether to obtain social welfare when the conditions are met, all should be considered in the evaluation of social integration policy.

5. Conclusion

As Korea's multicultural society becomes more, the issue of social integration of immigrants is of vital importance. Korea scored 56 points in MIPEX, ranking 18th among 52 countries.

Korea's social integration policy for immigrants has retreated in the past five years because of the increasing difficulty in obtaining permanent residency, but it is still in a leading position in Asia. MIPEX pointed out that removing core barriers to immigrants' social integration and providing targeted support to all immigrants' lives are the two main directions for Korea's improvement.

Although MIPEX is a widely used measurement tool for social integration policies, its application in Korea has limitations. First, MIPEX is a measurement tool developed mainly for Europe, and its evaluation standards are based on relevant European requirements and do not meet the actual situation in Korea. Second, MIPEX only focuses on the social integration of legal immigrants, while the illegal immigrants are excluded. Third, MIPEX only observes the established social integration policy and the law, ignoring the implementation of them.

In conclusion, it is essential to formulate basic and policy indicators that conform to the conditions of Korea in the Korean social integration policy index, the targets of the social integration policy should include all immigrants, and the actual implementation of the policy should be reflected in the evaluation. According to the specific conditions of the country, citizen participation, gender equality, and social security are policy areas that can be added.

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7. Appendix

7.1. Authors contribution

	Initial name	Contribution
Lead Author	YL	-Set of concepts ☑ -Design ☑ -Getting results ☑ -Analysis ☑ -Make a significant contribution to collection ☑ -Final approval of the paper ☑ -Corresponding ☑
Corresponding Author*	ES	-Play a decisive role in modification ☑ -Significant contributions to concepts, designs, practices, analysis and interpretation of data ☑ -Participants in Drafting and Revising Papers ☑ -Someone who can explain all aspects of the paper ☑

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A Study on the Professionalism of Cabin Crew Applying the PROFESSIONALISM Perspective

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Abstract

Purpose: *Various external variables, such as changes in the external environment and the outbreak of infectious diseases, are expected to bring many changes to the aviation industry, and deeper attention to crew work is needed. Since cabin crew's work requires expertise and detailed knowledge such as safety, security, service, and emergency medical knowledge, research should be started by considering cabin crew's work as a professional vocational group. Therefore, this study seeks to apply the variable Occupational Professionalism, which studies cabin crew's work from a professional perspective. Therefore, this study would like to find out the impact of cabin crew's professionalism on the service orientation, safety orientation and self-efficacy of cabin crew, and the impact of cabin crew's self-efficacy on service orientation and safety orientation.*

Method: *This study defines Korean cabin crew members working for domestic and foreign airlines as a population. Questionnaires were distributed through an online survey, and 252 out of 384 were used for empirical analysis. A structural model was constructed and analyzed to evaluate the research model and to verify the hypothesis.*

Results: *The higher the professionalism of cabin crew to perform their duties such as in-flight safety, security, first aid, and services, the higher the service orientation and safety orientation for passengers. Cabin crew can increase their belief and confidence in themselves that they can perform the tasks assigned to them better, and this is the way to increase safety and service orientation toward passengers.*

Conclusion: *This study defines cabin crew as experts in the pursuit of knowledge, self-management, sense of calling, and job regulation. When providing business training to cabin crew, airlines should further strengthen their eligibility to perform their duties through professional theoretical and practical training on safety, security, first aid, and service tasks.*

[Keywords] ***Professionalism, Service Orientation, Safety Orientation, Self-Efficacy, Cabin Crew***

1. Introduction

Since the term "fourth industrial revolution" was first advocated in the World Economic Forum(WEF) in 2016, the aviation industry has undergone a gradual change in line with the prediction that the technology will be easily incorporated into the aviation industry[1]. This is expected to replace the labor force of much of the airline industry, and actual airlines are developing smart services using artificial intelligence chat bots and providing big data-based customized services[2]. Meanwhile, the outbreak of the Covid-19 Pandemic foretells many changes in the aviation industry. The International Air Transport Association(IATA) and the International Civil Aviation Organization(ICAO) provide safety guidelines to airlines in order to prevent and respond to the spread of infectious diseases in connection with air operations[3].

*This Paper Summarizes Soyoung Lee's Sejong University Doctoral Thesis.

This is a guideline for responding to the spread of infectious diseases in aircraft, which requires airlines to train flight attendants step by step on identifying and responding to suspected passengers during flight, and taking follow-up measures after arrival at their destination. China's Civil Aviation Administration of China(CAAC) also requires cabin crew to apply the content of meal services differently, such as providing meals to passengers during flight, separated by low, medium, and high-risk flights, and requires professional work knowledge to handle in-flight medical emergencies.

Various external variables such as changes in the external environment and the outbreak of infectious diseases are expected to cause many changes in the aviation industry, which raises the need to examine the work of cabin crew in charge of in-flight safety, security, first aid and services during the flight. There is a prospect that technological advances will replace the labor force of much of the airline industry. However, while the area of simple physical labor in cabin crew's duties may easily be replaced, it is difficult to replace the area of work that is timely service for various situations, and quick assessment of safety and security issues. Although the cabin crew's job is responsible for the entire cabin, the research focuses primarily on aspects such as service-related research or safety-related research[4][5]. Therefore, it is necessary to start research by considering the work of cabin crew as a professional occupation group in charge of in-flight safety, security, service, and first aid.

Furthermore, after the Pandemic, airlines will try to be more fully committed to passengers safety and service to recover air demand. As a result, airlines need to design a new cabin crew training, and if so, it is a hot topic to discuss what training to cabin crew can increase service orientation and safety orientation toward passengers. In addition, the cabin crew's work requires expertise and skills to keep passengers comfortable and safe to their destinations, as well as highly specialized jobs that require the ability to manage psychological and emotional responses[6][7].

Therefore, in this study, the concept of occupational professionalism is derived as a prior variable by considering the work of cabin crew from a professional perspective and the impact of this variable on the safety orientation and service orientation of cabin crew. This paper also want to find out the impact of the airline cabin crew on their use of human resources with the sub-concept of psychological capital based on positive psychological state, self-efficacy[8][9][5].

2. Theoretical Background

2.1. Relationship between professionalism, service orientation and safety orientation

Occupational professionalism is defined as an attitude-oriented and action-oriented concept[10], indicating a professional state of immersion in a job[11].

Currently, professions classified as professionals are not recognized as professionals from the beginning, and have developed into professionals based on the theory that certain processes and conditions are secured and the socio-economic environment surrounding jobs develops into professionals[12]. Therefore, this study also defines the cabin crew as an expert based on the process theory, and conducts a study on professional professionalism.

The concept of occupational professionalism in this study derived the final four variables by referring to the five sub-concepts of attitude aspects of Hall's professional model study[10], 10 concepts of Hussey J & Holden M.T & Lynch P[13], 3 concepts of Choi[14], and 4 concepts of Lee[15]. These are the pursuit of knowledge, self-management, sense of calling, and job regulation.

Customer orientation to improve customer understanding and satisfaction is the most important orientation in performing the task of service[16]. As a result, the high professionalism of contact workers is to achieve self-realization and self-interest by exercising their abilities in the process of giving clear self-awareness and self-identification of service tasks[15]. The fol-

lowing hypothesis was also established by understanding the customer's symbols and characteristics and inferring that appropriate services will be provided to demonstrate a higher level of service orientation to the passenger.

Hypothesis 1. Airline cabin crew's professionalism will have a significant positive impact on service orientation.

Conducted a study by applying safety attitude items, and found that safety attitude precedes the motivational factors of safety behavior. In addition, safety attitude, which is a pilot's personal variable, also affects safety motivation, which greatly affects safety behavior as a state of trying to fly safely[17].

Hypothesis 2. Airline cabin crew's professionalism will have a significant positive impact on safety orientation.

2.2. Relationship between professionalism and self-efficacy

Self-efficacy refers to an individual's belief or confidence in his or her ability to mobilize the cognitive dimensions, motivation, and course of action required to successfully perform a particular task in a given situation[18]. Furthermore, the concept of self-efficacy has been established as an important influence on human behavior and performance, and has received much attention as a variable that is particularly important in describing motivation effects[18]. A cabin crew is an employee who performs in-flight service and safety tasks at the point of contact with passengers and is responsible for helping passengers arrive safely and comfortably at their destination. In addition, the cabin crew performing cabin service must change the details of the applicable cabin service according to the route, time of day, and the number of passengers on the operating flight, and are responsible for the safety of each passenger.

Therefore, it can be inferred that professionalism in the occupation can expand self-efficacy, a belief in self-efficacy that improves confidence in cabin crew's ability.

Hypothesis 3. Airline cabin crew professionalism will have a significant positive effect on self-efficacy.

2.3. Relationship between self-efficacy, service orientation and safety orientation

In the study of[5], service orientation was set as an outcome variable in terms of job performance and organizational performance, and it was found that the self-efficacy of airline cabin crew had a significant effect on service orientation. It can also be inferred that the cabin crew's self-efficacy will have a significant impact on service orientation, according to[19]'s definition that self-efficacy has a positive effect on the level of setting goals or performance criteria, the degree of effort, the degree of effort to overcome difficulties.

Also found that a high sense of safety efficacy directly positively affects safety participation or safety compliance, and higher the sense of safety efficacy, the higher the motivation for safety, which has an impact on safety participation. The positive effect has been shown to increase[20].

Therefore, this study established the following hypothesis based on prior research, as it can be inferred that self-efficacy of flight attendants in charge of service and safety tasks affects performance variables.

Hypothesis 4. The self-efficacy of airline cabin crew will have a significant positive effect on service orientation.

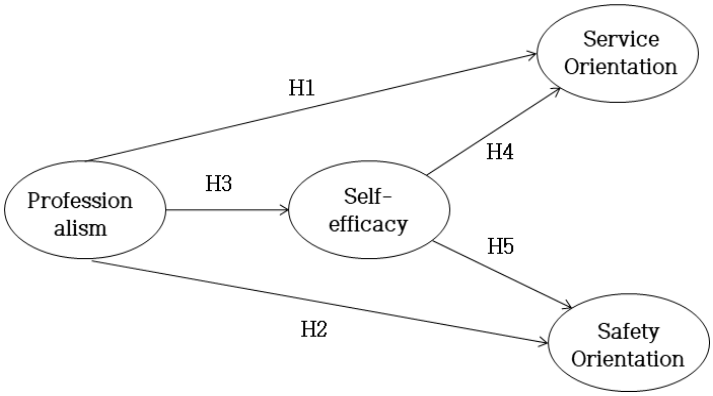
Hypothesis 5. The self-efficacy of airline cabin crew will have a significant positive effect on safety orientation.

3. Research Design

3.1. Research model

This study aimed to empirically verify how the professionalism of airline cabin crew affects service orientation and safety orientation. We also want to verify the impact of the professionalism of airline cabin crew on self-efficacy and self-efficacy on service orientation and safety orientation.

Figure 1. Research model.



3.2. Manipulative definition of variables and questionnaire composition

Professionalism shall be defined as related to the perception that cabin crew themselves accept their work as a professional job and the attitude to be appropriately equipped as a professional job. Based on a prior study approaching cabin crew from a professional attitude perspective, 4 questions about the pursuit of knowledge, 5 questions of belief in job regulation, 6 questions of self-management, 8 questions of a sense of calling, and a five-point Likert scale was applied[10][13][14][21][22].

Service orientation is defined as a set of attitudes and behaviors expressed by cabin crew members of an airline organization in a mental state of helping and cooperating with passengers at the interface with passengers, and the concept of cabin crew having a passenger-centered, service-oriented job attitude is called service orientation. The service orientation measurement items were also composed of 8 questions after modification and supplementation for the purpose of this study, using the Service Performance Scale(SOCO scale) developed by[23][24].

Safety orientation is defined as the overall safety-oriented attitude and behavior of cabin crew for safety on board and consists of 7 questions. The scale for measurement consists of a five-point Likert scale[17][20].

Self-efficacy is defined as personal belief and confidence in one's ability to perform the task as a cabin crew, and 8 questionnaires were modified and supplemented for this study by applying the new General Self-efficacy Scale(NGSE)[25].

4. Results of Research

4.1. Respondent profile

In this study, a frequency analysis and descriptive statistical analysis of the demographic and job-related characteristics of 252 airline cabin crew members, which are effective samples, were conducted as shown in <Table 1>.

Table 1. Demographic and job characters(n=252).

Variable	Category	Frequency	Ratio	Variable	Category	Frequency	Ratio
Sex	Female	238	94.4	Marital status	Single	175	69.4
	Male	14	5.6		Married	77	30.6
Final education	College graduate	40	15.9	Airline nationality	Domestic airlines	124	49.2
	4-year college graduate	181	71.8		Foreign airlines	128	50.8
	Master	27	10.7	Employment form	Full-time	216	85.7
	Degree of doctor	4	1.6		Non-regular workers	36	14.3
Monthly salary	100-199 Ten thousand won	9	3.6	Rank	Flight attendant	132	52.4
	200-299 Ten thousand won	103	40.9		Senior flight attendant	41	16.3
	300-399 Ten thousand won	101	40.1		Assistant purser	49	19.4
	400-499 Ten thousand won	31	12.3		Purser	26	10.3
	5million won or more	8	3.2		Chief Purser	4	1.6
	(Unit)	Average	SD		(Unit)	Average	SD
Age	(Years)	31.67	4.69	Career	(Year)	6.44	5.27

4.2. Evaluation of measurement model

In this work, prior to validating the hypothesis established through the structural model, we built a measurement model based on the two-step approach proposed by[26] and evaluated it through a confirmatory factor analysis. In this work, the reliability and compositional feasibility of individual measurement items were evaluated. Prior to evaluating the measurement model, we also wanted to improve the reliability of the entire measurement tool by assessing the reliability of the measurement tool based on the Cronbach's coefficient, which evaluates the internal consistency. The results of the reliability analysis in this study are shown in <Table 2> .

Table 2. Reliability analysis results.

Latent variable	Sub-dimensions and questions				Cronbach's α coefficient
	Observed variable	Number of first questions	Number of items removed	Number of final questions	
Professionalism		23	-	23	.892
Service orientation		6	-	6	.891
Safety orientation		7	-	7	.816
Self-efficacy		8	1	7	.839

In general, a Cronbach's coefficient of 0.6 to 0.7 or higher can be determined to be relatively reliable[27]. Thus, the reliability analysis of this study showed that the Cronbach's coefficient was at least .761, up to .892, indicating that the reliability of the measurement tools used in this study was generally acceptable. The reliability analysis conducted using the first eight questions of self-efficacy showed that the Cronbach's coefficient was .824. However, item number two, "I have never experienced any problems while working for this company," was found to be undermining reliability, which was eliminated and analyzed, resulting in a slight increase in Cronbach's self-efficacy. It turned out to be .839.

In this study, the most improved measurement model was derived through procedures in building and evaluating the measurement model. First, in this study, whether common method variance occurs or not was analyzed through a single factor model for individual measurement items. Second, in this work, we compare the item-parceling measurement model proposed by[28] with the individual measurement item model to derive a measurement model that most ideally fits the data in this study.

4.3. Concentration and discrimination justification

The results of the affirmative factor analysis on the measurement model of this study were shown as shown in <Table 3> . The standardized factor load of the observations was shown to be at least .535 to .882, all of which were statistically significant. The AVE index was shown to be at least .650 to a maximum of .856 to meet the recommended value(AVE>.5) of[29], The CCR index is at a minimum of 0.880 to a maximum of .The value of .947, indicating that this also sufficiently meets the recommended figure(CCR >.7) of[29]. As such, the standardized factor load of the measurement tool was statistically significant and sufficiently high, and both the AVE and CCR indices met the criteria, so the measurement tool in this study was evaluated to be sufficiently concentrated.

Table 3. Confirmatory factor analysis and intensive feasibility assessment.

Latent variable	Observed variable	Standardization	Standard error	t value	AVE	CCR
Professionalism	Knowledge pursuit	.672	-	-	.650	.880
	Self-management	.712	.146	8.783***		
	Sense of calling	.535	.170	7.045***		
	Job regulation	.535	.152	7.052***		
Service orientation	PSV1	.835	-	-	.856	.947
	PSV2	.849	.072	15.115***		
	PSV3	.810	.086	14.327***		
Safety orientation	PSF1	.664	-	-	.775	.910
	PSF2	.675	.103	9.108***		
	PSF3	.882	.111	10.370***		
Self-efficacy	PSE1	.767	-	-	.798	.922
	PSE2	.854	.091	12.469***		

	PSE3	.674	.086	10.249***

Note: *** p<.000.

In this study, the squared correlation coefficient between constituent concepts of confirmatory factor analysis was compared with the AVE index of each constituent concept in order to evaluate discriminant validity among constituent concepts. and the results were shown in <Table 4>. The correlation between all constituent concepts was found to be statistically significant, and was found to be consistent with the direction of the hypothesis established by this study. In addition, the squared value of the correlation coefficient was found to be from .341 to the maximum of .494, but the AVE index was from .650 to .856, indicating that the maximum value of the correlation coefficient was smaller than the minimum value of the AVE index. Therefore, the measurement tool of this study was evaluated to have sufficient discriminant validity.

Table 4. Correlation matrix and discriminant validity evaluation.

	Professionalism	Self-efficacy	Service orientation	Safety orientation
Professionalism	.650[c]	.483[b]	.494	.341
Self-efficacy	.695***[a]	.798	.404	.416
Service orientation	.703***	.636***	.856	.413
Safety orientation	.584***	.645***	.643***	.775
Average	3.80	3.73	4.07	4.17
Standard deviation	.41	.51	.54	.50

Note: a. Lower triangular matrix: correlation coefficient
b. Upper triangular matrix: squared correlation coefficient
c. Diagonal: AVE
*** p<.001.

As a result of comparing the standardized factor load, the AVE index, the CCR index, and the squared value of the correlation coefficient and the AVE index as a result of the confirmatory factor analysis, it was found that both concentrated and discriminant validity were satisfied. Therefore, the construct validity of the measuring tool in this study was satisfied.

4.4. Structural equation model and hypothesis verification

In this study, a structural model was constructed and analyzed to evaluate the research model and to verify the hypothesis, and the results were shown in <Figure 2>. Prior to verifying the hypothesis by evaluating the significance of the path coefficient, this study confirmed the fit of the structural model. The fitness index for the structural model is (60)=186.069 (p<.001), normed-=3.101, RMR=.024, GFI=.892, AGFI=.836, NFI=.879, TLI=.887, CFI =.913, RMSEA=.091. As explained earlier in the confirmatory factor analysis, most of the goodness-of-fit indices excluding statistics and Normed-statistics showed that the model is generally suitable.

(Hypothesis 1) As a result of analyzing the effect of professionalism on service orientation, the standardized path coefficient was found to be .548, and the test statistic for this was statistically significant as t=4.706(p<.001). Therefore, hypothesis 1 was adopted.

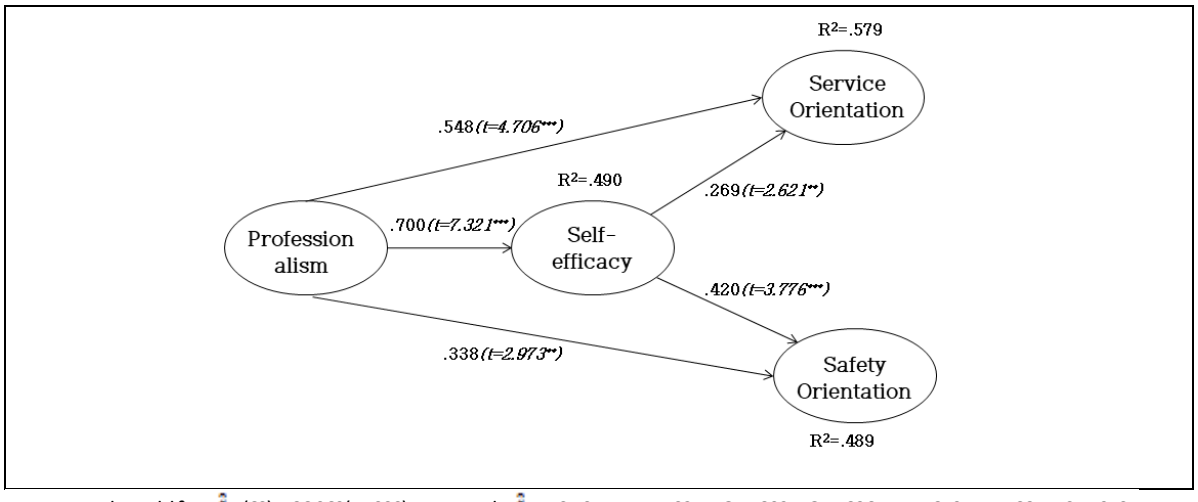
[Hypothesis 2] As a result of analyzing the effect of professionalism on safety orientation, the standardized path coefficient was found to be .338, which was statistically significant as the test statistic t=2.973(p<.001). Therefore, hypothesis 2 was adopted.

(Hypothesis 3) As a result of analyzing the effect of professionalism on self-efficacy, the standardized path coefficient was .700, and the test statistic for this was statistically significant as t=7.321(p<.001). Therefore, hypothesis 3 was adopted.

(Hypothesis 4) As a result of analyzing the effect of self-efficacy on service orientation, the standardized path coefficient was found to be .269, and the test statistic for this was statistically significant as t=2.621(p<.001). Therefore, hypothesis 4 was adopted.

[Hypothesis 5] As a result of analyzing the effect of self-efficacy on safety orientation, the standardized path coefficient was found to be .420, which was statistically significant as the test statistic t=3.776(p<.001). Therefore, hypothesis 5 was adopted.

Figure 2. Structural model analysis result.



Note: Research model fit: χ^2 (60)=186.069(p=.000), normed-χ^2 =3.101, RMR=.024, GFI=.892, AGFI=.836, NFI=.879, TLI=.887, CFI=.913, RMSEA=.091.

5. Conclusion

The results and implications of hypothesis testing in this study are as follows.

First, this study attempted to apply the professionalism of cabin crew, which have rarely been covered in existing airline cabin crew's research on human resource management. In addition, the concept of cabin crew professionalism was thoroughly considered through prior research, which defined cabin crew professionalism as a professional and approached as an attitude part of cabin crew under the sub-concept of knowledge pursuit, self-management, sense of calling, and job regulation. In addition, the hypothesis of the cabin crew, professionalism and service orientation, professionalism and safety orientation, professionalism and self-efficacy, and this hypothesis, derived from this study, showed significant research results. There is a need for follow-up studies to diversify the organizational perspective and the individual perspectives of employees that can foster employees. Like[30][31]study, Self-efficacy research is being conducted in various fields.

Second, professionalism has been shown to have a significant impact on service orientation and safety orientation. Today, various external variables such as changes in the external environment and the outbreak of infectious diseases are expected to bring about many changes in the aviation industry as a whole. In particular, after the Pandemic, airlines will try to be more fully committed to customer safety and service to recover air demand. As a result, airlines need to design a new cabin crew training, and if so, it is a hot topic to discuss what training to cabin crew can increase service orientation and safety orientation toward customers. Therefore, this study defined cabin crew as professional and organized professionalism of cabin

crew into the contents of knowledge pursuit, self-management, sense of calling, and job regulation. As a result, the higher the professionalism of cabin crew to perform their duties such as in-flight safety, security, first aid, and services, the higher the service orientation and safety orientation for customers.

Therefore, airlines should create an organizational culture where cabin crew members voluntarily seek knowledge about aviation security, safety, service and emergency medical care. In addition, preparing a plan to increase the sense of vocation for the cabin crew to perform the above tasks is a way to increase the service and safety orientation of the cabin crew. Another important sub-parameter of professionalism, self-management, is an important concept that makes them grow into professionals. Like[32]study, airlines can also further enhance cabin crew's service orientation and safety orientation by developing and educating programs that allow cabin crews to continue to manage themselves well when conducting direct service and safety education.

Third, Rapid changes in the aviation market are demanding more challenging and diverse tasks for cabin crew. The new aircraft model and the resulting changes in the in-flight structure must create a new service design, so cabin crew must always have new work knowledge. In addition, as passenger expectations continue to rise due to the popularization of air travel, cabin crews need a variety of in-depth knowledge across all areas of aviation safety and service to satisfy passengers. In particular, cabin crew members need knowledge-seeking behaviors, which are efforts to acquire new knowledge related to aviation security, safety, and first aid, in situations such as current pandemics. Therefore, it is important for airlines to further remind cabin crew members that they are qualified to perform their duties through professional theoretical and practical training on safety, security, first aid and service tasks. The study found that cabin crew can increase their belief and confidence in themselves that they can perform the tasks assigned to them better, and this is the way to increase safety and service orientation toward customers.

Fourth, the self-efficacy of cabin crew has a significant impact on service orientation and safety orientation. Based on these findings, various follow-up studies are needed from an organizational perspective and an employee's personal level, which can enhance the self-efficacy of cabin crew.

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7. Appendix

7.1. Authors contribution

	Initial name	Contribution
Author	SL	-Set of concepts ☑ -Design ☑ -Getting results ☑ -Analysis ☑ -Make a significant contribution to collection ☑ -Final approval of the paper ☑ -Corresponding ☑ -Play a decisive role in modification ☑ -Significant contributions to concepts, designs, practices, analysis and interpretation of data ☑ -Participants in Drafting and Revising Papers ☑ -Someone who can explain all aspects of the paper ☑

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The Aspects of Ecological ENVIRONMENT in Host City of the Winter Olympic Games

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Abstract

Purpose: *Environment protection is one of the major tasks of International Olympic Committee which is listed into Olympic Charter in 1996. As the concept of sustainable development was introduced into Olympic Games, the environment protection was the top issue which the host cities should be concerned. Winter Olympic Games is a sport events relying on natural environment particularly. Therefore, this paper explored the aspects of winter Olympic Games on ecological environment in host cities. It will propose the references for 2022 winter Olympic Games to make winter Olympic Games and ecological environment sustainable.*

Method: *This paper employs the systematic literature review to explore the relationship between winter Olympic Games and ecological environment. 15 articles was scanned and presented for extracting relevant information to analyze the aspects of ecological environment of host cities in winter Olympic Games. The information of Year, the place of Winter Olympic Games, impact or not, positive or negative impact, the specific performance and effect on host cities were extracted to use.*

Results: *Among the existing studies, it is believed that holding the Winter Olympics will have a certain impact on the ecological environment. There are negative and positive impacts both. The negative impact is mainly caused by the site selection and the construction of the venues occupying the natural environment, which leads to a series of subsequent effects, and then affects people's lives, containing water pollution, land source, air pollution and soon. There is also positive impact which can improve the environment protection.*

Conclusion: *First, the hosting of the Winter Olympic Games should take full account of the city's own ecological environment and urban environment. Second, the concept of sustainable development of the Olympic movement should be fully implemented. Third, relevant laws and regulations related to environmental protection should be issued.*

[Keywords] ***Olympic Games, Ecological Environment, Sustainable Development, Economic Impacts, Meta-Analysis***

1. Introduction

With the increasing number of environmental problems, people are paying more and more attention to environmental protection and are committed to slow or even reverse the trend of environmental deterioration[1]. Winter Olympic Games is considered as the catalyst to promote the sustainable development transformation and upgrading of the host city, but it will bring various adverse effects and risks as well as further development of economy, society, culture and environment to the host city[2]. The Winter Olympics is an important part of the Olympic movement and it can be affected by environmental factors. A large population gathering and meeting the needs of the games will have a certain impact on the ecological envi-

ronment[3]. The harmonious co-existence of the ecological environment and the Winter Olympics has gradually become the focus of the world. The sustainable development of the ecological environment and the Games has also become the focus of the International Olympic Committee. "Sustainability", identified in "Olympic Agenda 2020", has become a mandatory requirement for the preparation and hosting of the Olympic Games, and has gradually become one of the important signs to measure the success of the preparation of the Olympic Games[4]. Protecting the earth's ecological environment and promoting sustainable development are the inevitable choice of human society and the common responsibility of all countries in the world. The concept of sustainable development was formally introduced in our common future in the 1987. The Olympic Movement's Agenda 21 in 1999 and Olympic Charter in 1996 also emphasized the importance of sustainable development and the environment in the Olympic Movement. 2014, the International Olympic Committee(IOC) issued Olympic Agenda 2020, which took "sustainable development" as the core concept of the Olympic Movement. The important embodiment of sustainable development is to protect the environment and promote its long-term development while making use of the environment. As the value of the Olympic heritage is gradually attached importance to, the environmental heritage of the Olympic heritage is an important embodiment of sustainable development of the Olympic movement in environmental aspects. The concept of sustainable development promotes the integration of the environment and sports events, to achieve a win-win situation. In the context of the concept of sustainable development, the relationship between the development of the Winter Olympic Games and the ecological environment directly determines the duration of the future Winter Olympic Games. The sustainability of the ecological environment provides a stable space for the Winter Olympic Games and realizes the sustainability of the spatial and temporal dimensions of the Winter Olympic Games. The concept of sustainability will make a demonstration role for environmental protection.

Therefore, the questions blow were analyzed to explore the relationship between Winter Olympic Games and ecological environment.

Research Question 1: Is there any evidence to prove the relationship between Winter Olympic Games and ecological environment or Will Winter Olympic Games impact ecological environment?

Research Question 2: What aspects does Winter Olympic Games impact on ecological environment?

2. Method

Compared with the traditional literature review methods, systematic reviews is more scientific and objective method to ensure accurate results[5]. Systematic review can be subdivided into qualitative and quantitative comments. The former is a qualitative evaluation and summary of the results and conclusions of the original literature. The latter is the process of combining results using statistical methods, also known as meta-analysis[6]. Due to the most current studies focusing on ecological environment of a certain winter Olympic Game as research case, the aspects of it was not relatively comprehensive. Systematic review was employed to collect resources and summarize the aspects of ecological environment in host cities of the Winter Olympic Games as comprehensive and accurate as possibly. This paper employed systematic review to explore the whether Winter Olympic Games impacts ecological environment in host cities and what aspects does Winter Olympic Games impacts ecological environment in host cities.

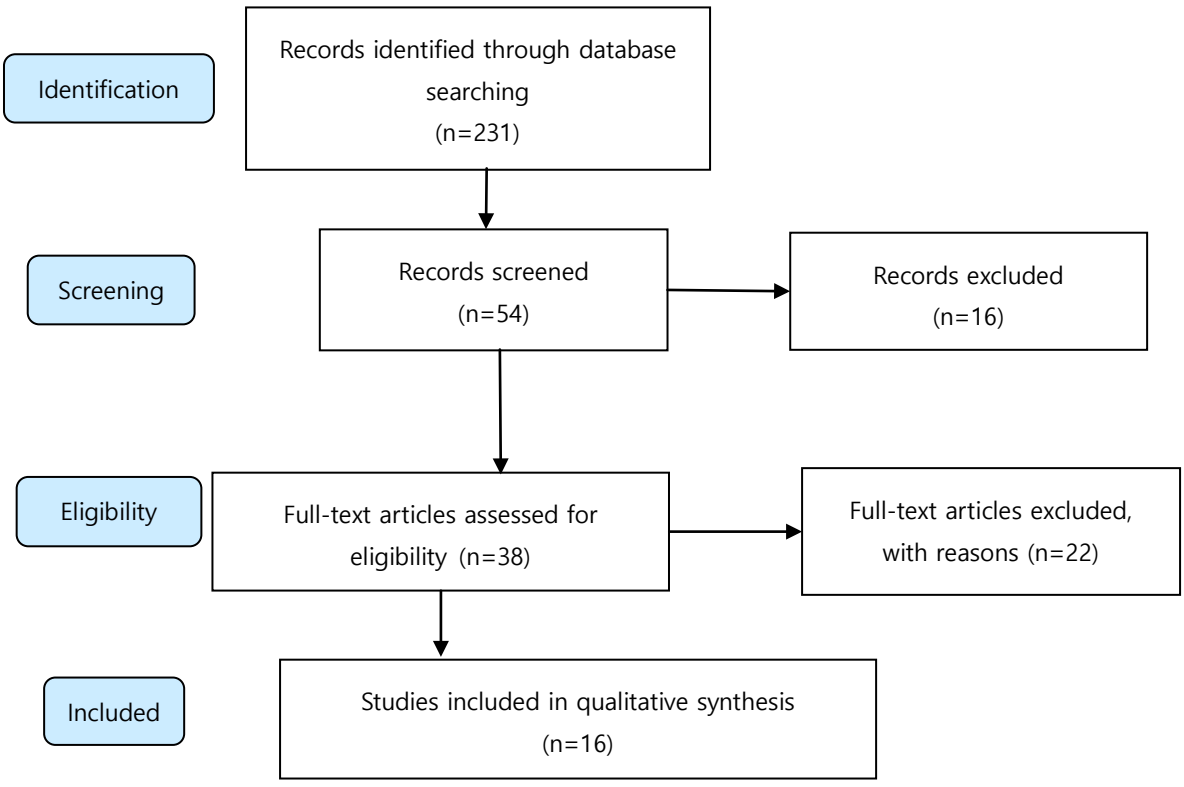
2.1. Search strategy and inclusion criteria

The initial search of articles was conducted via three databases: WOS, Taylor & Francis, and EBSCO. Environment protection was one of the tasks of IOC in Olympic Charter in 1996. Environment problems should be concerned and conducted by some measures by Olympic Games. Therefore, the search was limited form the studies published from January, 1996 to February, 2021 and the articles was limited into English, inclusive.

The initial search was conducted using search terms “winter Olympic Games” OR “Winter Olympics” OR “winter OG”AND “environment” OR “ecological environment” via WOS, Taylor & Francis, and EBSCO. The initial search was conducted by one researcher. The inclusion criteria consisted of articles that: (1)were English language, (2)were published from January 1st, 1996 to February 7th, 2021, (3)were journal articles, (4)discussed the relationship between winter Olympic Games and ecological environment, or what aspects did winter Olympic Games impact on ecological environment or how did winter Olympic Games effect on ecological environment.

The initial search returned 231 articles, which were narrowed down to 38 articles by one researcher after scanning titles and abstracts. And then 16 articles were remained by the other two researchers after full paper screening. Details are shown in <Figure 1>.

Figure 1. Process followed to construct literature sample.



2.2. Data extraction and synthesis

The following information were collected from the fully scanned papers by two researchers: (1)the relationship between winter Olympic Games and ecological environment, (2)positive impacts or negative impacts, (3)Year and place of Winter Olympic Games, (4)the aspects of ecological environment impacted by winter Olympic Games, (5)the impact on host cities. All the information above were examined by one researcher. As shown in the following <Table 1>.

Table 1. The impact of winter olympic games on ecological environment.

No.	Year	Place	Impact or not	Type of impacts	The specific performance	The effect on host cities
1	2014	Sochi	Yes	Negative	- Illegal waste dumps in the village of Akhshtyr, north of Sochi - Destruction of habitat of numerous species - Pollution of drinking water - Pollution in the air and soil - Noise pollution and dust from trucks - Build the Olympic Mountain Village and the bobsleigh venue near natural complexes of high ecological and scientific importance	- Putting the vulnerable biosphere in danger - Residents daily life without guarantee - Protesters and environmentalists have provoked aggression from the government by the laws to ensure the events
2	2014	Sochi	yes	Negative	- Agricultural earths was partly removed - Cutting down of mountain woods - Infringement of the developed conditions of a reservoir on hillsides - A breach of rare elements such as uranium, cadmium, and mercury on the land surface without building norms and rules - Water source pollution	- Lead to a stress condition in the local ecosystem - Raised formation of sludge and destruction of spawning areas of valuable kinds of fish - Residents daily life without guarantee
3	1924 - 2010	Chamo-nix-Turin	yes	Positive & negative	- Urban heating systems, water supplies, and sewage treatment - Woods protection	- Some events were canceled for the resist from local environmental protection organizations
4	1992	Albert-ville	yes	Negative	- Consideration of venue placement within the landscape and the use of environmentally friendly materials	
5	1994 - 2008		Yes	Negative	- Car emissions - The intentional use of ozone-harming gas - Removal of trees in sensitive areas	
6	2010	Turin	Yes	Positive	- Reducing greenhouse gas emissions - Reducing the water consumption to the lowest - Promoting the construction of environment-friendly hotel	
7	2022	Beijing	Yes	Positive & negative	- Damage the natural environment - Increase air pollution - Improve awareness of environmental protection	
8	2014	Sochi	yes	Positive	- Air quality - Surface in land water and sea water - Soil and biotic components	- Promoting national environmental monitoring system in different regions of the Russian Federation - Promoting the sustainable development of olympic games
9	2006	Turin	yes	Positive	- Decreasing air pollution(nitrogen dioxide, carbon monoxide and fine particulate matter, PM10)	- Promoting Residents daily life
10	2018	Pyeong Chang	yes	Positive & negative	- Renewable sources were used - Environmentally-friendly and recycled materials were used - Cutting down 58,000 trees	
11	2022	Beijing	Yes	Negative	- PFASs pollution	
12	2022	Beijing	Yes	Negative	- Urban expansion in wetlands ruined wetland ecosystem	

13	2022	Beijing	yes	Positive	- Ecological protection(living wood growing stock; forest coverage; urban green coverage; forest coverage; Per capita park green space) - Environment quality(chemical oxygen demand; ammonia nitrogen emissions; sulfur dioxide emissions; soot emissions; mean noise of regional environment; mean noise of trunk roads) - Resource utilization(comprehensive utilization of general industrial solid wastes; comprehensive utilization of hazardous waste; water resources; water consumption) - Environmental governance(sewage treatment; harmless treatment of domestic garbage; environmental pollution prevention investment in GDP; pollution reduction investment in GDP; natural ecological protection investment in GDP)	- Improving residents ' ecological civilization in Beijing
14	2006	Turin	Yes	Negative	- Air pollution	
15	2006	Turin	Yes	Positive	- Bought carbon credits from renewable energy projects and an energy efficiency scheme - made modest innovations in the areas of waste reduction, water conservation, and green building design	
16	2010	Vancouver	Yes	Negative	- Land use for leisure(land-use changes, pubic open-air leisure(POAL) areas, protected sites) - Air and water(public water supply, greenhouse gas emissions, air quality)	

2.3. Quality assessment

To extract more accurate and detailed information about whether Winter Olympic Games impacts ecological environment, the articles were removed if they have less connection between them.

3. Results

3.1. The relationship between winter olympic games and ecological environment

Among the existing studies, it is believed that holding the Winter Olympics will have a certain impact on the ecological environment. It is a way to present whether the Olympic Games can be developed sustainably or not. Due to the large scale of the Olympic Games, the number of participants, the construction of venues and facilities and other factors will have an impact on the ecological environment. The Winter Olympics, on the other hand, are mostly outdoor sports, which requires the support of the natural environment. It is difficult to use nature without damaging the environment. Therefore, this sporting event will have a great impact on the natural environment. Sochi winter Olympic Games was a questionable case which was hold at the cost of damaging natural environment and then make further influence to local residents. Prudnikova(2012) also analyzed the problems of ecological environment in Sochi winter Olympic Games[7]. Paquette(2011) examined the interpretation of environmental sus-

tainability(ES) within the Olympic Movement, found that environment was impacted by winter Olympics[8].

However, these effects are not all negative. In order to prevent the events from damaging the environment, some host cities have taken certain measures to protect the environment from being polluted. In order to protect the environment, some host cities make some laws and regulations and specific measures in advance to prevent or minimize the damage. At this time, the relationship between the Winter Olympics and the environment appears to be closer. Specifically, the Winter Olympics had a positive impact on the ecological environment. Yang(2018) suggested that the measures that Beijing is taking can guarantee the environment without damaging to the greatest extent and improve residents' ecological civilization in Beijing[9]. Senese(2018) noted that winter Olympic Games Played an important role in decreasing air pollution and improving residents daily life[10]. Sarychev(2015) believed that proper measures could improve the quality of air, soil and water to promote national environmental monitoring system and the sustainable development of Olympic Games[11]. However, the impacts of the Winter Olympic Games on the environment of the host cities are not single, and sometimes the positive and negative impacts exist together. The negative impact is mainly caused by the site setting and the construction of the venues occupying the natural environment, which leads to a series of subsequent effects, and then affects people's lives. Dendura(2019) pointed that both positive and negative impacts work on local environment in PyeongChang[12]. Liu(2017)also insisted that there are positive and negative impacts working on environment by 2022 Beijing Winter Olympic Games[13]. Holden and Vanwynsberghe(2014) pointed out that Winter Olympic would improve the environment protection measures and innovations to minimize the harm to ecological environment[14].

Through the summary of the literature, the winter Olympic Games will have positive and negative effects on the ecological environment of the host city. The negative impact is to damage the ecological environment, and can later seriously affect the lives of residents. The positive impact is generally to improve the awareness of environmental protection or take certain measures to control pollution, the loss will be reduced to the most digested. Therefore, as long as the Winter Olympic Games take effective measures, while making use of the natural environment, it can also promote the sustainable development of the ecological environment, and then promote its own sustainable development.

3.2. The impact aspects of ecological environment by winter olympic games

By summarizing the existing literature, it is found that the ecological environment affected by the Winter Olympic Games specifically refers to the pollution of water resources, the utilization of land resources, air pollution, ecological protected areas, cutting down trees and the application of environmental protection awareness and environmentally friendly materials. Vanwynsberghe(2015) proved Winter Olympic Games would have a slight impact on environment by quantitative analysis[15]. Among them, water resources is directly related to the host city residents livelihood of the main factor. The discharge of construction sewage leads to the pollution of drinking water, which brings a direct threat to the lives of local residents[16]. The biggest contradiction between land resources and the Winter Olympic Games lies in the construction of venue facilities. Due to the particularity of the Winter Olympic Games, it is not possible to share the venues with the summer events, so the new venues will inevitably occupy land resources, and at the same time cause the destruction of the ecological environment such as cutting down trees, which will have an impact on the ecological environment. The 2014 Sochi Winter Olympics has always been a typical case in the history of the Olympic Games due to its special geographical location and the size of the city. The construction of the pavilion has occupied some agricultural land, and even occupied the important value of the ecological protection zone[17]; Urban sprawl leads to the destruction of wetlands[18]; Some of the land is directly polluted by chemical materials. Air pollution mainly includes automobile exhaust emissions and harmful gases from city heating systems[19][20][21]. Although these

reasons are not directly caused by the Winter Olympic Games, they are indirectly caused by the time of the Winter Olympic Games and the large number of participants, and can also be classified as the impact of the Winter Olympic Games on the ecological environment. The aspects above are the concrete embodiment of the negative impact of the Winter Olympics on the ecology of the host cities. These aspects have a direct impact on people's lives, and recovery will take a long time to achieve, require a large amount of time costs, and some of the damage caused is irreversible. The concrete embodiment of the positive impact of the Winter Olympics on the ecology of the host cities is to improve the residents' awareness of environmental protection. In the construction of the Winter Olympics venues, environment-friendly materials and renewable materials should be used as far as possible to reduce the damage to the environment from the source and achieve a harmonious coexistence with the ecological environment[22].

4. Conclusions and Suggestion

This paper took sustainable development as the evidence to conduct time span. It analyzed the relationship between Winter Olympic Games and ecological environment in host cities and the specific aspect Winter Olympic Games impacting on it. However, the studies in this period relatively focused on some certain typical cases, such as Sochi Winter Olympic Games and Pyeongchang Winter Olympic Games. The aspects summarized were a little similar and could not cover and present other Winter Olympic Games in other period. In addition, some articles in other database and cited in the literature were not mentioned. All these will make some limitation to this study. It is hoped that it can be improved in the further study.

Sustainable development is the main development appeal of the Olympic Movement in the new era. It is not only promotes the sustainable development of the Olympic Movement, but also brings a sustainable impact on the host cities and promotes the continuous development of the host cities. Compared to Summer Olympic Games, there are higher requirements for the natural environment for Winter Olympic Games particularly. At the same time it also can produce negative impact. It will damage the ecological environment, most directly affect the life of local residents and impede the Olympic movement. It will impact water resources, the air, the land and ecological reserve. These effects are mostly due to the venue construction. There are some positive impacts. Hosting Winter Olympic Games can benefit various areas, including the economy, society, culture, and environment[23]. It can provide an opportunity to improve the ecological environment during the winter Olympic Games, such as promoting people's environmental protection consciousness and application of environmental protection material. It seeks a balance for sporting events and protect the ecological environment and sustainable development.

Based on the concept of sustainable development of the Olympic Movement, the protection of the ecological environment during the Winter Olympic Games has become a major issue for the development of the Olympic Movement. Beijing will host the 2022 Olympic Winter Games after the Summer Olympics in 2008. It is the first city host both winter Olympic Games and summer Olympic Games. So it has higher requirements for the ecological environment. Then some suggestions are proposed as follows.

First, the hosting of the Winter Olympic Games should take full account of the city's own ecological environment and urban environment. According to its own conditions, and the construction of venues should be in combination with the environmental characteristics of the host cities, using renewable resources and environment-friendly materials for construction. Winter Olympic Games could be left environment legacy of Olympic Games to make ecological environment sustainable development[24].

Second, the concept of sustainable development of the Olympic movement should be fully implemented. As an opportunity to host cities environmental governance, Olympic winter

games should combine with the events in winter Olympics planning and urban development in the future. Existing environmental problems of governance can be taken as the primary task of venues. The concept of sustainable development of Olympics is not the requirement for the time, also the wisdom form the ancient passed away with how to be harmony with surroundings[25].

Third, relevant laws and regulations related to environmental protection should be issued. Publicity of environment protection should be improved, so that the public have a clear awareness of environmental protection, especially during the Games, to set a good example for the development of the Winter Olympic Games and provide a good environmental foundation.

Winter Olympic Games is a mega sport events, which is an factor to impact the ecological environment both positively and negatively. Winter Olympics is not only a platform to present the sport charming, but also a chance to renew urban environment via sustainable development concept holding by Olympic movement. However, ecological environment will be harmed by excessive pursuit of benefits of Winter Olympics, neglecting the self-condition of host cities. Conversely, comprehensive planning of winter Olympic Games will improve the ecological environment and make Olympic Games as a environment legacy to host cities after Games.

5. References

5.1. Journal articles

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6. Appendix

6.1. Authors contribution

	Initial name	Contribution
Lead Author	XZ	-Set of concepts ☑ -Design ☑ -Getting results ☑ -Analysis ☑
Corresponding Author*	HS	-Make a significant contribution to collection ☑ -Final approval of the paper ☑ -Corresponding ☑ -Play a decisive role in modification ☑
Co-Author	XB	-Significant contributions to concepts, designs, practices, analysis and interpretation of data ☑ -Participants in Drafting and Revising Papers ☑ -Someone who can explain all aspects of the paper ☑

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Application and Satisfaction Study of Medua-Based TEACHING & LEARNING Method in Beauty Education: Focusing on Flipped Learning using Google Classroom

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Abstract

Purpose: *After the 4th Industrial Revolution, changes in innovation are required in education. With a report by technology company, Dell estimating that 85 percent of jobs that will exist in 2030 haven't yet been invented, today's school leavers are facing a future in an uncertain job market. Find out how schools are helping students to develop skills that will make them work-ready. This researcher applied media-based teaching and learning methods to provide classes to beauty major students.*

Method: *As a result of the survey, most of the students were satisfied with the medium-based teaching and learning method for flipped learning using Google classroom. The following is a summary of what students are satisfied with in the Google classroom and Flipped Learning class. The students responded that they were able to have fun classes without being bored, received a lot of help from the professor, were able to repeat learning at home, check the contents of the assignments correctly, and concentrate well. Students pointed out that it was a little difficult to use at first, and that they had to download class-related apps as an inconvenience during class.*

Results: *As a result of the survey, most students were satisfied with the class using media-based teaching and learning methods. The contents that were good for teaching using the media-based teaching and learning method are summarized as follows. "It was great to be able to have more fun classes", "I received a lot of help from the professor", "I can study at home", "I was able to check exactly what the assignment was", "It is possible to repeat learning", "It wasn't boring. and I was able to concentrate well". The inconvenient points in class were "It was a little difficult to use for the first time", "Internet data is essential", "You need to download a class-related app".*

Conclusion: *To transform future education, the ability of media-based teaching and learning methods using digital skills is essential for both instructors and learners. For this, the foundation should be actively formed to study the effectiveness and application of media-based education such as infrastructure configuration and operation management, various content development and support, and digital skills.*

[Keywords] ***Media-Based, Teaching & Learning Method, Google Classroom, Flipped Learning, Beauty***

1. Introduction

After 2030, about 85% of jobs will be converted to new ones[1], and we anticipate that the job market will be innovative in 2050. Machine learning and robots will change jobs in virtually every field. And it is said that human and AI will not compete for jobs, but mutual cooperation will become a prominent form. However, the problem is that a new job is likely to require a high degree of expertise[2]. So, how should education change to get new jobs?

With the era of the 4th industrial revolution, drones deliver parcels, 3D printing can produce almost anything, VR cameras can experience virtual reality, smartphones, not cameras,

produce photos and videos, and all shopping malls are on a single mobile device. Connected. We live in an era where we can live almost anywhere.

Although these trends and demands are changing rapidly, the reality and environment of our education market does not seem to have changed significantly. Nevertheless, among the educational problems in Korea, the problem of private education costs is serious, which has devastated the family economy, wasteful due to duplicate investment is serious, and educational inequality is deepening the structure. We need to look for innovative ways to improve school education and improve public values and quality of public education[3][4].

In the 21st century, as generations change and times and environments change, what types of digital competencies should learners have, and in what form should the learning required change accordingly? This is the time for instructors to research and develop.

Our young people today are faced with the uncertain job market of the future. In schools, instructors must develop skills and explore new ways of teaching to empower students who are anxious about an uncertain future.

Media-based learning methods that utilize the overflowing knowledge online and methods of leading the knowledge to self-directed learning in which the learner becomes the subject of learning and actively engages in learning have been emphasized recently. Education methods using these media-based teaching and learning methods are being studied.

In this study, to the subjects of beauty major in the second semester of 2019, some cases that the researcher uses most effectively in class among media-based learning methods were applied, and satisfaction surveys were conducted. In addition, the researchers tried to cover how to use beauty education in the future using media-based teaching and learning methods.

Looking at the preceding studies on media-based learning, most of the studies include media-based classes in foreign countries, case studies of media-based learning for middle and high school students, studies on emotional disorders and child behavior using video media, and media. Most of the studies on the learning immersion and learning effect used were. Case studies on media-based learning for beauty-related subjects over the past five years have been insufficient. This study aims to explain the case of using the media-based teaching-learning method in major-related subjects for beauty major students, and discuss problems and specific plans for this.

2. Media Based Teaching & Learning Method

2.1. Research on google classroom & flipped learning

In the past, media-based classes taught teachers to use media to understand concepts, principles, and content. However, in the past, studies have shown that the effectiveness of media-based education is insufficient, critical, and skeptical, but recent student-led media-based learning cases have been developed. In addition to the topic of the 4th Industrial Revolution in the 21st century, researches related to media-based teaching methods and learning methods that can utilize smart devices were reviewed at a time when research using media-based teaching methods and learning methods is actively progressing.

In the preceding studies related to media-based teaching and learning, in the case of science subjects, many studies were applied to classes using smart devices such as smart pads, smart phones, and wearable devices, and to classes using educational software. Looking at the media-based education trend for each era of hardware-based technology, media education using the Internet(online) was mainly conducted in the 2000s, and media education using smart phones and smart pads was conducted in the 2010s. In recent years, media education using augmented reality(AR)(smart education) and augmented reality(AR), and media education using wearable devices such as smart watches are being conducted[5].

In the study of Sang-Hong Kim, a study on the development of a flip-learning instructional model using smart tools was conducted for the study of learner-centered subject education[6]. In a recent study on media-based learning, it is said that using a variety of media activates cognition of each other, has a positive effect on improving memory, and increases learning satisfaction. According to the research of Young-Don Kang(2016), it was to enhance the understanding of learners by making their own data through digital programs and image technology so that learners can understand English literature, and to further develop self-produced media and use them in various fields[7]. The development and emergence of new and diverse media has influenced the transformation of education into interactive and horizontal communication between instructors and learners. Accordingly, the curriculum of media-based instruction should be composed of a media-based class that enables learners to cultivate a leading and critical attitude, and to produce and cultivate creative and active communication skills.

Google started with the spirit of organizing all the information in the world and providing it to everyone[8]. Google stores 500 million objects out of 3.5 billion knowledge in the Knowledge Vault[9]. Google is constantly working to provide “Knowledge-Based Trust“[10]. Google also values public values when it comes to education. Google announced Google Classroom, a new tool from Google Apps for Education, as the optimal platform for flipped learning in May 2014(LJY)[11]. Google Classroom is a popular example of a media-based teaching and learning method. In this study, flipped learning was proposed using Google classroom, an innovative tool for converting to learner-centered participatory learning for Japanese language classes[12].

2.2. Class satisfaction with media based teaching and learning method

According to Lee Ji-young's research on “five-stage smart learning model using media-based teaching and learning method,” it was found that 83.6% of students were satisfied with the online-based media-based teaching and learning method[13]. In Kim's research, the feedback from learners about Google classroom-based flipped learning, which was investigated using Google Forms, was generally positive. The vast majority of learners responded very positively to self-directed learning by cultivating the ability to selfize and internalize knowledge[14]. In a study investigating the teaching method for English education using flip learning in the age of artificial intelligence, “Kahoot” and “Class Card” apps, which are media-based teaching and learning tools, were used to stimulate students' interest and fun in learning activities. And the students were satisfied with their classes. Most learners said the class was not boring and fun[15].

In this study, cases in which flip-learning and educational contents capable of interactive lessons are used using smart digital devices that are not restricted at any place and time are defined as a media-based teaching and learning method. The purpose of this study was to investigate the cases of applying to the actual beauty subject class by utilizing various media tools for students related to the beauty major, and the students' satisfaction with the class.

3. Research Method

This study applied a media-based teaching and learning method to personal color and makeup-related beauty major classes for first and second year students in the Department of Beauty Health at Jeonju Vision College in the second semester of 2019. As a media-based teaching and learning method, a method of showing flipped learning videos to students before class using Google classroom was used. In order to plan a more advanced flip-learning class in the future, a class satisfaction survey was conducted on 90 students including students and instructors who participated in the class.

The questionnaire items for the class satisfaction survey were mainly in the form of a 5-point scale and free description, and the study was conducted using the online questionnaire method using Google Forms. Among the items on the questionnaire, three items of demographic variables were included. 11 questions were used, including the online class experience using Google classroom and flipped learning videos and satisfaction with mobile use. There were a total of 14 questions used for this study.

4. Research Results

4.1. Classes applying media-based teaching and learning methods

Since 2017, this researcher has consistently applied the media-based teaching and learning method to students in the Department of Beauty and Health at Jeonju Vision College. In this study, media-based learning was introduced for each subject such as personal color system, makeup practice, and stage makeup among beauty-related subjects in the second semester of 2019. And the students' satisfaction in class was investigated.

The tools used in the media-based teaching and learning method are the Google classroom platform for interactive lessons, the sound and visual Kahoot, the video editing tool using GOM Mix Pro, and the photo editing function. Funia, Office Lens, Viva Video, Moment Cam, Mind Meister with Mind Map function, Think Wise, etc., Mirroring using Mobizen and Tip Viewer, video utilization through YouTube, and VideoScribe of whiteboard animation And powtoon.

A number of effective trials and applications were conducted for each subject. Among them, the media that are used most effectively in class and have the highest learning effect for students were Kahoot, Google's classroom, YouTube, VideoScribe, and Powtoon animation. The following is an orderly list of examples of applying the most used media to class.

4.1.1. Google classroom

Google classroom is a digital online classroom where students can open a classroom online, invite students to post posts, and communicate assignments and announcements. The advantage of classroom is that it is effective in performing tasks for flipped learning, and has a function that can load video materials and various content materials necessary for class. Content uploaded by instructors and learners is automatically clouded to Google Drive, and it has excellent service function, and when K-12 school and higher education instructors use it, it gives permission to use it for free, subject to school account use. The biggest advantage of G-Suite for Education is that it provides unlimited Google Drive storage. In addition, the Google classroom function has more advantages in that it is easy to check whether an assignment is submitted or not and that it is possible to synchronize through score assignment[16]. The following picture is an example of a teacher using a personal color subject classroom in the actual Google classroom <Figure 1>, <Figure 2>.

Figure 1. Google classroom for each subject opened in the classroom.

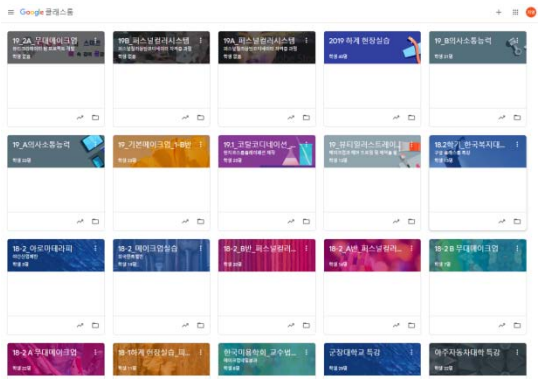
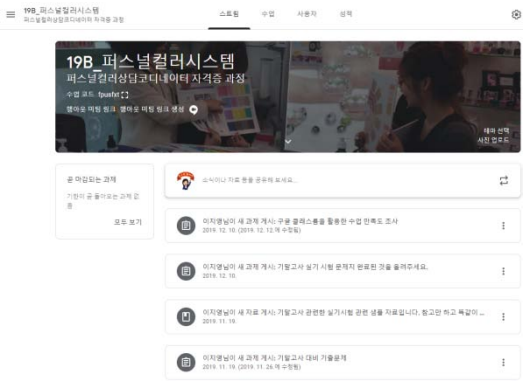


Figure 2. Assigning assignments to google classroom stream.



4.1.2. Youtube

YouTube, the number one search engine in the world, is a free video sharing site. Users can upload and share videos. In addition, you can search and download online video data from around the world, or receive links only to URL addresses and use them for learning. Instructors can create their own educational videos, upload them to YouTube, and share them with students. In addition, there is an editing function called Creative Studio, so you can edit and post a video, or set it to be unlisted, and then link to only those who want to share it.

This researcher has produced 577 videos since 2016, uploaded them to YouTube, and used them as educational content. In the playlist, videos are classified by class subject and used in class <Figure 3>. This researcher named his YouTube "EasYoung ppyeogong TV <Figure 4>"[17].

Videos required for each subject class were separately produced and created, or the subject class activities were produced as videos and edited and uploaded to YouTube. After categorizing it into a playlist, the URL was shared for students to review. Apps used for YouTube video production include DocZoom Creator Pro, Powtoon, VideoScribe, Viva Video, myeolchi app, Canva, Gomix Pro, and so on.

Figure 3. Educational video content uploaded to youtube.

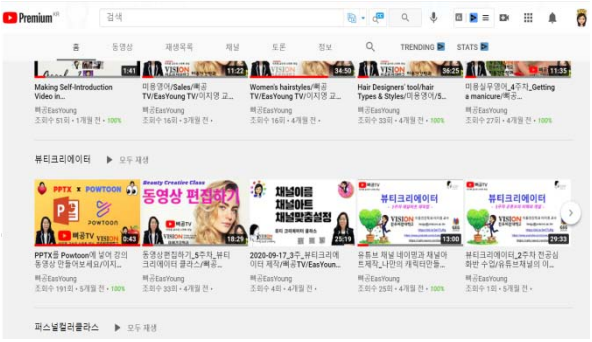
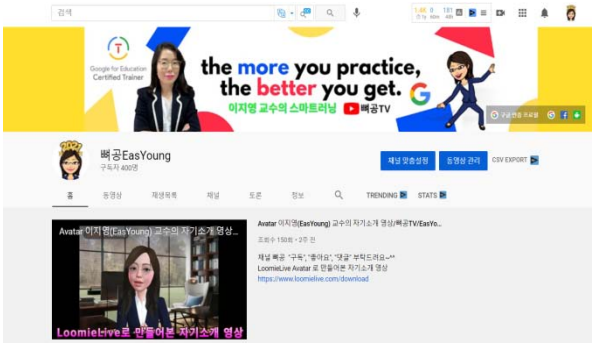


Figure 4. “EasYoung ppyeogong TV” youtube channel.

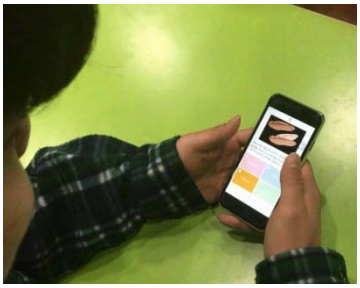


4.1.3. Kahoot

Kahoot, which provides game-based learning content, has a feature that students love very much. Provides sound and video to create an immersive environment[18]. When freshmen were admitted and the professor introduced herself to the students during the first class, Kahoot was used to play the Jinjinga game. Students' reactions are always exciting, but sometimes in the mobile settings of the students, it should be done after checking whether the environment is good or data is sufficient. Easy access by entering a pin number without installing the app on the mobile[19][20].

Kahoot has an assignment function, and using this assignment function, the midterm exam for personal color system subjects in the second semester of 2019 was conducted for each student <Figure 5>. After the students' exams were over, they were taught to fully understand the contents of the midterm exam by carrying out problem solving with Kahoot. The result of the test with Kahoot is automatically clouded in detail, so it is easy to store and manage test scores. The Kahoot problem can be developed by the instructor, or it is convenient to duplicate and use the already developed content.

Figure 5. Midterm exam in kahoot.



4.1.4. Whiteboard animation

VideoScribe and Powtoon were used as animation techniques that can make people who are not good at drawing well. VideoScribe is an animation program developed by a company called "Sparkol" that does not support Korean, so if you save Korean characters using illustrations and load them as pictures in VideoScribe, a video written in English will come out. There is a voice recording function, so explanation is possible <Figure 6>.

Unlike VideoScribe, the Powtoon animation technique supports Korean and boasts simple usability. If you use it for free, you can only share it on YouTube or Facebook. If you use it for a fee, it is a useful app that allows you to create high-quality videos and download them as MP4 files. It can be a bit complicated to use for early users.

Powtoon is a learning medium using digital media technology and web-based animation software. Anyone can use a pre-made template or create an animated presentation using high-quality images, and create by dubbing various types of music and user-created voices. Powtoon can create more lively video class materials through visual, text, graphic, image, photo, sound and animation functions[21]. The results from the case study using Powtoon showed that the learning results taught by the SAVI learning model using Powtoon animation media were higher than those taught by the traditional methods[22].

This researcher created and used a video that introduces the department introduction, the introduction of the instructor, the manners and hygiene management to be observed in the classroom, and the learning goals and activities for each week <Figure 7>.

Figure 6. Videoscribe whiteboard animation made for class.

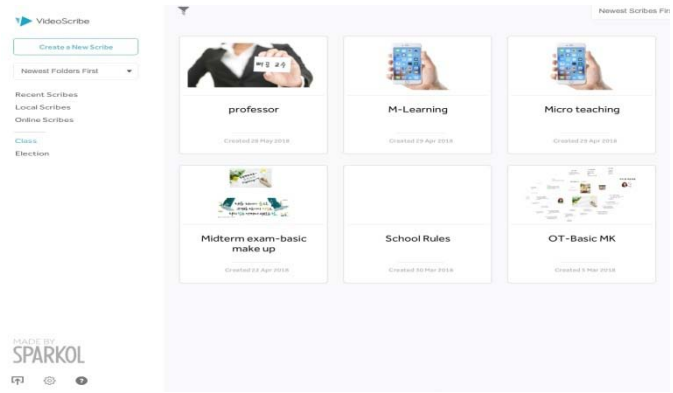
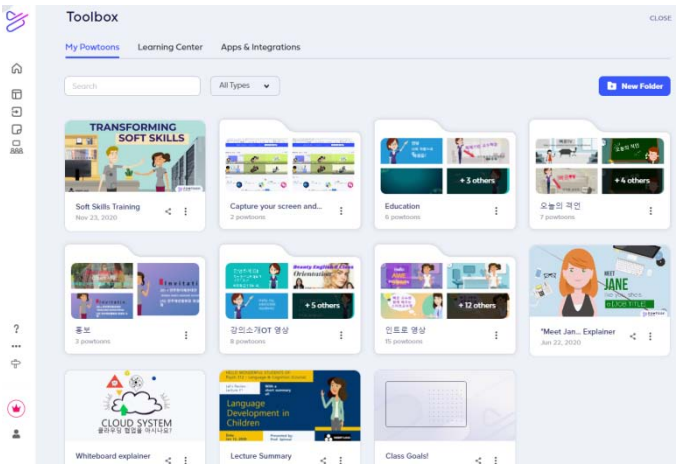


Figure 7. Powtoon animation made for class.



4.2. Class satisfaction survey applied to media-based teaching and learning method

A total of 14 questions, including demographic questions, were used for the questionnaire survey on the level of satisfaction with the class applying the media-based teaching and learning method, and the results are as follows.

4.2.1. Class experience using google classroom

54.4% of respondents said they had experienced class experience using Google classroom for the first time, and 47.8% answered that they had experienced more than 2 subjects <Figure 8>. The reason is considered to be the reason that this researcher has used it in his major curriculum classes since 2017.

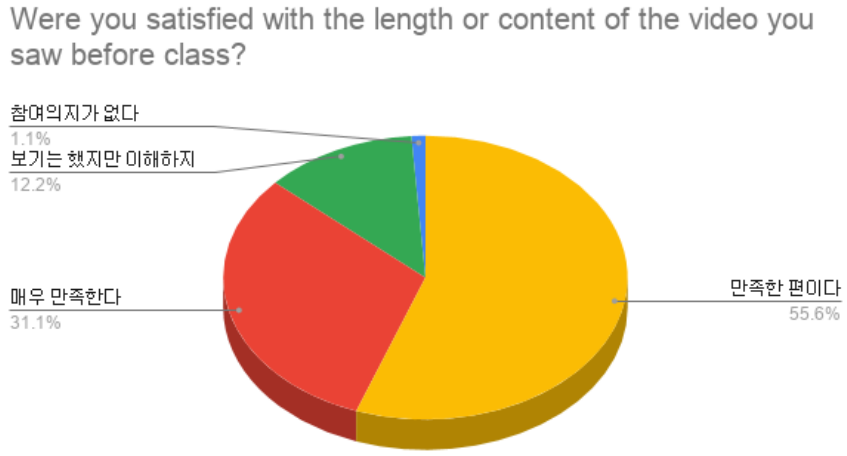
Figure 8. Class experience using google classroom.

Note: Blue : First experience(51.1%), Red : Have experienced more than 2 classes(44.4%), Green : Don't know Google classroom(3.3%), Yellow : I know Google classroom, but I have never used it for class(1.1%).

4.2.2. Satisfied with the length or content of the flipped Learning video

In this study, media-based learning was also used for flipped learning, and the video was previewed before class and inducement to participate in class. In terms of satisfaction, 86.7% of respondents said they were satisfied <Figure 9>.

Figure 9. Satisfied with the length or content of the flipped Learning video.

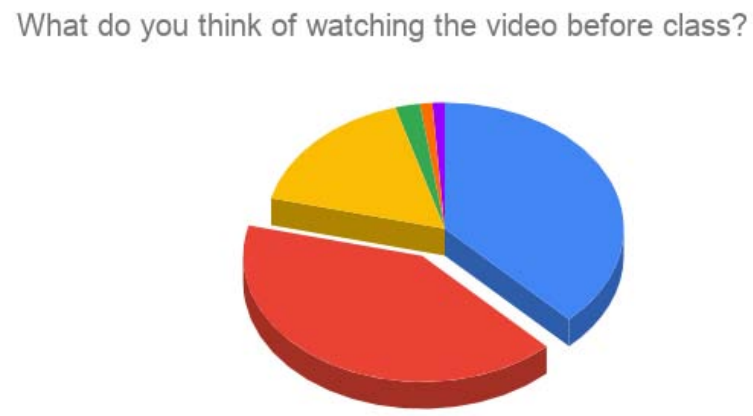


Note: Yellow: Be satisfied(55.6%), Red: Very satisfied(31.1%), Green: I saw it but I didn't understand(12.2%), Blue: Have no intention to participate(1.1%).

4.2.3. Satisfaction with watching flipped learning videos before class

In the survey on satisfaction with watching flipped learning videos before class, 41.1% of respondents said that pre-class content delivery seems to be very helpful <Figure 10>.

Figure 10. Satisfaction with watching flipped learning videos before class.

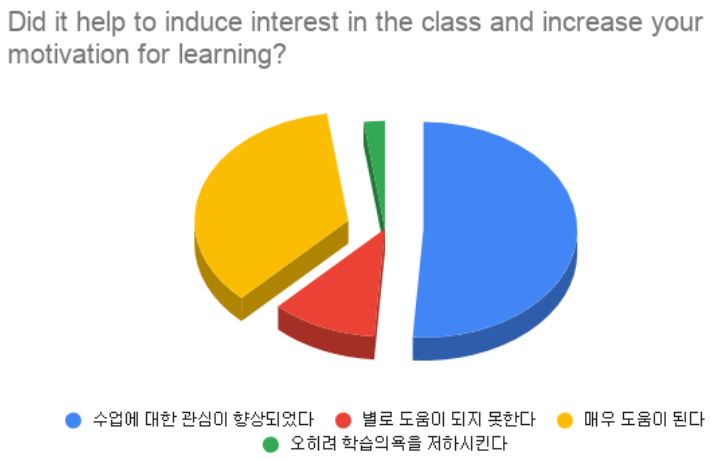


Note: Red: The pre-class content was very helpful(41.1%), Blue : be normal(37.8%), Yellow: It seems to be more helpful than after class(16.7%), Green: It doesn't matter when(2.2%), Orange: Extra-class activities are a burden(1.1%), Purple: Other(1.1%).

4.2.4. Satisfied with inducing interest in class and promoting learning motivation

As a result of implementing the media-based teaching and learning method, 84.7% of respondents said they were satisfied with inducing interest in class and increasing their motivation to learn <Figure 11>.

Figure 11. Satisfied with inducing interest in class and promoting learning motivation.

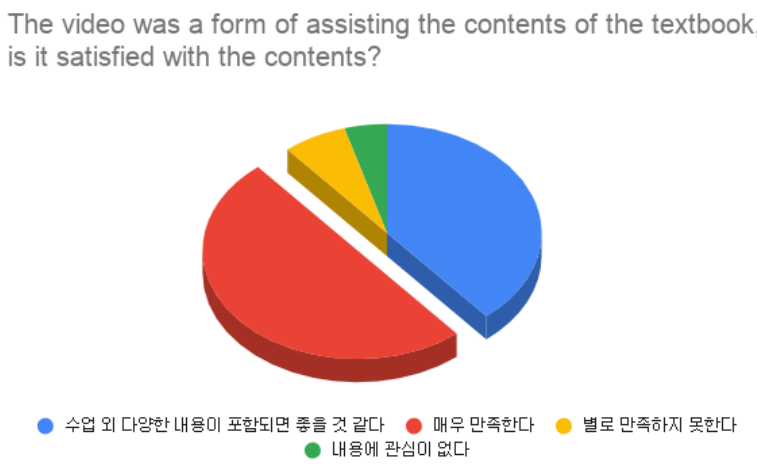


Note: : Blue : Interest in class has improved(51.5%), Yellow : Very helpful(35.6%), Red : It doesn't help much(11.1%), Green : Rather, it lowers the motivation to learn(2.2%).

4.2.5. Satisfaction with the content of the format that assists the video in text

The video was used as an auxiliary format for the contents of the textbook. As a result of the survey, 50% of the respondents said they were very satisfied, and 38.9% answered that it would be good if various contents other than class were included <Figure 12>. It is believed that some students want a video that arouses interest and motivation for class, such as Spot.

Figure 12. Satisfaction with the content of the format that assists the video in text.

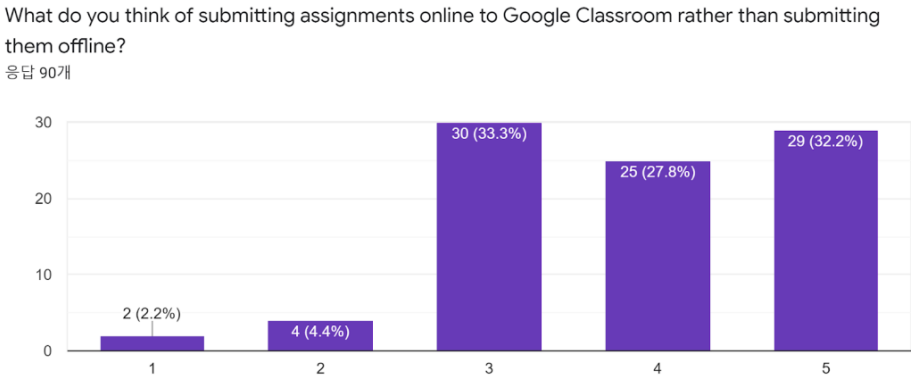


Note: Red: Very satisfied(50.0%), Blue: It would be nice if various contents other than the class were included(38.9%), Yellow: Not very satisfied(6.7%), Green: Not interested in the content(4.4%).

4.2.6. Satisfaction with submitting assignments online through google classroom

It was found that 60% of students were satisfied with submitting online assignments using digital devices with the Google classroom app <Figure 13>.

Figure 13. Satisfaction with submitting assignments online through google classroom.

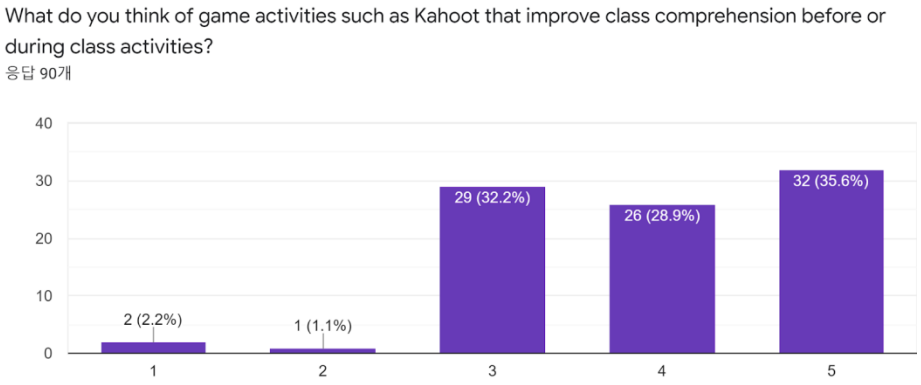


Note: 5: Very satisfied(32.2%), 4: satisfied(27.8%), 3: Normal(33.3%), 2: Not satisfied(4.4%), 1: Not very satisfied(2.2%).

4.2.7. Satisfaction with improving understanding of class contents through game activities such as kahoot

In class activities, 64.5% of respondents said they were satisfied that game activities such as Kahoot enhance the understanding of class content <Figure 14>.

Figure 14. Satisfaction with improving understanding of class contents through game activities such as kahoot.

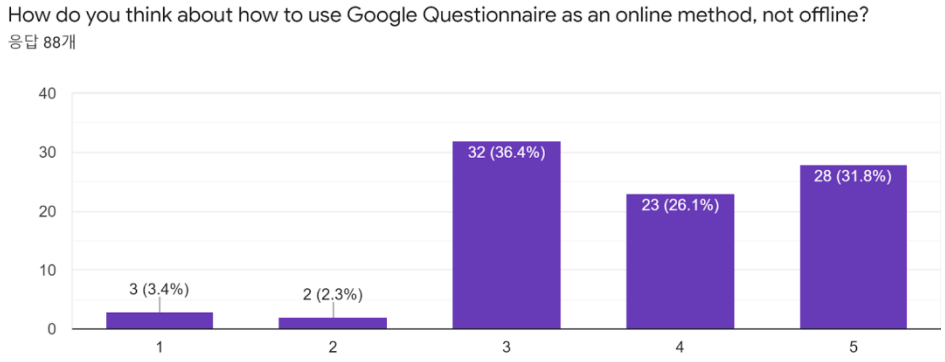


Note: 5: Very satisfied(35.6%), 4: satisfied(28.9%), 3: Normal(32.2%), 2: Not satisfied(1.1%), 1: Not very satisfied(2.2%).

4.2.8. Satisfaction with online exams using google forms

This researcher conducted a paperless test using Google forms. As a result of the satisfaction survey, 57.9% of the students were satisfied <Figure 15>.

Figure 15. Satisfaction with online exams using google forms.

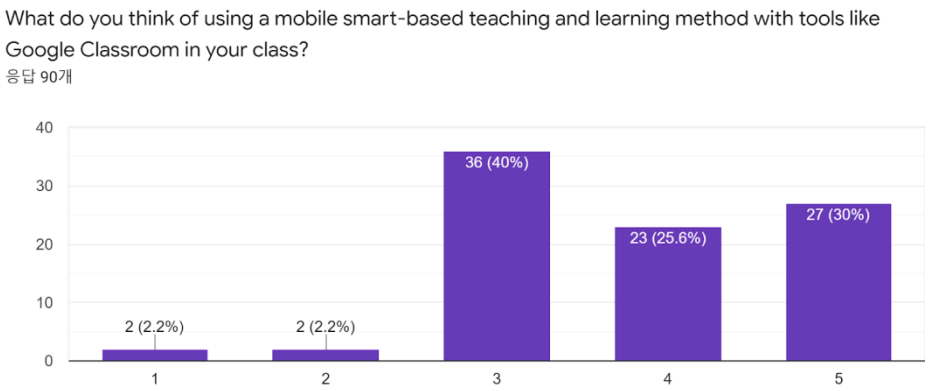


Note: 5: Very satisfied(31.8%), 4: satisfied(26.1%), 3: Normal(36.4%), 2: Not satisfied(2.3%), 1: Not very satisfied(3.4%).

4.2.9. Satisfaction with the use of media-based teaching and learning methods using mobile

It was found that 55.6% of students were satisfied with the question about using mobile teaching and learning methods such as the Google classroom app <Figure 16>.

Figure 16. Satisfaction with the use of media-based teaching and learning methods using mobile.



Note: 5: Very satisfied(30.0%), 4: satisfied(25.6%), 3: Normal(40.0%), 2: Not satisfied(1.2%), 1: Not very satisfied(2.2%).

4.2.10. Free description of instruction using media-based teaching and learning methods

This researcher allowed the students to freely describe the good points and the inconveniences in the class that applied the media-based teaching &learning method. As a good point, the redundant content is summarized as follows. “It was nice to have a more fun class”, “I received a lot of help from the professor”, “I can study at home”, “I was able to check exactly what the assignment was”, “Repeated learning is possible”, “Not boring I was able to concentrate well”, “I was able to immediately check what class I took, etc.

The following responses were uncomfortable in class using the media-based teaching and learning method. “It was a bit difficult because it was my first time using it”, “Internet data is essential”, “I need to download class-related apps”, “I need to use class-related apps”, etc.

5. Conclusion

In this study, when the necessity for innovation in future education along with the 4th industrial revolution was critical, a media-based teaching-learning method was used, focusing on beauty-related subjects, and a case study and satisfaction survey of makeup and personal color subjects were conducted. The subjects of this study are students taking beauty-related classes, and the most effective methods of using educational contents that enable flipped learning and interactive classes, and the most effective and students' favorite Kahoot, Google classroom, YouTube, VideoScribe, and Powtoon were applied to classes.

Since the use of media-based teaching and learning methods increases the learning effect of learners and gives interest and enjoyment to the class, if appropriately used, teaching can be developed far more in terms of communication and understanding of education than traditional learning methods. However, personal variables such as the learner's cognitive style and verbal ability should be considered and dealt with. In some cases, students who lacked the ability to use devices, such as how to use computers or smart phones, need to be coached one-on-one with learners because the instructor created a separate learning mentoring time.

Learners can acquire much more content than analog learning methods in media-based learning, but they have to invest more time in media-based learning. Learners with poor learning ability or who do not want to learn may not enjoy the benefits of media-based education. Learning computers and smart digital devices efficiently takes time. This is because

the ability to learn about computers and digital devices is clearly critical to the success of media-based education.

In order to innovate future education, the competency in digital media-based teaching and learning methods is essential for both instructors and learners. To this end, it is necessary to closely examine problems such as the composition and operation management of infrastructure, the absence of various contents, impractical teacher support, and misunderstanding of smart education in the effectiveness and application of media-based education. In future research, research on various methods to maximize communication and learning effects through media-based learning is needed.

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7. Appendix

7.1. Authors contribution

	Initial name	Contribution
Author	JL	-Set of concepts ☑ -Design ☑ -Getting results ☑ -Analysis ☑ -Make a significant contribution to collection ☑ -Final approval of the paper ☑ -Corresponding ☑ -Play a decisive role in modification ☑ -Significant contributions to concepts, designs, practices, analysis and interpretation of data ☑ -Participants in Drafting and Revising Papers ☑ -Someone who can explain all aspects of the paper ☑