

The Influence of Digital Native Media Utilization and Network Homogeneity on Creative Expressive Ability in an Open Innovation Paradigm

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Abstract: This study conducted a digital content development class that conform to the interests of the education students. We analyzed their creative expressive ability before and after participating in the said class. Furthermore, this study evaluated how media utilization and network homogeneity among the characteristics of digital natives affect their creative expressive ability. The subjects of the study are 320 students from four-year E universities in Gyeonggi-do. The results revealed that the digital content development class proposed in this study can be fully utilized as a class model that reflects the needs of the current generation and invigorates the curriculum for digital nativization.

Keywords: Open innovation paradigm, Digital natives, Media utilization, Network homogeneity, Creative expressive ability

1. Introduction

With the acceleration of the global society and the emphasis on the fundamental spread of knowledge and creative innovation in technology-based industries, Chesbrough introduced the open innovation paradigm in 2003. It actively utilizes external ideas to diversify sources of innovation while deliberately maximizing the use of technologies. With the recent convergence of new media outlets, public and private media channels have emerged widely and simultaneously around the world, highlighting the fundamental spread of knowledge and creative innovation. Yun (2016) revealed that as the knowledge-based economy develops, the amount of knowledge is rapidly increasing with the rate of circulation [1]. In particular, the development of innovative technological civilization provided a high-speed Internet environment, and the use of smartphones enabled people to live in space and time without restrictions.

The digital natives are born into the Internet, computers, and smartphones as essential aspects in everyday life. Georgescu - Roegen's(1992) study argued that the human ability to expand technology and intellectual domain should not be underestimated [2]. Thus, the digital natives use digital devices in educational fields in expanding technology and knowledge. In the education market, where the use of digital devices is rapidly expanding, students' motivation for learning and class participation rates should be promoted, and the direction of smart education should be presented from the perspective of a digital native. In the open innovation era, it is necessary to look for new education methods in the digital natives' perspectives and check the impact of network homogeneity on their creative expression ability. Network homogeneity means the psychological homogeneity within the network to which social networking services (SNS) users belong. While the definition of creative expression ability varies, this study defined this as the ability to generate unique ideas and produce new and appropriate products in new perspectives.

In the social environment of SNS, networks can change society and empower the opinions of the few who are isolated in a pluralistic society. It is also a tool for a number of powerless people. However, social networking sites are misused socially, causing homogeneity on the network, social problems, and huge confusion if linked to collective dramatization [3]. Network homogeneity consists of ideological homogeneity and social homogeneity. Ideological homogeneity means the homogeneity of political and social beliefs or beliefs felt by users within the SNS users' networks. Social homogeneity refers to the homogeneity of social characteristics (age, educational background, economic background) that users feel psychologically within the network of SNS users [4]. Norris(2005) said that because of the network characteristics of SNS, digital natives strengthen the beliefs and interests shared on SNS networks [5]. There are not many such network homogeneity studies. Therefore, this research is meaningful in terms of preparing for an open era of innovation.

In addition, in the open innovation paradigm, and the availability of many media devices, the use of media is becoming more diverse [4]. The digital natives have limited absolute time for media utilization, so it is more effective and efficient for them to use media, search for related news through computers or smartphones, and communicate with friends through the SNS. Existing studies related to media utilization of digital natives [5–11] focused on personal factors such as personality variables and values rather than on media utilization for comparative analysis with other generations.

Unlike content produced through mass media in the past, contents in the UCC era are not only readable. The contents produced are processed, edited and reproduced by a second producer (C) and exported to the outside, thus having a high degree of open diffusion. UCC learns and experiences new ways of expression as an imaging medium. Understanding and experiencing media suitable for the digital age away from the existing media is helpful to creativity as a new way of expression. This allows us to understand today's visual phenomena, correctly utilize them as a means of expression for life and culture, and ultimately drive open innovation in today's social and cultural lives and in the future.

Since absolute time for media utilization is limited, it is common to be effective and efficient among digital natives to communicate with friends through SNS while searching for related news via computer or smartphone. Existing studies related to the media usage patterns of the digital natives [6–13] have focused on personal factors, such as personality changes and values, rather than media use, for comparative analysis with other generations. The ideological homogeneity of social homogeneity on SNS networks is among the characteristics of digital natives. According to Norris (2002), due to the nature of the social network, the digital natives find it easy to join groups that allow them to reinforce shared beliefs and interests and leave these groups if otherwise [3]. It is meaningful to analyze the impact of network homogeneity and media utilization through UCC production training activities in this paradigm of innovation, which might determine its impact on the future of the digital natives.

This study proposes a class model for the production of UCC video content as part of the educational activities that meet the interests of today's education students as digital natives, conducts education according to the class model, and analyzes whether there is a difference in creative expressive ability before and after participating in the class. In addition, among the characteristics of a digital natives, we wanted to analyze how media utilization and network homogeneity affect their creative expressive abilities.

The research issues for this purpose are as follows.

First, what are the media utilization levels, network homogeneity levels, and creative expression skills of the digital natives?

Second, what is the impact of UCC production training on the creative expressive abilities of the digital natives?

Third, what is the impact of media utilization and network homogeneity on the creative representation of the digital natives?

2. Literature Reviews

2.1. Understanding the Digital Age and the Characteristics of the Digital Natives in an Open Innovation Paradigm

Digital natives, introduced by Marc Prensky (2001), refer to a generation that freely uses digital devices, such as computers and the Internet, like natives speakers [14]. Williams (2015) referred to digital natives as the Alpha generation who will grow with digital devices, cannot live without smartphones, and can transmit their thoughts online in time [15]. They interact with digital technology at a younger age than other generations due to mobile devices and touch screens, and they do not utilize technology and networks as tools but as part of their lives [16].

American futurist Stan Davis calls today's global village a "network economy" or an "adjacent economy" in his book "Future Governance." According to him, the access economy created by the spread of the Internet and digital technology is shifting to an open innovation paradigm through three features: speed, access, and intangible value. Digital natives are quickly and easily getting various information through different creativity, challenges to new things, speed, and various media utilization.

Looking at the characteristics of digital natives, these are:

First, they can focus and deal strategically with multiple targets. In other words, they are proficient in multitasking or parallel processing.

Second, they seek immediate interaction and rapid response through the network.

Third, they seek to actively reveal oneself through various networks, make claims and make one voice through consensus. These characteristics can be called network homogeneity [17].

Based on this, it is necessary to review the level of media utilization and network homogeneity among the characteristics of digital natives and to explore education methods for digital natives that conform to the open innovation paradigm.

2.2. The Direction of UCC Video Production Education Activities from a Constructivist Perspective

From an educational point of view, the open innovation paradigm is defined as a new method of innovation that increases performance by utilizing external ideas and technologies and expanding external technological resources [18]. This is in the same vein as the constructivist perspective, in which learners themselves utilize the resources and skills given and actively generate results towards the goal through internal reflection. In particular, UCC production activities utilize the learners' external resources and skills to make video content performance through the learner's creative expressive ability and spread it to many other members. These UCC production activities are based on the principle of constructivism, on the premise of dialogue and cooperation between learners, and the need for all members to actively stick to their roles.

The knowledge that is emphasized in constructivism is not in the same form to everyone but is variedly altered and diffused by the cognitive actions of the individual that make up the knowledge. In addition, in the configurational learning environment, the environment is created so that learners can think on their own, and the contents and goals of the classes can be discovered and organized by the learners, not limited by the teacher. This constructivist learning environment can propose UCC video educational activities as the necessary teaching methods for digital native learners in the new open innovation paradigm.

UCC, a genre of visual culture, is a cultural phenomenon that takes place in an online space where videos produced by one are uploaded to the site, watched, evaluated, and shared together. Recently, with the expansion

of one-person creative broadcasting, it has become a space where individuals, companies, institutions, and organizations can voluntarily promote themselves. Such socio-cultural changes should be actively considered introducing them as appropriate teaching methods for the digital natives

2.3. Model of UCC Video Production Class

To find the appropriate methods in teaching the UCC video production, it is necessary to understand the general video production process. Typically, the video production process is carried out in three stages: Pre-production, Production, and Post-production [19]. The following are the application of the teaching steps to the general process of UCC production.

TABLE 1. UCC VIDEO PRODUCTION COURSE

Production phase	Contents	Class phase	Contents
Pre-production	-Planning UCC - Scenario production -Storyboard fabrication	Planning	-Understanding and utilizing one-person media - Understanding practical elements for planning and writing a production form through mind maps - Team scenario and storyboard writing exercises
Production	-Filming and collecting photos and video materials	Production	-Shooting with a camera -Select music -Preparing for editing programs -Understand basic photographic tools -Using video editing apps (Anchovy, Quick, KineMaster) - Free music for copyrights and the use of YouTube Audio Library
Post-production	-Smart video editing app editing, composing, publishing	Appreciation	-Watching videos -Creating an appreciation review

The UCC video production classes need to understand UCC in general at the planning stage and decide the subject of the work. Based on the investigation of the determined subject, the mind map is produced, the main plot is drawn up through the mind map, and the storyboard is written. In the production stage, video editing tools are used, and UCC is produced by referring to the storyboard. In the appreciation stage, classes are conducted in the order of UCC viewing on the web, writing, and presenting appreciation papers.

The digital content development class models (e.g. UCC video production) modified from the digital content development models of Lee and Owens (2000) [20] are shown in Table 2 [20].

Table 2. UCC Video Production Course

Phase	Detail Item	Contents
Analysis	Needs analysis	Confirmation of goals and extraction of differences from level of linkage through education
	Front-end analysis	Analysis of learners, technologies, tasks, learning contents, environmental conditions, learning medium, cost, etc.
Design	Schedule	Overall time plan for curriculum development

	Project team	Roles and responsibilities of all personnel involved in the development process
	Characteristics of medium	Interface design on how to express learning content on the Internet
	Content structure	Matters concerning grouping, interaction, and evaluation methods of learning content
	Front-end analysis	Extracts design errors, duplication, and cost-consuming elements through a comprehensive review of all elements designed as just-to-be-developed.
Development, Production	Development	Multimedia development and integration work for each element
	Production	Test drive and fix technical problems, errors, loading speed, etc.
Operation	Delivery	Class operation
Evaluation	Content evaluation	Evaluation of educational effectiveness on developed content
	Evaluation of learning performance	Evaluation of individual competency improvement

The digital content teaching design model of Lee and Owens (2000) is a model that reduces redundant elements for each point in consideration of the waste of time and money that is likely to occur in eLearning curriculum design [20]. Because it is important to reduce time and cost waste, front-end analysis is included to predict and analyze the entire step from the basic analysis to the final stage of cost assessment. Also, the education effectiveness and learning performance of the developed contents are evaluated after the class operation and the continuous circulation process is considered.

3. Methodology

3.1 Subjects

The study was conducted on 320 first to fourth year level students of E University in Gyeonggi-do. The general characteristics of the study subjects were shown in Table 3.

Table 3. General characteristics (n=303)

Observation variable		Frequency	%
Gender	Female	235	77.6
	Male	68	22.4
Grade	First	138	45.5
	Second	84	27.7
	Third	35	11.6
	Fourth	46	15.2
College	College of Health Sciences	133	47.9
	College of Bio-convergence	170	52.1

3.2 Research Instrument

The measurement tools in this study were composed of questions about general characteristics and questions about media utilization, network homogeneity, and creative expressive ability. The measurement tool for media utilization used a digital media utilization diagnostic scale based on the validity of Hwang Young-mi's (2009)

research [21]. The sub-factors of digital media utilization consist of a total of 14 questions, including expressiveness, immediateness, communicability, and immersion.

Based on the research by Norris (2005), the network homogeneity measurement tool was developed by Na Eun-kyung (2007), Ryu Jung-ho, and Lee Dong-ho (2011). [22~24]. The sub-factors of network homogeneity consist of a total of 12 questions, with SNS utilization strength, ideological homogeneity, and social homogeneity.

The creative expressive ability measurement tool used the creative expressive ability diagnosis question among the key competency diagnosis questions secured by E University. The sub-factors of creative expressive ability consist of a total of 15 questions, including creative character and attitude, creative problem solving, and convergence thinking.

A total of 43 questions were used to measure the level of media utilization ability and network homogeneity affecting creative expression capabilities. The question composition of the measuring tool is shown in Table 4.

Table 4. Question composition and reliability coefficient of measurement tools

Division		Number of questions	Cronbach' α
General characteristics	Gender, Grade, College	3	-
Media utilization	Expressiveness (5 items), immediateness (3 items), communicability (2 items), and immersion (3 items)	13	.899
Network homogeneity	SNS utilization strength (5 items), network ideological homogeneity (4 items), network social homogeneity (3 items)	12	.911
Creative expressive ability	Creative character and attitude (5 items), creative problem-solving (5 items), and convergence thinking (5 items)	15	.903

3.3 Data analysis

The data analysis method for this study used the IBM SPSS Statistics 20.0 program. First, frequency analysis was performed to examine the average and standard deviation of the demographic and sociological factors and measurement variables of the surveyed persons, and the Cronbach's coefficient value was calculated to ensure the reliability of the measurement tool. Also, a paired t-test was conducted to see if there were any differences in the creative expressive ability of digital natives before and after the digital content development class. Furthermore, stepwise multiple regression analysis was conducted to identify the influence of media utilization and network homogeneity on the participants' creative expression capabilities.

4. Results

4.1 Differences in creative expressiveness of digital natives before and after the digital content development class

The results of the comparison of the pre and post creative expressive abilities by the paired t-tests after the digital content development class are shown in Table 5.

Table 5. Results of t-test on the effectiveness of digital content development class

By sub-factor of creative expressive ability paired t-test	M	SD	Mean difference (Pre mean-Postt mean)	p

paired 1	Pre-creative character and attitude	3.0361	0.84284	-0.86988	-10.026***	0.000
	Post-creative character and attitude	3.9060	0.59044			
paired 2	Pre-creative problem solving	3.0145	0.85127	-0.77590	-9.708***	0.000
	Post-creative problem solving	3.7904	0.72240			
paired 3	Pre-convergence thinking	2.8988	1.08127	-0.79518	-9.954***	0.000
	Post-convergence thinking	3.6940	1.04267			

*** $p < .001$

All the sub-factors of creative expressive ability showed that the post-average value improved from the pre-average value, and that the statistical significance of the difference between the pre-average value and the post-average value was statistically significant both at .001. Therefore, we could confirm that the UCC digital content development class is effective for improving the creative expressive ability of university students' digital natives.

4.2 The Impact of digital native media utilization on creative expressive ability

The results of stepwise multiple regression analysis of media utilization for creative expressive ability are shown in Table 6.

Table 6. Analysis of variance (n=303)

	Sum of squares	df	Mean square	F	p
Regression Model	6.668	2	3.334	7.679	.001
Residual	34.735	80	.434		
Total	41.404	82			

$R^2(\text{adj. } R^2) = .161(.140)$

As a result of the statistical significance test of a model that measures the influence of creative expressive ability with four independent variables consisting of immersion, expressiveness, immediateness, and communicability, which are sub-factors of media utilization, the F statistic value of the model that includes instance and communications was excluded due to lack of immersion and expressiveness, and the significance rate is .001, which is a significant representation of creative ability at the significant level .05.

Although these results are independent variables that affect the ability of creative expression in the sub-factors of media utilization, it is important to be cautious in generalizing the results of the study since 16% can be predicted. From the conducted survey, the influence of the native media utilization on creative expression capabilities is low.

The results of the statistical significance analysis and contribution of individual independent variables to the use of media for creative expressive ability are shown in Table 7.

Table 7. Analysis summary of the impact of media utilization on creative expressive ability (n=303)

Independent variable	Dependent variable	Unstandardized regression coefficients		Standardized regression coefficients	t(p)
		B	Standard error	β	
(constant)	Creative expressive ability	3.073	.346		8.889(.000)
Immediateness		.450	.115	.523	3.914(.000)

Communicability		.267	.101	.354	2.655(.010)
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As a result of testing the contribution and statistical significance of the dependent variables and individual independent variables, the independent variables that significantly affect their creative expressive ability at a significant level of .05 are Immediateness ($t=3.91, p=.000$), and communicability ($t=2.65; p=.010$). According to the standardized coefficient representing the relative contribution of the independent variable, the ability to express creatively is influenced in the order of instantly and communicability.

4.3 Effect of network homogeneity on creative expressive ability of the digital natives

The regression results of network homogeneity with respect to creative expressive ability are shown in Table 8. Table 8. Analysis of variance (n=303)

	Sum of squares	df	Mean square	F	p
Regression Model	5.190	2	2.595	5.733	.005
Residual	36.213	80	.453		
Total	41.404	82			

$R^2(\text{adj. } R^2) = .125(.103)$

As a result of the statistical significance test of a model that measures the influence of creative expressive ability with three independent variables, network utilization strength, ideological homogeneity, social homogeneity, and ideological homogeneity, which are sub-factors of network homogeneity, was excluded because it was not significant. Also, the F statistic values of the model, which includes the strength of network utilization and social homogeneity, are 5.733 and the significant probability is .005, and the independent variables included in the model are significantly described in the significance level of .05. Twelve percent of the total change in creative expression capability (10 % according to the modulus of modification) is explained by the independent variables included in the model. However, although network utilization strength and social homogeneity are independent variables that affect creative expression ability among the sub-factors of network homogeneity, generalizing the results of the study requires caution as it can be predicted around 12%.

The contribution of individual independent variables to network homogeneity to creative expressive ability and the statistical significance analysis results are shown in Table 9.

Table 9. Analysis summary of the impact of network homogeneity on creative expressive ability (n=303)

Independent variable	Dependent variable	Unstandardized regression coefficients		Standardized regression coefficients	t(p)
		B	Standard error	β	
(constant)	Creative expressive ability	3.427	.232		14.740(.000)
SNS utilization strength		.327	.097	.498	3.38(.001)
Social homogeneity		.200	.091	.326	2.209(.030)

As a result of testing the contribution and statistical significance of the dependent variables of individual independent variables, the independent variables that significantly affect the creative expressive ability at a significant level of .05 are SNS utilization strength ($t=3.38, p=.001$), and social homogeneity ($t=2.20, p=.030$). According to the standardization coefficient, which shows the relative contribution of the independent variable, the SNS utilization strength, and social homogeneity are influencing the creative expressive ability in the order of the network utilization strength and social homogeneity.

5. Conclusion and discussions

This study conducted a digital content development class for digital natives in the open innovation paradigm to evaluate the difference of their creative expressive ability before and after participating in the class. We also analyzed the factors influencing their creative expressive including the characteristics of digital natives, media utilization, and network homogeneity.

First, the UCC digital content development class is effective in improving the creative expressive ability of the participants. Second, as a result of analyzing the impact of media utilization on the creative expressive ability of digital natives, we could see that among the sub-factors of media utilization, immediateness and communication affect creative expressive ability. Third, after analyzing the impact of network homogeneity of digital natives on

creative expressive ability, we found that among the sub-factors of network homogeneity, network utilization strength and social homogeneity affect creative expressive ability.

In conclusion, the digital natives students of college students improve their creative expressive ability through the UCC digital content development class, and in particular, it can be seen that the degree of network use and social homogeneity among the media utilization of digital natives influence their creative expressive ability [25].

Therefore, it is expected that the digital content development class model proposed in this study will be fully utilized as a class model that reflects the needs of the current generation and conforms to the curriculum for digital nativization. Also, based on the research results that creative expressive ability is promoted when using digital native's media, technical and educational approaches to media utilization should be taken to enhance immediateness and communication rather than immersion and expressiveness.

Besides, it is necessary to find ways to organize networks into groups of similar social homogeneity and increase the frequency of use of networks to avoid causing group polarization on the network through research results that show that the higher the intensity of network use and social homogeneity, the more creative the ability to express is promoted [26-28]. Constructing such a group-oriented community with high social homogeneity is perceived as a new educational paradigm in an era of open innovation needed by the digital native's generation. For example, the intensity of the use of networks such as Twitter, Facebook, and Instagram will be further strengthened for the current digital native's generation, who will form a community of their social homogeneity in such network spaces. In the era of open innovation in the future, rather than negative expectations of the formation of these communities, there can be positive expectations that creative expression skills can be promoted as the result of this study.

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