

Influences of Metacognitive Ability on “Information ethics” for University Students

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Abstract- We examined the influence of the Metacognitive Ability (Monitoring, Control, Metacognitive knowledge) on consciousness of information ethics (crisis avoidance, personal information, health maintenance, crime prevention, illegal copying, copyright) among university students. We surveyed “Scale for evaluating consciousness of information ethics”(Miyagawa et al. 2011) and “the Adults’ Metacognition Scale”(Abe et al. 2010) for 148 university students. We found the interaction of “crisis avoidance”, “copyright” in “crisis avoidance”, “copyright”, “crisis avoidance” in Metacognitive knowledge, “crisis avoidance” in Control, “copyright” in Monitoring as a result of Metacognitive Ability the higher and lower (2) × gender (2) a two way analysis of variance about each factor in information ethics. In each case, female students marked higher average scores than male students in the Metacognitive Ability lower group. Also, we found that Metacognitive Ability’s main effects were superior in almost all factors in information ethics. Both resulted in the Metacognitive Ability higher group’s average scores being higher than that of the lower group..

Keywords –information ethics, Metacognition, university student, information-related education

I. INTRODUCTION

Due to the rapid development of the internet and mobile handhelds becoming smaller, cheaper, and more functional, our society is becoming more ubiquitous in relying on them. Information ethics is one of the most important skills for communicating in an information-oriented society. On the other hand, online trouble led by lack of information morality is spreading. Improvement and education about information morality are becoming urgent problems for schools, from elementary school to universities. Recently, students have been hearing information ethics lectures in Technology and Home Economics in junior high school and Information Study in high school. Furthermore, they are learning information morality in their daily lives by means of mobile phones and PCs. Prior research reveals that learner’s meta-recognition is highly influenced by empirical learning. Meta-recognition is the act of monitoring one’s behaviors and adjusting/revising them to grasp oneself objectively. Knowing their general recognition characteristics will be a “step” in monitoring their study and it will also affect information ethics.

Considering and gaining a knowledge about “How meta-cognitive ability affects learning information ethics” through study and experience will be fundamental to conceiving a teaching method of information ethics from elementary school to universities.

As a result of prior research of meta-cognitive and information ethics, a model was proposed regarding information ethics teaching methods and its assessment and expected effects by Konno's in his "Construction of information morality education by metacognition approach"[1]

However, there are is substantial analysis of relevance and effect regarding meta-cognitive abilities and awareness of information ethics. Therefore in this paper, we targeted university students and examined the effect of learners' meta-cognitive abilities on awareness of information ethics.

II.METHOD

A. *Research period* –

The research was conducted from April to May 2012.

B. *Subject of research* –

Target subjects of this research included 61 males, 87 females, a total of 148. There were 53 valid male answers, 74 female, a total of 127 valid answers. 85.8% of all answers were valid.

C. *measurement scale used in research* –

We utilized "the Adults' Metacognition Scale", written by Abe[2] to help grasp meta-recognition ability as a measurement scale, which utilized the Adults' Metacognition Scale. This measurement consists of 3 factors, 28 items (monitoring, control, Metacognitive knowledge), and five-point scale. Each factor in the Adults' Metacognition Scale is explained below. "Monitoring" is an item that must be carried about as objectively as possible, from start to finish. The questions included "Prepare all answers before presenting them", "Summarize what you learn when the task at hand is over"and the like. "Control" is, before and during execution, controlling cognitive activity as one corrects their answers and methods to efficiently complete the task. The questions included "change the method when one does not comprehend", "stop and re-read from the beginning when one does not comprehend", etc. "meta-cognitive knowledge" is a knowledge about the task, people, and methods. The questions included "I understand what I am good and bad at", "Make sure I spend enough time to learn", etc.

Awareness scale of information ethicsIn order to grasp the awareness scale of information morals, we utilized "awareness scale of information morals" by Miyagawa[3]. This measurement consists of 6 factors, 20 items (crisis avoidance, personalinformation, healthmaintenance, crimeprevention, illegalcopy, copyright), and five-point scale. Each factor in "awareness scale of information morals" is explained as follows. "crisis avoidance" is a factor regarding awareness for avoiding danger when utilizing ICT. The questions included "avoiding sites which infringe on others' privacy", etc. "Personal information" is a factor regarding awareness of safeguarding personal information. The questions included "It is Ok to freely give out somebody's email address without second thought", etc. "health maintenance" is a factor in the awareness of health preservation utilizing information tools. The questions included "I will take breaks when using the computer" etc. "crime prevention" is a factor of awareness of crime prevention in an information society. The questions included "consulting the nearest adult when finding personal attack on the Internet", etc. "illegal copy" is a factor of awareness of software pirating. The question included "if I am able to, I will pirate games and software without thinking twice", etc. "copyright" is a factor of awareness of copyrights in utilization of ICT. The questions included "I copy an image I like from the Internet, and publish it on my own site", etc.

III. EXPERIMENT AND RESULT

Regarding the 6 factors of information moral awareness, having separated "meta-cognitive ability"'s 3 factors' average values into higher and lower groups, we did a two way analysis of variance with gender. Differences between the factors of "meta-cognitive ability" are displayed in tables 1, 2 and 3.And the result of "simple main effect" in "interaction" is shown in Fig1.

Table-1. Means and standard deviations of information ethics, as a function of gender and monitoring

Information ethics	Gender	Monitoring				Main effect of Gender	Main effect of Metacognitive	Interaction
		Higher		Lower				
		Mean	S.D.	Mean	S.D.			
F1:Crisis avoidance	male	4.05	0.85	3.68	0.91	+	*	<i>n. s.</i>
	female	4.24	0.56	3.94	0.57	$F(1, 123)=3.06$	$F(1, 123)=6.52$	$F(1, 123)=0.06$
	whole	4.14	0.72	3.85	0.71			
F2:Personal information	male	4.43	0.64	4.22	0.50	<i>n. s.</i>	**	<i>n. s.</i>
	female	4.49	0.39	4.26	0.65	$F(1, 123)=0.19$	$F(1, 123)=4.58$	$F(1, 123)=0.00$
	whole	4.46	0.53	4.24	0.60			
F3:Health maintenance	male	4.09	0.82	3.42	1.11	<i>n. s.</i>	**	<i>n. s.</i>
	female	3.93	0.81	3.48	0.87	$F(1, 123)=0.10$	$F(1, 123)=11.77$	$F(1, 123)=0.47$
	whole	4.01	0.81	3.46	0.95			
F4:Crime prevention	male	3.47	0.81	2.90	0.75	<i>n. s.</i>	**	<i>n. s.</i>
	female	3.64	0.67	3.19	0.78	$F(1, 123)=2.73$	$F(1, 123)=13.65$	$F(1, 123)=0.17$
	whole	3.56	0.74	3.09	0.77			
F5:Illegal copy	male	3.24	1.07	3.06	1.19	**	<i>n. s.</i>	<i>n. s.</i>
	female	3.80	0.72	3.45	0.72	$F(1, 123)=8.05$	$F(1, 123)=2.59$	$F(1, 123)=0.29$
	whole	3.52	0.95	3.31	0.92			
F6:Copyright	male	4.10	0.92	2.96	1.12	<i>n. s.</i>	**	+
	female	3.86	0.79	3.36	0.82	$F(1, 123)=0.22$	$F(1, 123)=24.89$	$F(1, 123)=3.85$
	whole	3.98	0.86	3.22	0.95			

+ $p < .10$ * $p < .05$ ** $p < .01$

Table-2. Means and standard deviations of information ethics, as a function of gender and control

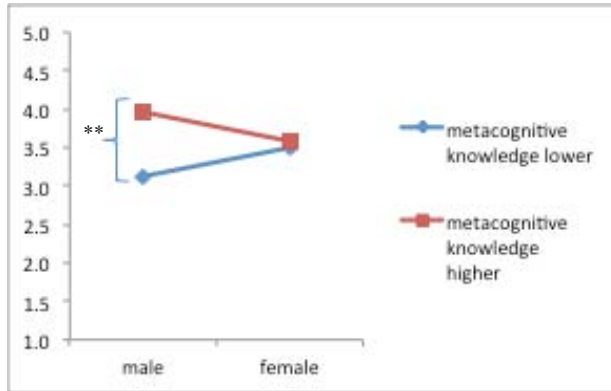
Information ethics	Gender	Control				Main effect of Gender	Main effect of Metacognitive	Interaction
		Higher		Lower				
		Mean	S.D.	Mean	S.D.			
F1:Crisis avoidance	male	4.30	0.60	3.45	0.95	<i>n. s.</i>	**	*
	female	4.22	0.56	3.92	0.56	$F(1, 123)=2.63$	$F(1, 123)=23.04$	$F(1, 123)=4.98$
	whole	4.26	0.57	3.73	0.77			
F2:Personal information	male	4.47	0.66	4.19	0.46	<i>n. s.</i>	**	<i>n. s.</i>
	female	4.50	0.38	4.21	0.67	$F(1, 123)=0.05$	$F(1, 123)=7.92$	$F(1, 123)=0.00$
	whole	4.49	0.52	4.20	0.59			
F3:Health maintenance	male	3.98	0.90	3.59	1.10	<i>n. s.</i>	**	<i>n. s.</i>
	female	3.79	0.82	3.53	0.90	$F(1, 123)=0.54$	$F(1, 123)=3.85$	$F(1, 123)=0.12$
	whole	3.87	0.86	3.55	0.98			
F4:Crime prevention	male	3.43	0.82	2.99	0.79	<i>n. s.</i>	*	<i>n. s.</i>
	female	3.57	0.74	3.18	0.75	$F(1, 123)=1.43$	$F(1, 123)=8.93$	$F(1, 123)=0.05$
	whole	3.51	0.77	3.11	0.76			
F5:Illegal copy	male	3.30	1.17	3.02	1.06	**	**	<i>n. s.</i>
	female	3.79	0.70	3.40	0.74	$F(1, 123)=7.23$	$F(1, 123)=4.22$	$F(1, 123)=0.13$
	whole	3.57	0.96	3.25	0.89			
F6:Copyright	male	4.02	1.00	3.13	1.16	<i>n. s.</i>	**	<i>n. s.</i>
	female	3.87	0.84	3.28	0.75	$F(1, 123)=0.00$	$F(1, 123)=19.73$	$F(1, 123)=0.77$
	whole	3.93	0.91	3.22	0.93			

+ $p < .10$ * $p < .05$ ** $p < .01$

Table-3. Means and standard deviations of information ethics, as a function of gender and metacognitive knowledge

Information ethics	Gender	Metacognitive knowledge				Main effect of Gender	Main effect of Metacognitive knowledge	Interaction
		Higher		Lower				
		Mean	S. D.	Mean	S. D.			
F1:Crisis avoidance	male	4.23	0.83	3.46	0.77	+	F(1, 123)=18.27	F(1, 123)=4.33
	female	4.19	0.47	3.93	0.65			
	whole	4.21	0.65	3.75	0.73			
F2:Personal information	male	4.46	0.63	4.19	0.49	n. s.	+	n. s.
	female	4.39	0.63	4.30	0.51			
	whole	4.42	0.63	4.26	0.50			
F3:Health maintenance	male	4.16	0.81	3.33	1.05	n. s.	**	n. s.
	female	3.90	0.79	3.41	0.89			
	whole	4.02	0.80	3.38	0.95			
F4:Crime prevention	male	3.39	0.87	3.00	0.73	n. s.	n. s.	n. s.
	female	3.36	0.85	3.36	0.69			
	whole	3.37	0.85	3.22	0.72			
F5:Illegal copy	male	3.26	1.21	3.04	1.00	**	n. s.	n. s.
	female	3.68	0.79	3.49	0.68			
	whole	3.49	1.02	3.31	0.84			
F6:Copyright	male	3.97	1.10	3.13	1.08	n. s.	**	**
	female	3.58	0.94	3.51	0.75			
	whole	3.75	1.02	3.36	0.90			

+p<.10 **p<.05 ***p<.01



p<.01p<.01

Figure 1. crisis avoidance(metacognitive knowledge × gender)

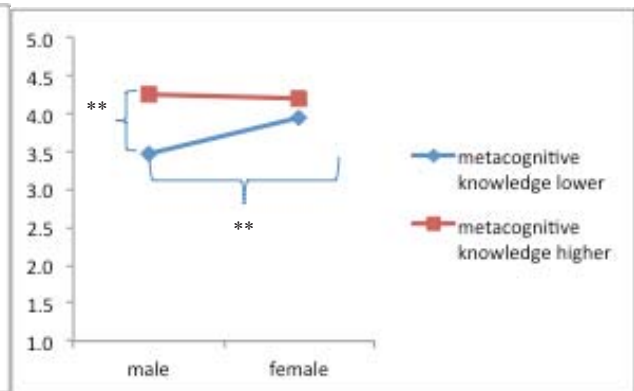


Figure 2.copyright(metacognitive knowledge × gender)

As a result, regarding “copyright”(F(1, 123)=3.85 p<.10) there was found a mutual interaction between Metacognitive Ability’s ”Monitoring” and gender. Also, regarding “crisis avoidance”(F(1, 123)=4.98 p<.05), there was a relationship between Metacognitive Ability’s ”Control” and gender. Further, regarding ”crisis avoidance”(F(1,123)=4.33p<.01) and “copyright”(F(1, 123)=5.00 p<.01), there was relationship between Metacognitive Ability’s ”Metacognitive knowledge” and gender. According to the results of simple main effect examination, in all cases, average female Meta-cognitive ability values were higher than the average male values. Therefore, when ”crisis avoidance, ”copyright”, etc. are involved, the meta-cognitive ability's lower male group likely have to re-think their study methods. As an main effect of Metacognitive Ability’s ”Monitoring”, “crisis avoidance”(F(1, 123)=6.52 p<.05), ”personal information”(F(1, 123)=4.58 p<.01), ”health maintenance”(F(1, 123)=11.77 p<.01) and “crime prevention”(F(1, 123)=13.65 p<.01) showed significant values. As an effect of Metacognitive Ability’s ”Control”, ”personal information”(F(1, 123)=7.92 p<.01), ”health maintenance”(F(1, 123)=3.85 p<.01), ”crime prevention”(F(1, 123)=8.93 p<.05), ”illegal copy”(F(1, 123)=4.22 p<.01), and “copyright”(F(1, 123)=19.73 p<.01) showed significant values. In the area of Metacognitive Ability’s “Metacognitive knowledge”, only “health maintenance” (F(1, 123)=17.10 p<.01) showed significant values. In all cases, meta-cognitive ability higher group's average value was higher than that of the lower group. “Copyright” (F(1, 123)=6.86 p<.01) is significant as an main effect of gender, and “crisis avoidance”(F(1, 123)=3.07 p<.10) as a significant trend was observed. In both cases, female average values were higher than those of the males. From these

results, we found a clear difference about awareness in many factors among university students' "awareness about information ethics", it apparent that Metacognitive Ability's "Monitoring", "Control" influences Information Moral Awareness development. For these results, Meta-cognitive abilities; especially "Control" and "Modeling", have a relationship with awareness about information ethics among university students. From the above results, controlling and monitoring oneself objectively is an important ability to promote awareness and actions based in appropriate behavior in an information society.

Therefore, although it is not direct, meta-cognitive ability aids awareness of information morals. Thus, adopting academic methods that arouse meta-cognitive ability becomes crucial.

Because lower male groups scores significantly low in Metacognitive Ability's "Monitoring" and "Metacognitive knowledge" of information ethics' "copyright", Metacognitive Ability's "Control" of information ethics' "crisis avoidance", and "Metacognitive knowledge" of Metacognitive Ability, having considered the above, academic support and improving counseling methods are necessary.

IV.CONCLUSION AND FUTURE RESEARCH

In this research, we examined the effect of meta-recognition on information ethics and found that learners' "Control", "Monitoring", "Metacognitive knowledge" affect development of each skill in information ethics. Also, judging by the factors of information ethics, such as "crisis avoidance" and "copyright," one is not mistaken in being concerned for the meta recognition lower male group. In the future, large-scale follow up studies that investigate and examine the differences in the stages of development will have to be conducted. Finally, one should seek a practical application by examining and applying the curriculum and instruction method which will appropriately bring up information ethics, especially among the information ethics lower groups of male learners.

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