

CRITICAL THINKING SKILLS AND INFORMATION LITERACY OF STUDENTS FROM UNIVERSITIES IN SAGAING DISTRICT

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Abstract

The main purpose of this study was to investigate the critical thinking skills and information literacy of students from universities in Sagaing District. Descriptive survey method and quantitative research design were used in this study. The specific objectives were to explore the differences between critical thinking skills and information literacy of students by gender, grade, age, and university and to investigate the relationship between critical thinking skills and information literacy of students. A total of 941 students (male = 475 and female = 466) were selected as the participants of this study through simple random sampling technique. To measure students' critical thinking skills and information literacy, Critical Thinking Skills Questionnaire (Orszag, 2015) and Information Literacy Survey Instrument (Kovalik, Yutzey, & Piazza, 2013) were used respectively. Each of these items was on the four-point Likert type. The quantitative data were analyzed by descriptive statistics, independent sample *t* test, one-way ANOVA, Pearson product-moment correlation and linear regression analysis. According to the result, critical thinking skills of male students were better than that of female students. And then, it was found that there were no significant differences in students' critical thinking skills by grade, age and university. Similarly, it was found that there were no significant differences in students' information literacy by gender, grade and age. Then, ANOVA result reported that there was significant difference in students' information literacy by university. University 3 was statistically significant difference from University 1 and University 4 and then, University 5 was significant difference from University 1 in information literacy. Finally, there was statistically significant positive correlation in critical thinking skills and information literacy of students ($r=.505, p<.01$). Moreover, the regression analysis result indicated that the critical thinking skills could explain 25% of information literacy.

Key words: Critical Thinking, Critical Thinking Skills, Information Literacy

Introduction

The more the world becomes modern, the more complicated it becomes and together with social and psychological disorders, it becomes more complicated. In today's world where information and technology is changing so rapidly, all societies try to educate their citizens as individuals who are inquisitive, questioning, critical and creative, can think critically, and communicate effectively and have the capacity and knowledge to solve problems rightly. Qian (2007) pointed out that education plays an important role in the advancement of a society and therefore, a good education prepares an individual for adulthood and life, and brings welfare and success to a nation. In this context, education aims to equip individuals throughout the different stages of education, where most of the time individuals learn how they should behave, as well as how to manage problems with effective problem-solving and critical thinking skills. Therefore, possessing higher level skills such as critical thinking skills is very important for students to live successfully and happily in global era.

Both in educational theory and practice, there is an increased emphasis on the importance of teaching 21st century skills to university students all over the world. One of these skills is critical thinking, which is believed by many to be a primary goal of higher education (Flores, Matkin, Burbach, Quinn, & Harding, 2012). Slameto (2014) reported that critical thinking is a cognitive activity related to the use of reason. Learn to think critically means using mental processes, such as attention, categorizing, selection, and assess/decide. Critical thinking skills

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give the right direction to think and work, and assist in determining the relationship with the other with something more accurate. Developing critical thinking skills is an integration of several development skills: observation, look at the information from various perspectives, analysis, reasoning, judgment, decision making, and persuasion. So, the better development of these skills, the more we can address complex problems with satisfactory results.

Critical thinking involves the capability of approaching information in an active, evaluative and creative way. Swapna and Biradar (2017) stated that people who think critically and consistently attempt to live rationally, reasonably, and empathically. Educational institutions have experimented with several strategies to help foster critical thinking, as a means to enhance information evaluation and information literacy among students. Therefore, critical thinking skills are intertwined with information literacy.

Sasikala and Dhanraju (2010) expressed that information literacy plays a prominent role in the knowledge based society: especially effective use of IT based services and collaborative learning in the various levels of the educational system. So, information literacy is a necessary skill that is utilitarian in every aspect of a person's life. For students, information literacy would lead to independent and student-centric learning, rather than dependence on the teacher to provide answers to questions or problems that they encounter. This in turn creates a greater responsibility towards their own learning, which would help them to become dynamic learners and thinkers who are creative, analytical and efficient instead of mere regurgitators of facts. Therefore, information literacy helps the learners to become independent and life-long learners.

By Saglam, Cankaya, Ucer and Cetin (2017), developments in information technologies have important impacts on education and considerably change teaching methods, programs, learning areas, and roles of teachers and students. The concepts of information literacy and critical thinking are two important concepts of today's information and technology age closely related to each other and sometimes used interchangeably. For the future of a society, it is of great importance for individuals to have information literacy and critical thinking skills; therefore, all societies invest efforts to impart these skills to their citizens through education. Therefore, students, especially the leaders of the nation in future should possess the critical thinking skills and information literacy to accommodate with the rapidly changing society and to solve the situations and problems rightly that arise in their environment.

Purpose of the Study

The main aim of the study was to examine the critical thinking skills and information literacy of students from universities in Sagaing District during 2018-2019 academic year.

The specific objectives were as follows:

1. To examine the differences in critical thinking skills of students by gender, grade, age and university,
2. To find out the differences in information literacy of students by gender, grade, age and university,
3. To investigate the relationship between critical thinking skills and information literacy of students.

Literature Review

The foundation of critical thinking is based on the teaching practices and visions of ancient Greek philosopher, Socrates since 2,500 years ago. The concept of critical thinking, with

its application in the educational discourse, found its very roots in the Socratic teaching practice of “deep questioning” which aimed at seeking evidence, closely examining reasons and assumptions, analyzing concepts and investigating applications of ideas. Founding his teaching ideas on the action of questioning, Socrates provided two of the main principles of modern theories of learning: the dialogic, interactive nature of the teaching process and the critical and independent evaluation capability as the main goal of reasoning skills (Vezzosi, 2004).

In the later part of the 20th century, definitions of critical thinking converged of educators from two separate disciplines- philosophy and psychology (Gibson, 1995). Many philosophical definitions of critical thinking tend to be based on or related to the concept of informal logic, while psychological definitions are most often based of theories of cognition or neuroscience (cited in Schroeder, 2012).

One of the most comprehensive multidisciplinary researches that tried to identify critical thinking skills was conducted by Facione in 1990. Facione used the Delphi Method and formulated to create a clear and accurate conceptualization of critical thinking. Altogether six core skills were identified in the study: interpretation, analysis, evaluation, inference, explanation, and self-regulation (Facione, 2013).

Information literacy (IL) is an essential skill for functioning in today’s knowledge society. The term information literacy was first used by Paul Zurkowski, the President of Information Industry Association in 1974. According to him, information literate peoples were those who trained in the application of information resource in their work. They have learned techniques and skills for utilizing the wide range of information tools as well as primary sources in molding information solutions to their problems (cited in Swapna & Birader, 2017).

Many researchers, education professionals and organizations have developed information literacy models through research and evaluation. Among them, information literacy model that was used in the study was developed by Carol C. Kuhlthau, Professor of Library and Information Science at Rutgers University in New Jersey in 1988. It is a six stage model; initiation, selection, exploration, focus formulation, collection and presentation with the three realms of experience; the affective (feelings) the cognitive (thoughts) and the physical (actions) common to each stage (cited in Swapna & Birader, 2017).

Methodology

The main purpose of this study was to investigate the critical thinking skills and information literacy of students from universities in Sagaing District. In this study, quantitative approach, descriptive research design and questionnaire survey method were used. By using simple random sampling techniques, 941 students (475 males and 466 females) from second year and fourth year were selected in this study.

To study critical thinking skills and information literacy of students, Critical Thinking Skills Questionnaire and Information Literacy Survey Instrument were used. The instrument for critical thinking skills was adopted from Orszag (2015) consisting of 23 items with six main skills. The instrument for information literacy was adopted from Kovalik, Yutzey, and Piazza (2013) comprising 28 items. Each of these items was on the four-point Likert type (1= Strongly Disagree, 2= Disagree, 3= Agree, 4= Strongly Agree). All of the items were positively stated.

To know the reliability of the instruments, pilot testing was conducted with 50 students in Sagaing University of Education who are not included in this research study. After piloting, items were analyzed to test the reliability of critical thinking skills and information literacy. The internal consistency reliability coefficient (Cronbach's alpha) of critical thinking skills and information literacy were .824 and .761.

The actual data collection was done with 941 students in December. The results were analyzed by descriptive statistics, independent sample *t* test, one-way ANOVA and Pearson product-moment correlation and linear regression analysis.

Data Analysis and Findings

The Descriptions of Critical Thinking Skills of Students

In order to examine the critical thinking skills of students, descriptive statistics was used. The results were shown in Table 1.

Table 1 Descriptive Statistics for Critical Thinking Skills of Students

Variable	<i>N</i>	Mean	<i>SD</i>	Maximum	Minimum
Critical Thinking Skills	941	64.64	6.76	88	37

Table 1 showed that the observed mean score of students' critical thinking skills (64.64) was higher than theoretical mean score (57.5) and the standard deviation was 6.76. So, the result of students' critical thinking skills was satisfied.

To be clearer, the participants in this study were classified into three groups such as high, average, low. Based on the descriptive analysis of critical thinking skills, students with scores above (+1) standard deviation from sample mean were identified as the high group and students with scores below (-1) standard deviation from the sample mean were considered as low group. And then, students with scores between (+1) and (-1) standard deviation were identified as the average group. 11% of students were fallen in high group, 77% were average group and 12% of students were low group. The frequency and percentage of students in different level groups were shown in Table 2.

Table 2 Frequency and Percentage of Students' Critical Thinking Skills in Different Level Groups

Variable	Low Group (Below 58)	Average Group (Between 58 and 72)	High Group (Above 72)	Total
Critical Thinking Skills	110 (12%)	727 (77%)	104 (11%)	941 (100%)

According to Table 2, it was concluded that the results of the test answered by students were satisfied.

Subscales of Critical Thinking Skills

Critical thinking skills of students were measured by six subscales; interpretation, analysis, evaluation, inference, explanation, and self-regulation. According to descriptive statistics, the results were mentioned in Table 3.

Table 3 Descriptive Statistics for Students' Critical Thinking Skills Scores by Each Subscale

Subscales	No. of Items	N	Minimum	Maximum	Mean	Mean %	SD
Interpretation	6	941	9	24	16.63	69.29%	2.16
Analysis	3	941	3	12	8.40	70%	1.38
Evaluation	3	941	4	12	8.26	68.83%	1.35
Inference	4	941	7	16	11.26	70.38%	1.54
Explanation	3	941	4	12	8.75	72.92%	1.31
Self-regulation	4	941	5	16	11.35	70.94%	1.56

According to the descriptive statistics, explanation had the highest mean percent and evaluation had the lowest mean percent among these six subscales of critical thinking skills. Thus, the students in this study possessed more explanation subscale than other subscales.

In order to examine the difference in critical thinking skills of students by gender, descriptive statistics was used. The results were shown in Table 4.

Table 4 Descriptive Statistics for Critical Thinking Skills of Students by Gender

Variable	Gender	N	Mean	SD
Critical Thinking Skills	Male	475	65.29	7.25
	Female	466	63.97	6.16

According to Table 4, it was found that the mean scores of male students (65.29) were slightly greater than that of the female students (63.97). Therefore, it can be concluded that male students were better than female students in critical thinking skills.

Moreover, to be more specific, the independent sample *t* test was used to examine whether the differences in critical thinking skills by gender were significant or not. The results were shown in Table 5.

Table 5 Results of Independent Sample *t* test for Critical Thinking Skills of Students by Gender

Variable	<i>t</i>	<i>df</i>	<i>p</i>	<i>MD</i>
Critical Thinking Skills	2.994	939	.003**	1.32

** The mean difference is significant at 0.01 level.

Table 5 showed that there was significant difference in critical thinking skills by gender ($t=2.994$ and $p<.01$).

And then, the differences for each subscale of critical thinking skills of students were shown in Table 6.

Table 6 Descriptive Statistics and Results of Independent Sample *t* test for the Subscales of Critical Thinking Skills by Gender

Variables	Gender	N	Mean	SD	<i>t</i>	<i>df</i>	<i>p</i>
Interpretation	Male	475	16.88	2.32	3.555	939	.000***
	Female	466	16.38	1.96			
Analysis	Male	475	8.44	1.48	.931	939	.352

Variables	Gender	N	Mean	SD	t	df	p
Evaluation	Female	466	8.35	1.27	2.318	939	.021*
	Male	475	8.36	1.42			
	Female	466	8.15	1.26			
Inference	Male	475	11.45	1.64	3.829	939	.000***
	Female	466	11.06	1.41			
Explanation	Male	475	8.78	1.34	.825	939	.410
	Female	466	8.71	1.29			
Self-regulation	Male	475	11.39	1.61	.748	939	.455
	Female	466	11.31	1.52			

*The mean difference is significant at .05 level.

*** The mean difference is significant at .001 level.

In accordance with Table 6, it was found that there were significant differences between males and females in interpretation subscale ($t=3.555$, $p<.001$) and inference subscale ($t=3.829$, $p<.001$) and evaluation subscale ($t=2.318$, $p<.05$). It was indicated that male students were better than female students in interpretation, evaluation and inference. But, it was found that there were no significant differences between males and females in analysis, explanation and self-regulation subscales ($p>.05$).

In order to examine the difference in critical thinking skills of students by grade, descriptive statistics was used. The results were shown in Table 7.

Table 7 Descriptive Statistics of Critical Thinking Skills of Students by Grade

Variable	Grade	N	Mean	SD
Critical Thinking Skills	Second Year	473	64.80	6.62
	Fourth Year	468	64.47	6.90

According to Table 7, the mean scores of second year were slightly different the mean scores of fourth year in critical thinking skills. To observe clearly whether these differences of critical thinking skills of students in terms of their grade were statistically significant or not, the independent sample t test was conducted and the results were shown in Table 8.

Table 8 Results of Independent Sample t test for Critical Thinking Skills of Students by Grade

Variable	t	df	p	MD
Critical Thinking Skills	.746	939	.456	.33

According to the result, there was no significant difference in critical thinking skills of students with respect to grade ($t=.746$, $p>.05$).

In order to examine the difference in critical thinking skills of students by age, descriptive statistics was used. The results were shown in Table 9.

Table 9 Descriptive Statistics of Critical Thinking Skills of Students by Age

Variable	Age	N	Mean	SD
Critical Thinking Skills	17-19 yrs	415	64.78	6.84
	Above 19 yrs	526	64.52	6.70

According to the Table 9, the mean scores of 17-19 years were slightly higher than the mean scores of above 19 years for critical thinking skills. To make sure these differences, the independent sample t test was used and the results were mentioned in Table 10.

Table 10 Results of Independent Sample *t* test for Critical Thinking Skills of Students by Age

Variable	<i>t</i>	<i>df</i>	<i>p</i>	<i>MD</i>
Critical Thinking Skills	.577	939	.564	.26

As shown in Table 10, it was found that there was no significant difference by their age concerning with the critical thinking skills ($t=.577, p>.05$).

In order to examine the difference in critical thinking skills of students by university, descriptive statistics was used. The results were shown in Table 11.

Table 11 Descriptive Statistics of Critical Thinking Skills of Students by University

Variable	University	<i>N</i>	Mean	<i>SD</i>	Minimum	Maximum
Critical Thinking Skills	University 1	199	65.12	6.71	37	85
	University 2	192	63.76	7.41	41	88
	University 3	199	64.59	5.69	50	85
	University 4	157	65.41	7.37	50	88
	University 5	194	64.44	6.58	44	81
	Total	941	64.64	6.76	37	88

In accordance with Table 11, the mean scores of students from University 4 were higher than that of students from other universities. It can be concluded that the students from University 4 may be better than the students from others in critical thinking skills.

In order to investigate whether these differences were statistically significant or not, ANOVA was calculated and the results were showed in Table 12.

Table 12 ANOVA Result of Critical Thinking Skills of Students by University

Variable	Sum of Squares	<i>df</i>	Mean Square	<i>F</i>	<i>p</i>
Critical Thinking Skills	Between Group	294.409	4	73.602	1.615 .168
	Within Group	42663.020	936	45.580	
	Total	42957.428	940		

According to Table 12, the obtained value $F(4,936) = 1.615, p>.05$ for critical thinking skills was not significantly different according to university.

The Descriptions of Information Literacy of Students

In order to examine the information literacy of students, descriptive statistics was used. The results were shown in Table 13.

Table 13 Descriptive Statistics for Information Literacy of Students

Variable	<i>N</i>	Mean	<i>SD</i>	Maximum	Minimum
Information Literacy	941	78.39	7.24	103	45

Table 13 showed that the observed mean score of students' information literacy (78.39) was higher than the theoretical mean score (70) and the standard deviation was 7.24. So, the result of students' information literacy was satisfied.

To be clearer, the participants in this study were classified into three groups such as high, average, low. Based on the descriptive analysis of information literacy, students with scores above (+1) standard deviation from sample mean were identified as the high group and students with scores below (-1) standard deviation from the sample mean were considered as low group. And then, students with scores between (+1) and (-1) standard deviation were identified as the average group. 14% of students were fallen in high group, 74% were average group and 12% of students were low group. The frequency and percentage of students in different level groups were shown in Table 14.

Table 14 Frequency and Percentage of Students' Information Literacy in Different Level Groups

Variable	Low Group (Below 71)	Average Group (Between 71 and 85)	High Group (Above 85)	Total
Information Literacy	112 (12%)	698 (74%)	131 (14%)	941 (100%)

According to Table 14, it was concluded that the results of the test answered by students were satisfied.

To examine the difference in information literacy of students by gender, descriptive statistics was used. The results were shown in Table 15.

Table 15 Descriptive Statistics of Information Literacy of Students by Gender

Variable	Gender	N	Mean	SD
Information Literacy	Male	475	78.77	7.69
	Female	466	78.00	6.74

According to Table 15, it was found that the mean scores of male students (78.77) were slightly greater than that of the female students (78.00). Moreover, to be more specific, the independent sample *t* test was used to examine whether the differences in information literacy by gender were significant or not. The results were shown in Table 16.

Table 16 Results of Independent Sample *t* test for Information Literacy by Gender

Variable	<i>t</i>	<i>df</i>	<i>p</i>	<i>MD</i>
Information Literacy	1.642	939	.101	.77

According to Table 16, there was no significant difference in information literacy by gender ($t=1.642, p>.05$). So, it indicated fair and balanced gender sensitivity.

To examine the difference in information literacy of students by grade, descriptive statistics was conducted and the results were presented in Table 17.

Table 17 Descriptive Statistics of Information Literacy of Students by Grade

Variable	Grade	N	Mean	SD
Information Literacy	Second Year	473	78.80	7.06
	Fourth Year	468	77.97	7.41

According to Table 17, the mean scores of second year were slightly different the mean scores of fourth year in information literacy. To observe clearly whether these differences of

information literacy of students in terms of their grade were statistically significant or not, the independent sample *t* test was conducted and the results were shown in Table 18.

Table 18 Results of Independent Sample *t* test for Information Literacy by Grade

Variable	<i>t</i>	<i>df</i>	<i>p</i>	<i>MD</i>
Information Literacy	1.749	939	.081	.83

The results in Table 18 showed that there was no significant difference in information literacy of students with respect to grade ($t=1.749, p>.05$).

To examine the difference in information literacy of students by age, descriptive statistics was conducted and the results were presented in Table 19.

Table 19 Descriptive Statistics of Information Literacy of Students by Age

Variable	Age	<i>N</i>	Mean	<i>SD</i>
Information Literacy	17-19 yrs	415	78.66	6.99
	Above 19 yrs	526	78.18	7.44

According to the Table 19, the mean scores of 17-19 years were slightly higher than the mean scores of above 19 years in information literacy. To make sure these differences, the independent sample *t* test was used and the results were mentioned in Table 20.

Table 20 Results of Independent Sample *t* test for Information Literacy by Age

Variable	<i>t</i>	<i>df</i>	<i>p</i>	<i>MD</i>
Information Literacy	1.012	939	.312	.48

As shown in Table 20, it was found that there was no significant difference by their age concerning with the information literacy ($t=1.012, p>.05$).

To examine the difference in information literacy of students by university, descriptive statistics was used. The results were shown in Table 21.

Table 21 Descriptive Statistics of Information Literacy of Students by University

Variable	University	<i>N</i>	Mean	<i>SD</i>	Minimum	Maximum
Information Literacy	University 1	199	76.74	6.26	58	101
	University 2	192	78.80	8.65	45	102
	University 3	199	79.71	5.47	59	95
	University 4	157	77.20	7.96	61	103
	University 5	194	79.27	7.26	62	99
	Total	941	8.39	7.24	45	103

According to Table 21, students from University 3 had the highest mean scores and the least standard deviation in information literacy among students from University 1, University 2, University 4 and University 5. So, it can be assumed that students from university 3 were better than others in information literacy.

In order to investigate whether these differences were statistically significant or not, ANOVA was calculated and the results were showed in Table 22.

Table 22 ANOVA Result of Information Literacy of Students by University

Variable	Sum of Squares		df	Mean Square	F	p
Information Literacy	Between Group	1296.082	4	324.021	6.317	.000***
	Within Group	48011.563	936	52.294		
	Total	49307.645	940			

*** The mean difference is significant at .001 level.

As above mentioned ANOVA results, the obtained value $F(4,936) = 6.317$, $p < .001$ for information literacy was significantly different according to university at .001 level.

In order to fully interpret these results, the Post Hoc Test was calculated in terms of Game-Howell method about the significant difference by university.

Table 23 Result of Post Hoc Test for Information Literacy of Students by University

Variable	University Type (I)	University Type (J)	Mean Difference (I-J)	p
Information Literacy	University 3	University 1	2.975***	.000
		University 2	.911	.728
		University 4	2.510**	.008
		University 5	.440	.961
	University 5	University 1	2.535**	.002

** The mean difference is significant at .01 level.

*** The mean difference is significant at .001 level.

In accordance with Table 25, it was found that University 3 was significantly different from University 1 ($p < .001$) and University 4 ($p < .01$). University 5 was also significantly different from University 1 ($p < .01$). But, University 2 was not significantly different with other Universities. So, students from University 2 may be the same in information literacy with others.

Correlation Between Critical Thinking Skills for Each Subscale and Information Literacy

To investigate the relationship between critical thinking skills for each subscale and information literacy of students, Pearson product-moment correlation was calculated.

Table 24 Correlation of Critical Thinking Skills for Each Subscale and Information Literacy

Variables	CTS	In	As	Ev	Ie	Ex	SR	IL
Critical Thinking Skills	-	.807**	.705**	.733**	.772**	.653**	.643**	.505**
Interpretation		-	.487**	.524**	.510**	.490**	.309**	.433**
Analysis			-	.405**	.515**	.270**	.408**	.286**
Evaluation				-	.480**	.447**	.374**	.366**
Inference					-	.405**	.439**	.381**
Explanation						-	.284**	.401**
Self-regulation							-	.304**
Information Literacy								-

** Correlation is significant at the 0.01 level (2-tailed).

Table 24 showed that all of the variables were significantly correlated. Thus, there was statistically significant positive correlation in critical thinking skills and information literacy ($r=.505, p<.01$). In other words, it can be said that students who had high critical thinking skills were likely to have high information literacy according to Cohen (1988).

In order to investigate how well critical thinking skills predicts information literacy of students and how many percent it predicts, linear regression analysis was computed as shown in Table 25 and then model summary was presented in Table 26.

Table 25 Result of Regression Coefficient for Critical Thinking Skills and Information Literacy

Model	Unstandardized Coefficient		Standardized Coefficient	<i>t</i>	<i>p</i>
	<i>B</i>	Std. Error	Beta		
Constant	43.414	1.961	.505	22.137	.000
Critical Thinking Skills	.541	.030		17.931	.000

Dependent Variable: information literacy

According to result, the identified equation to understand relationship was;

$$IL = 43.414 + .541CTS$$

Note: IL = information literacy

CTS = critical thinking skills

Table 26 Model Summary for Critical Thinking Skills and Information Literacy

Model	<i>R</i>	<i>R</i> Square	Adjusted <i>R</i> Square	Std. Error of the Estimate
1	.505	.255	.254	6.254

Predictors: (Constant), critical thinking skills

The result indicated that the adjusted R squared value was .254. Thus, it indicated that 25% of the variance in information literacy was explained by critical thinking skills according to Cohen (1988).

Discussions and Recommendations

The primary purpose of this study was to examine the critical thinking skills and information literacy of students from Universities in Sagaing District. According to the data obtained from the scores of both critical thinking skills and information literacy, the results indicated that critical thinking skills and information literacy of students were satisfactory in the present study.

Firstly, according to the *t* test result, it was reported that the critical thinking skills between male students and female students were statistically significant differences and critical thinking skills of male students were better than that of female students. This result may be possible because females use critical thinking skills and solve problems as much as males but in a style that is less confrontational and direct (Dow & Wood, 2006). Besides, this may be due to some physiological differences and physiological differences but largely through the effect of nurture. And, there was significantly different between males and females in interpretation subscale. This may be possible because males are more interested in abstract aspects than females. Next, there was significantly different between males and females in evaluation

subscale. This may be possible because males are able to think clearly and make decisions based on reasons rather than emotions. Moreover, there was significantly different between males and females in inference subscale. This may be possible because males are better in inquiry and cognition than females. So, male students are better than in critical thinking skills than female students in this study because of the above reasons.

Then, the *t* test result of information literacy indicated that there was no significant difference in students' information literacy by gender. This may be possible because college and university students in Myanmar have equal opportunities and facilities for searching related information when the teachers made them assign concerning with their projects and assignments. In Myanmar, students are not limited for using library by gender. So, these situations seem to make females be equal in information literacy in comparing with males.

Secondly, the result of the *t* test showed that there was no significant difference between second year students and fourth year students in critical thinking skills. This may be possible because class level does not affect on university students' critical thinking skills because of teaching methods and strategies (Gulveren, 2007 cited in Aktas & Unlu, 2013). And, it can be assumed that students have the same background knowledge and experiences to address the issues. So, this situation seems to make second year students be equal in critical thinking skills in comparing with fourth year students.

Then, the *t* test result of information literacy indicated that there was no significant difference in students' information literacy by grade. This may be possible because students gain equal access to find the related information. They may easily search the related information by using the search engines (e.g Google) with the mobile technological advances and library. So, these situations seem to make second year students be equal in information literacy in comparing with fourth year students.

Thirdly, the *t* test result reported that there were no significant differences in critical thinking skills and information literacy of students by age. It may be possible because habits are fully developed during this age range (18-25) (Anafo & Filson, 2014) and during this period, they have the high-quality surrounding to nurture good habits and skills and they receive the same facilities and opportunities from their campus. So, these situations seem to make 17-19 years students be equal in critical thinking skills and information literacy in comparing with above 19 years students.

Fourthly, according to ANOVA result, there was no statistically significant difference in critical thinking skills of students by university. It may be possible because of students' university life and background knowledge, and teaching methods. In addition to these situations, university is the best place where the new generations can obtain experiences and knowledge from communications (peers and teachers) and they can gain more access to share the different ideas from diverse cultures and races. And, they get advices and guidance from teachers and colleagues to determine whether the issues are true or false in their environment. So, these situations seem to make students be equal in critical thinking skills by university.

Then, ANOVA result of information literacy reported that there was statistically significant difference in information literacy by university. University 3 was statistically significant difference from University 1 and University 4 in information literacy. It may be possible because universities obtain the financial support and facilities from the country. So, the university life of students is not much different by facilities. But, the quality of students may be

different based on the use of facilities very effectively and the guidance and support of librarians. Students from University 3 must be trained to obey the strict disciplines and must carry out many extracurricular activities. And, they spend their leisure time by reading in library and playing sports because they are mostly a little opportunity to go outside. So, these situations seem to make students be different in information literacy by university.

And, there was significant difference between University 5 and University 1 in information literacy. According to the schedule of students from University 5, they must enter the library room once a week. And, they receive help and guidance from teachers and librarians to search the desired information and they sometimes report the overview of the literature they read to their teachers. So, they have possessed information literacy since first year. So, these situations seem to make students in University 5 be different in information literacy in comparing with students in University 1.

According to the above findings, in order to improve critical thinking skills and information literacy of students, the following recommendations were made.

- Teachers should use questioning method concerning with the lessons in their classroom daily to enhance student critical thinking skills and then, should foster problem-based learning, active and inquiry-based experiments, and constructive approach to become critical thinkers.
- Teachers and administrators should undertake open-ended discussions for students based on the real-world problems and should provide students the opportunity to work in a collaborative and cooperative group setting.
- Lecturers should integrate academic assignments based on information literacy into the teaching and learning process.
- The librarians in the university library should assist students to search for information technologically and systematically.
- Mutual collaboration should be undertaken between teachers and librarians to cultivate requisite information literacy skills for students.

Critical thinking skills and information literacy are closely related to each other and are two of the most important concepts of this technology age. So, teachers and administrators should contribute to students with the right directions to improve critical thinking skills and information literacy. By this way, students will achieve success in their education and can live successfully in their life.

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