

# New Normal Appropriate Learning Model: 2NAL Model during COVID-19 Pandemic for Undergraduates of Thai Educational Institutions

Thamasan Suwanroj<sup>1</sup>, Orawan Saeung<sup>2</sup>

<sup>1,2</sup>Department of Computer Technology, Faculty of Industrial Technology, Nakhon Si Thammarat Rajabhat University, 1 Moo 4, ThaNgio, Mueang Nakhon Si Thammarat Nakhon Si Thammarat Province, 80280, Thailand

<sup>1</sup> thamasan\_suw@nstru.ac.th

<sup>2</sup> orawan\_ray@nstru.ac.th

**Abstract:** Due to the serious COVID-19 pandemic and the adjustment of educational management in Thailand that caused the change of learning model from old to new normal by online learning at home, the objectives of this research were to study and analyze the factors of new normal appropriate learning model: 2NAL model during COVID-19 pandemic for undergraduates of Thai educational institutions. The method of study was divided into 2 phases. First phase was to study the factors of new normal appropriate learning model for undergraduates discussed by 9 experts of public educational institutions. In-depth interview was used to ask the opinions about the factors of new normal appropriate learning model for Thai undergraduates. The questions were clearly structured and used for individual interview. For this phase, the data were analyzed by using qualitative data analysis. The second phase was to analyze the factors of new normal appropriate learning model for undergraduates discussed by 1,126 experts of all public educational institutions which provide undergraduate degree across Thailand. The research instrument was the questionnaire used to ask the opinions about the

factors of new normal appropriate learning model for undergraduates. The data were analyzed by using confirmatory factor analysis for this phase. New knowledge gained from the research was new normal appropriate learning model: 2NAL model which consisted of the factors as follows: 1) Content Literacy 2) Intelligence Literacy 3) Digital Literacy 4) Self Literacy 5) Collaborative Literacy and 6) Curiosity Literacy.

The results were very useful and important in developing new normal appropriate learning model during COVID-19 pandemic for undergraduates of Thai educational institutions in the next phase of the research. Also, it was used for learning management in the digital age with practical application.

**Keywords:** Learning model, New normal, COVID-19, Confirmatory factor analysis, Educational institutions

## 1. Introduction

Many countries around the world have been facing the severe COVID-19 pandemic including Thailand. This has affected learning management of Thai educational institutions to change the normal learning style to online learning style for students to study at home. However, there were problems in learning at home. The behaviour of the learners was not clearly seen by instructors and the ways of doing activities in the classroom were limited compared to normal

---

**Thamasan Suwanroj**

Department of Computer Technology, Faculty of Industrial Technology, Nakhon Si Thammarat Rajabhat University, Thailand  
thamasan\_suw@nstru.ac.th

classroom (Hoi et al., 2018). With this situation, the teaching style has been adjusted based on the context. From the reasons and problems mentioned above, the research had the idea to develop the new normal appropriate learning model during COVID-19 pandemic for undergraduates of educational institutions across Thailand. This was to encourage students to express their behaviour and participate in the activities organized by learning management through online channels appropriately and to achieve the learning goals with a successful learning management. This model was regarded as the new normal appropriate learning model based on the situation previously mentioned.

The model could be used for learning management in the digital age by using online media to provide the teaching and learning activities for the students to study at home and to develop expected level of their competency in terms of student-centered learning. Thus it was very challenging to develop the new normal appropriate learning model based on the context of the situation previously stated. Learning management must be provided through online professional learning networks to encourage the learners to develop the competency with their full potential (Doe, 2015). The learners must be able to learn by themselves and to seek new knowledge to develop continually based on the digital literacy under the supervision of instructors (Ellis et al., 2020).

In conclusion, although many countries have faced the severe COVID-19 pandemic, it was really necessary for the educational institutions to provide learning and teaching continually. The learning and teaching style must be changed based on the context of each country (Van Lancker et al., 2020). Thai educational institutions had to change the old learning style to online learning style or study at home and the instructors were the administrator of their own subjects. It was not easy because the instructors could not see the reaction of the learners clearly and thoroughly. Without the appropriate learning style, learning management could be failed (Hodges et al., 2020). Thus the appropriate learning style on the situation mentioned previously was regarded as the important key for the instructors to organized the learning activities and to make the students participate in the learning continuously and efficiently (Ilmiyah et al., 2020).

Compared to other research topics presented by such as Bao (2020); Burgess (2020); Ding et al.

(2018); Gillen et al. (2018); Hoi et al. (2018); Zhou et al. (2020), this research was different and remarkable by using the technique of mixed method - qualitative and quantitative. This research started by using qualitative method. In-depth interview was used for a group of experts to study the factors of new normal appropriate learning model for Thai undergraduates. The questions were clearly structured and used for individual interview. The data were collected and compiled from experts of public educational institutions by using the questionnaire again. For quantitative data analysis, confirmatory factor analysis was used to confirm the empirical data (quantitative data). This was to check it was in line with the qualitative data or not. Goodness of fit statistics was used as the standard to make different and remarkable to the research. The literature review showed that the research was relevant to the contexts of many countries such as Almanthari et al. (2020) from Indonesia, Bao (2020) from China or Crawford et al. (2020) who did the research of the responses of digital teaching in higher education from 20 countries across the world. The results from the research showed that the educational institutions didn't stop learning and teaching activities but they all adjusted the style of learning and teaching. Thus this research was remarkable because the learning style was developed by brainstorming with a group of experts of public educational institutions which provide undergraduate degree across Thailand and it was appropriate for the context of Thailand. The main objectives of the research were to study and analyze the factors of new normal appropriate learning model during COVID-19 pandemic for undergraduates of educational institutions across Thailand. The results of the research were very important and useful because they could be used to develop new normal appropriate learning model during COVID-19 pandemic for undergraduates of educational institutions across Thailand in the next phase of the research. It was also used for learning management in the digital age with practical application. Henceforth, to be short and concise, "2NAL model" will be used to stand for the name of the research.

## 2. Literature Review

The literature review related to the study to consider the factors of 2NAL model using to support the research model of the factors of 2NAL model were summarized as follows:

Content Literacy: CL means the skills in

organizing the subject content based on course description or the scope of the content arranged in order of difficulty. The width and depth of the content studied during COVID-19 pandemic are considered including the scope and the order of the content presented to the students at that time (Barnett, 2020); (Gess-Newsome et al., 2019).

**Intelligence Literacy:** IL means the skill and ability of the instructors and students in leaning management and appropriately adjusting to the problems during COVID-19 pandemic. It is also the ability to do learning activities purposefully with social impact, including the ability of logical thinking, adapting efficiently to circumstances and society (Barnett, 2020); (David et al., 2020).

**Digital Literacy:** DL means the skill in understanding and using digital literacy. It is also the skill in using tools, materials, and digital literacy at the present such as computer, smart-phone, tablet, computer program and online media for the best interests in communicating, operating and co-working. Moreover, this skill can be used to develop the learning and teaching process to be up-to-date and efficient by covering 4 dimensions of ability which are Use, Understand, Create and Access digital literacy efficiently (Alvermann et al., 2019); (Suwanroj et al., 2019); (Abdullaha et al., 2020).

**Self Learning Literacy:** SLL means the learning process skill that the students initiate their self-learning based on their interests, needs and skills. The students have their goals, are able to seek the learning resources, choose the learning methods and have self-assessment for learning progress. The students can choose to do by themselves or work together with others. This is the learning based on curiosity. The students will plan their learning by themselves (Artetxe et al., 2018); (Muthupoltotage et al., 2018).

**Collaborative Literacy:** CL means the learning through working group. The students will be divided into small groups with 3-6 members. Each member has different ability. They help each other in learning to reach the group's goal. They work and share responsibility. They accept each member's role and exchange the knowledge and experience between the members both in the classroom and on internet (Moreno-Guerrero et al., 2020); (Spruellet al., 2020).

**Curiosity Literacy:** CL means curiosity skill or a strong desire to know or learn something based on the

content of the subject and course description. This skill is from doing the activities by searching the additional information from different sources or experimenting in order to get the knowledge of the learners and discussing in the classroom by using the ability of the instructor through learning management or teaching by embedding with the learners (Jake, 2020); (Markham, 2020).

From the literature review related to the study mentioned above, the research acquired the research model factors of new normal appropriate learning model. Then the acquired knowledge was improved to be 2NAL model.

### 3. Method

#### Phase 1 The Study of 2NAL model Factors

##### Step 1.1 The study of factors for 2NAL model factors

Source was the literature review related to 2NAL model factors synthesized from the ideas of the academicians as follows: Abdullaha et al. (2020); Alvermann et al. (2019); Artetxe et al. (2018); Barnett (2020); David et al. (2020); Gess-Newsome et al. (2019); Jake (2020); Markham (2020); Moreno-Guerrero et al. (2020); Muthupoltotage et al. (2018); Spruell et al. (2020); Suwanroj et al. (2019). The literature review mentioned above was in 2018-2020 and used as the guideline to get the model factors. There were 12 topics selected and summarized from the contents of literature review. The main factors at least 2 of 3 were selected and synthesized based on the ideas of selecting and searching from the content of information in order to get the details of 2NAL model factors.

Research Instrument was qualitative data record which was synthesized from the documents. The steps in designing and checking the quality of the research instrument were as follows: first, the factors of 2NAL model were grouped to acquire the conceptual frame which consisted of 6 factors (as mentioned in literature review). Next, the data and details of 2NAL model factors were used as the guideline and used to design the qualitative data record. The documents which were the frequency record file of the factor list with the context details were studied by indicating the delimitation and issues for document analysis. Then, the qualitative data record was designed and presented to 5 experts to consider, develop and approve, respectively.

**Data Collection and Compilation** The data were collected and compiled from the document during 1-15 February 2020.

**Data Analysis** The qualitative data acquired from the qualitative data record synthesized from the documents and related research were analyzed by using content and frequency analysis. The research designed the table to summarize the contents. The frequency from the related ideas previously mentioned was checked. The details of 2NAL model based on the ideas were summarized and the frequency of the data was checked. To evaluate the analysis and synthesis, the ideas of Lin et al. (2019); Suwanroj et al. (2019); about the criterion in choosing the frequency at 50% were used to consider and determine the draft version of 2NAL model to use as the factors of 2NAL model in the next phase of the research.

**Step 1.2 In-depth interviews for asking the opinion about 2NAL model factors**

Source was the group of 9 experts who are from the public and private educational institutions and have expertise in developing learning model with at least 10 years of experience. Purposive sampling was used to select these 9 experts to be the key informants of the research.

**Research Instrument** was the in- depth interview questions to ask the opinions about the factors of 2NAL model which was appropriate for the new normal for Thai undergraduates. The questions were clearly structured and used for individual interview. Qualitative analysis was used to analyze the data covering 6 factors to find the list of observed variables. The content validity of in- depth interview questions was checked by the group of 5 experts before using in collecting and compiling. After obtaining the observed variables, the group of experts considered to confirm the details of 2NAL model factors which covered 6 subordinate factors. After the confirmation of the experts, the research obtained 18 observed variables which were used to design the questionnaire asking for the opinion about 2NAL model factors which was appropriate for the new normal for Thai undergraduates.

**Data Collection and Compilation** The data were collected during 1-10 March 2020 from 9 experts or 100% of the specified group of experts.

**Data Analysis** The statistics used for descriptive analysis were frequency and percentage. The criterion used to accept, consider and confirm the details of 2NAL model factors was the percentage up to 50% (Suwanroj et al., 2019).

**Phase 2 Confirmatory factor analysis of 2NAL model**

Population was the group of 2,929 experts who have knowledge and teaching experience not lower than 10 years in the public educational institutions across the country (Suwanroj et al., 2019).

Sample was a group of experts who have knowledge and teaching experience not lower than 10 years in the public educational institutions across the country. For sample size determination, the research used the concept presented by Suwanroj et al. (2019); Keith et al. (2018) which said that the way to determine the sample size depending on the amount of the factors that the research wants to analyze. The proportion of the sample must be 10 units for 1 variable and the sample needs 100 people at least. This research had 18 observed variables therefore the minimum of the sample size should not be less than 180 people. However, for the correctness and accuracy based on the statistical principle, the research used multi-stage sampling to determine the details of the sample to 1,126 people. This step followed all conditions for sample size determination as previously mentioned.

**Research Instrument** was the questionnaire to ask the opinion about the factors of new normal appropriate learning model for undergraduates. The questionnaire used 5 levels of rating scale. The content validity and the reliability for scale of the research instrument were 0.97 - 0.99. The content validity and the reliability for factor were 0.96 - 0.99. Second order confirmatory factor analysis was used for data analysis. To test the reliability, the research tried out the instrument with 100 experts who were not the same group of the sample. However, these 100 experts have knowledge and experience in teaching not lower than 10 years and work for the public educational institutions of Thailand as well. Cronbach's Alpha Coefficient was used to test the quality of the research instrument for the reliability aspect. From the test, the reliability of the research instrument designed for knowledge aspect was between 0.97 – 0.99. The reliability of the research instrument designed for all aspects was 0.99. This showed that the research instrument had an appropriate level of quality to collect the data.

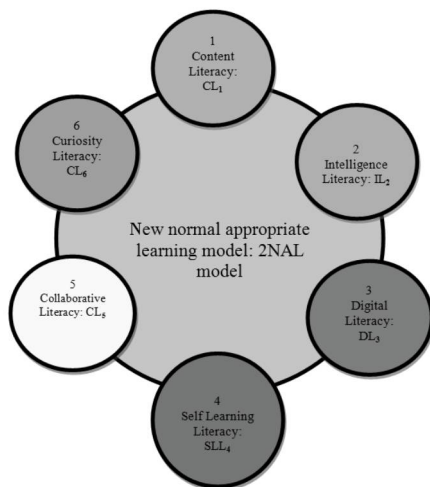
Data Collection and Compilation By mailing a letter of permission and QR code of an online questionnaire to the sample group, the data were collected by scanning the QR code to answer the questionnaire. There were 1,126 responses sent back from the sample group or 100% of the specified experts. The data were collected and compiled during 1-30 April 2020.

Data Analysis The second order confirmatory factor analysis was used to analyze 2NAL model by using IBM SPSS Statistics 14.0 for Windows and LISREL 8.72. To analyze the factors which the research created the measurement model based on the literature review previously mentioned, it was needed to use the statistical methods to prove the correctness of the measurement model. At present confirmatory factor analysis is still very popular because of its high level of construct validity. Moreover, it can be used to create the new knowledge for the research correctly Suwanroj et al. (2019); Keith et al. (2018).

**4. Results**

**Part 1. Results of the Study and Analysis of Factors of 2NAL Model Learning Style**

From the results of studying the related literature and the in-depth interview discussed by the experts to consider and analyze the factors of 2NAL learning style, the research acquired the conceptual framework of 2NAL model factors. After considering 2NAL model factors, the conclusion showed that the details and style of the factors consisted of 6 subordinate factors as shown in the figure 1 and there were 18 observed variables with the research symbols as shown in the table 1



**Fig. 1: Style of New normal appropriate learning model: 2NAL model**

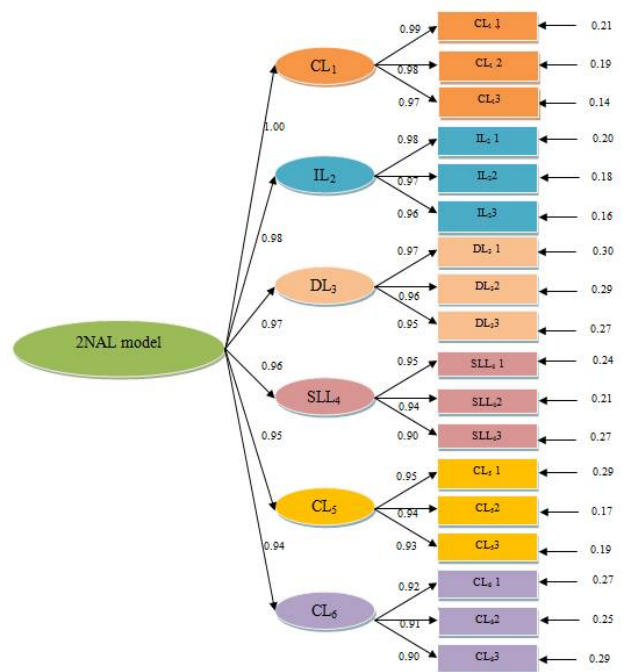
**Table 1 : Details of style, observed variables and symbols of 2NAL model**

Factor	Symbol	List of observed variables	Symbol
Content Literacy	CL <sub>1</sub>	1. Learning style had clear contents of the subject and was easy to learn by arranging the contents in order of difficulty.	CL <sub>1</sub> 1
		2. Learning style consisted of different activities such as learning from work sheet or skill sheet applied from the contents of the subject. The contents were arranged in order of difficulty.	CL <sub>1</sub> 2
		3. Learning style consisted of different activities and media platforms. The contents were interesting and accurate.	CL <sub>1</sub> 3
Intelligence Literacy	IL <sub>2</sub>	1. Learning style constructed responses and exchanges in different issues.	IL <sub>2</sub> 1
		2. Learning style had clearly goal setting during learning management in order to create intelligence literacy.	IL <sub>2</sub> 2
		3. Learning style stimulated intellectual thoughts rationally and efficiently.	IL <sub>2</sub> 3
Digital Literacy	DL <sub>3</sub>	1. Learning style encouraged the learners to use digital media for learning management.	DL <sub>3</sub> 1
		2. Learning style used online channels and tools to support learning management.	DL <sub>3</sub> 2
		3. Learning style helped the learners improve their digital competency both directly and indirectly.	DL <sub>3</sub> 3

Self Learning Literacy	SLL4	1. Learning style encouraged the learners to build the skill of self-learning process initiated by themselves based on their interests.	SLL4 1
		2. Learning style created the skills in seeking learning sources and choosing learning methods.	SLL4 2
		3. Learning style provided self-assessment for learning progress. The learners could choose to do by themselves. This was the learning based on curiosity. The learners planned their learning by themselves.	SLL4 3
Collaborative Literacy	CL5	1. Learning style had an emphasis on working group. The learners were divided into small groups.	CL5 1
		2. Learning style had an emphasis on different abilities of each member. They helped each other to reach the group's goal. They worked and shared responsibility.	CL5 2
		3. Learning style provided knowledge and experience exchanges between the members both in the classroom and on internet.	CL5 3
Curiosity Literacy	CL6	1. Learning style provided the activities to create curiosity skill or a strong desire to know what the learners wanted based on the content of the subject and course description. The skill was created through the activities in searching the additional information from different sources.	CL6 1

		2. Learning style provided the experiment in order to get the knowledge of the learners. Then the knowledge was discussed in the classroom by using the ability of the instructor through learning management.	CL6 2
		3. Learning style was the learning management or teaching by embedding with the learners.	CL6 3

The analysis results of the factors of 2NAL model learning style gained from the study results and in-depth interview of the experts who analyzed the factors of 2NAL model learning style together were used to develop the model diagram of second order confirmatory factor of 2NAL model learning style in part 2 (as shown in the figure 2).Part.2.Results of Confirmatory Factor Analysis of 2NAL model



Chi-Square = 25.03, df = 51, P-value = 0.14, RMSEA = 0.00

Fig. 2: The model diagram of second order confirmatory factor of 2NAL model learning Style

From figure 2, the results of second order confirmatory factor analysis showed that the consistency between the model and the empirical data of 2NAL model learning style was at a good standard. Moreover, all goodness-of-fit statistics met the standards. The second order confirmatory factor analysis was used to confirm 2 issues as follows:

Issue 1: This was to confirm that the 18 observed variables were the subordinate factors of the main factors which consisted of 6 processes of 2NAL model learning style.

Issue 2: This was to confirm that the main factors mentioned above fit together to create the learning style of 2NAL model. All results showed that all observed variables were actually the subordinate factors of the main factors and the main factors actually fit together to create the learning style of 2NAL model, according to the statistical methods.

Goodness-of-fit statistics of the factor model and the empirical data was shown in the table 2.

**Table 2 : Goodness-of-fit statistics of the factor model and the empirical data**

Goodness of Fit Index	Standard*	Value	Result of Consideration	Conclusion
$\chi^2$ -test	$p > 0.05$	0.14	Passed	Good
$\chi^2/df$	$< 2$	0.49	Passed	Good
GFI	0.95	1.00	Passed	Good
AGFI	0.95	1.00	Passed	Good
NFI	...	1.00	Passed	Good
CFI	$\geq 0.95$	1.00	Passed	Good
RMSEA	$\leq 0.05$	0.00	Passed	Good
SRMR	$\leq 0.05$	0.00	Passed	Good
RMR	$\leq 0.05$	0.00	Passed	Good

\* (Suwanroj et al, 2019)

The table 2 showed that all goodness-of-fit statistics of the factor model and the empirical data met the standards by considering 2-test which was statistically non-significant ( $p = 0.14$ ),  $2/df = 0.49$ ,  $GFI = 1.00$ ,  $AGFI = 1.00$ ,  $NFI = 1.00$ ,  $CFI = 1.00$ ,  $RMSEA = 0.00$ ,  $SRMR = 0.00$  and  $RMR = 0.00$ . This also showed that the model from figure 2 matched the empirical data of the learning style of 2NAL model at a good standard. Then 6 processes of the learning style of 2NAL model were set priority in descending order. The results of the second order confirmatory factor analysis were used to confirm the quantitative data collected from the sample. The details were shown in the table 3.

Factor loading, Covariance and Priority of the Factor of the Learning styles of 2NAL model

**Table 3 : Factor loading, Covariance and Priority of Factors of Learning styles of 2NAL model**

The Factor of the Learning styles	Factor loading		t	R <sup>2</sup>	Priority of the Factor
	b	S.E			
<b>CL<sub>1</sub></b>	<b>1.00</b>	<b>0.01</b>	<b>27.91*</b>	<b>0.98</b>	<b>1</b>
CL <sub>1</sub> 1	0.99	0.01	28.35*	0.97	
CL <sub>1</sub> 2	0.98	0.01	28.41*	0.96	
CL <sub>1</sub> 3	0.97	0.01	28.40*	0.98	
<b>IL<sub>2</sub></b>	<b>0.98</b>	<b>0.01</b>	<b>27.30*</b>	<b>0.96</b>	<b>2</b>
IL <sub>2</sub> 1	0.98	0.01	27.35*	0.95	
IL <sub>2</sub> 2	0.97	0.01	27.97*	0.94*	
IL <sub>2</sub> 3	0.96	0.01	27.61*	0.96	
<b>DL<sub>3</sub></b>	<b>0.97</b>	<b>0.02</b>	<b>26.73*</b>	<b>0.95</b>	<b>3</b>
DL <sub>3</sub> 1	0.97	0.01	26.70	0.97*	
DL <sub>3</sub> 2	0.96	0.01	26.65*	0.94	
DL <sub>3</sub> 3	0.95	0.02	26.47*	0.93	
<b>SLL<sub>4</sub></b>	<b>0.96</b>	<b>0.02</b>	<b>26.75*</b>	<b>0.95</b>	<b>4</b>
SLL <sub>4</sub> 1	0.95	0.02	26.61	0.98*	
SLL <sub>4</sub> 2	0.94	0.01	26.59*	0.95	
SLL <sub>4</sub> 3	0.90	0.02	26.37*	0.96*	
<b>CL<sub>5</sub></b>	<b>0.95</b>	<b>0.02</b>	<b>26.02*</b>	<b>0.95</b>	<b>5</b>
CL <sub>5</sub> 1	0.95	0.02	26.61*	0.98*	
CL <sub>5</sub> 2	0.94	0.01	26.59*	0.95	
CL <sub>5</sub> 3	0.93	0.02	26.35*	0.96*	
<b>CL<sub>6</sub></b>	<b>0.94</b>	<b>0.01</b>	<b>26.73*</b>	<b>0.95</b>	<b>5</b>
CL <sub>6</sub> 1	0.92	0.01	26.71*	0.99*	
CL <sub>6</sub> 2	0.91	0.02	25.97*	0.95*	
CL <sub>6</sub> 3	0.90	0.01	24.30*	0.98*	

\*  $p < .01$

The table 3 showed the priority in descending order of the 6 processes of 2NAL model learning style which were new normal appropriate learning model during COVID-19 pandemic for undergraduates of Thai educational institutions. The results of the second order confirmatory factor analysis were used to confirm the quantitative data collected from the sample. The details were as follows:

First Process Factor of Content Literacy: CL<sub>1</sub>

CL<sub>1</sub> 1 (Learning styles had clear contents of the subject and was easy to learn by arranging the contents in order of difficulty.) was the variable with the highest factor loading at 0.95 and the covariance of Content Literacy factor was at 97%. CL<sub>1</sub> 2 (Learning styles consisted of different activities such as learning from work sheet or skill sheet applied from the contents of the subject by arranging the contents or activities in order of difficulty.) was the variable with the second highest factor loading at 0.98 and the covariance of Content Literacy factor was at 96%. CL<sub>1</sub> 3 (Learning pattern consisted of different activities and media platforms. The contents were interesting

and accurate.) was the variable with the third highest factor loading at 0.97 and the covariance of Content Literacy factor was at 98%, respectively.

#### Second Process Factor of Intelligence Literacy: IL<sub>2</sub>

IL<sub>2</sub> 1 (Learning style constructed responses and exchanges in different issues.) was the variable with the highest factor loading at 0.98 and the covariance of Intelligence Literacy factor was at 95%. IL<sub>2</sub> 2 (Learning style had clearly goal setting during learning management in order to create intelligence literacy.) was the variable with the second highest factor loading at 0.97 and the covariance of Intelligence Literacy factor was at 94%. IL<sub>2</sub> 3 (Learning style stimulated intellectual thoughts rationally and efficiently.) was the variable with the third highest factor loading at 0.96 and the covariance of Intelligence Literacy factor was at 96%, respectively.

#### Third Process Factor of Digital Literacy: DL<sub>3</sub>

DL<sub>3</sub> 1 (Learning style encouraged the learners to use digital media in learning management.) was the variable with the highest factor loading at 0.97 and the covariance of Digital Literacy factor was at 97%. DL<sub>3</sub> 2 (Learning style used online channels and tools to support learning management.) was the variable with the second highest factor loading at 0.96 and the covariance of Digital Literacy factor was at 94%. DL<sub>3</sub> 3 (Learning style helped the learners improve their digital competency both directly and indirectly.) was the variable with the third highest factor loading at 0.95 and the covariance of Digital Literacy factor was at 93%, respectively.

#### Forth Process Factor of Self Learning Literacy: SLL<sub>4</sub>

SLL<sub>4</sub> 1 (Learning style encouraged the learners to build the skill of self-learning process initiated by themselves based on their interests.) was the variable with the highest factor loading at 0.95 and the covariance of Self Learning Literacy factor was at 98%. SLL<sub>4</sub> 2 (Learning style created the skills in seeking learning sources and choosing learning methods.) was the variable with the second highest factor loading at 0.94 and the covariance of Self Learning Literacy factor was at 95%. SLL<sub>4</sub> 3 (Learning style provided self-assessment for learning progress and the learners could choose to do by themselves. This was the learning based on curiosity. The learners planned the learning by themselves.) was

the variable with the third highest factor loading at 0.90 and the covariance of Self Learning Literacy factor was at 96%, respectively.

#### Fifth Process Factor of Collaborative Literacy: CL<sub>5</sub>

CL<sub>5</sub> 1 (Learning style had an emphasis on working group. The learners were divided into small groups.) was the variable with the highest factor loading at 0.95 and the covariance of Collaborative Literacy factor was at 98%. CL<sub>5</sub> 2 (Learning style had an emphasis on different abilities of each member. They helped each other to reach the group's goal. They worked and shared responsibility.) was the variable with the second highest factor loading at 0.94 and the covariance of Collaborative Literacy factor was at 95%. CL<sub>5</sub> 3 (Learning style provided knowledge and experience exchanges between the members both in the classroom and on internet.) was the variable with the third highest factor loading at 0.93 and the covariance of Collaborative Literacy factor was at 96%, respectively.

#### Sixth Process Factor of Curiosity Literacy: CL<sub>6</sub>

CL<sub>6</sub> 1 (Learning style provided the activities to create curiosity skill or a strong desire to know based on the contents of the subject and course description. The skill was created through the activities in searching the additional information from different sources.) was the variable with the highest factor loading at 0.92 and the covariance of Curiosity Literacy factor was at 99%. CL<sub>6</sub> 2 (Learning style provided the experiment in order to get the knowledge of the learners. Then the knowledge was discussed in the classroom by using the ability of the instructor through learning management.) was the variable with the second highest factor loading at 0.91 and the covariance of Curiosity Literacy factor was at 95%. CL<sub>6</sub> 3 (Learning style was the learning management or teaching by embedding with the learners.) was the variable with the third highest factor loading at 0.90 and the covariance of Curiosity Literacy factor was at 98%, respectively. Factor Validity and Average Variance Extracted (AVE) of Learning Style Factors of 2NAL Model

Table 4 showed that 6 factors of 2NAL model learning style which were appropriate for new normal during COVID-19 pandemic had high validity when compared to the standard (more than .60). This was in line with the ideas of Suwanroj et al., (2019); Keith et al., (2018). The factors of 2NAL model style had high



**Table 3 :Factor loading, Covariance and Priority of Factors of Learning styles of 2NAL model**

## A. Validity (c)

Priority of the Factor	Standard*	Value	Consideration Result
1. CL <sub>1</sub>	>0.60	0.99	High validity
2. IL <sub>2</sub>	>0.60	0.98	High validity
3. DL <sub>3</sub>	>0.60	0.98	High validity
4. SLL <sub>4</sub>	>0.60	0.96	High validity
5. CL <sub>5</sub>	>0.60	0.97	High validity
6. CL <sub>6</sub>	>0.60	0.99	High validity

\*(Suwanroj et al, 2019; Keith et al., 2018)

## B. Average Variance Extracted (AVE) (v)

Priority of the Factor	Standard*	Value	Consideration Result
1. CL <sub>1</sub>	>0.50	0.96	High explanation
2. IL <sub>2</sub>	>0.50	0.98	High explanation
3. DL <sub>3</sub>	>0.50	0.97	High explanation
4. SLL <sub>4</sub>	>0.50	0.96	High explanation
5. CL <sub>5</sub>	>0.50	0.97	High explanation
6. CL <sub>6</sub>	>0.50	0.98	High explanation

\*(Suwanroj et al, 2019; Keith et al., 2018)

validity when considering the factor loading and the standard factor of the observed variables which latent variables were measured in each factor. The main factors could be used to explain the high variance of the variables in the factor when compared to the standard (more than 0.50). This was relevant to the ideas of Suwanroj et al., (2019); Keith et al., (2018). Thus the 6 factors of 2NAL model could be considered appropriate to use as the learning styles during COVID-19 pandemic for undergraduates of Thai educational institutions because based on the principle of statistic using confirmatory factor analysis, it proved that they had high validity.

## 5. Discussion

From the results, there were 3 main issues to discuss as follows:

**First Issue:** The study's results of 2NAL model factors gained from the literature review based on 12 ideas presented by Abdullaha et al. (2020); Alvermann et al. (2019); Artetxe et al. (2018); Barnett (2020); David et al. (2020); Gess-Newsome et al. (2019); Jake (2020); Markham (2020); Moreno-Guerrero et al.

(2020); Muthupoltotage et al (2018); Spruellet al. (2020); Suwanroj et al. (2019); and the synthesis of 2NAL model factors with the list of 18 observed variables to develop the learning factors of new normal appropriate learning model during COVID-19 pandemic for undergraduates of Thai educational institutions were in line with the research results presented by Barnett B. (2020); Suwanroj et al. (2019); Nayeem et al. (2018) in the part of using qualitative research to synthesize the knowledge in order to study the details and factors from academic documents, research or related literature to use as the research framework for the first phase.

**Second Issue:** The results of in-depth interview created to discuss about the factors of 2NAL model by a group of 9 experts from public and private educational institutions showed that the experts agreed and gave details about the factors of new normal appropriate learning model during COVID-19 pandemic for undergraduates of Thai Educational Institutions. Eighteen observed variables were provided from this step and were regarded as the subordinate factors of the main factors of new normal appropriate learning model during COVID-19 pandemic for undergraduates of Thai Educational Institutions. This learning model was named "2NAL model" and consisted of 6 factors as follows: 1) Content Literacy: CL<sub>1</sub> 2) Intelligence Literacy: IL<sub>2</sub> 3) Digital Literacy: DL<sub>3</sub> 4) Self Learning Literacy: SLL<sub>4</sub> 5) Collaborative Literacy: CL<sub>5</sub> and 6) Curiosity Literacy: CL<sub>6</sub>. The factor of Content Literacy was relevant to the research results presented by Barnett (2020); Gess-Newsome et al. (2019). The factor of Intelligence Literacy was relevant to the research results presented by Barnett (2020); David et al. (2020). The factor of Digital Literacy was relevant to the research results presented by Alvermann et al. (2019); Suwanroj et al. (2019); Abdullaha et al. (2020). The factor of Self Learning Literacy was relevant to the research results presented by Artetxe et al. (2018); Muthupoltotage et al. (2018). The factor of Collaborative Literacy was relevant to the research results presented by Moreno-Guerrero et al. (2020); Spruellet al. (2020). And the factor of Curiosity Literacy was relevant to the research results presented by Jake (2020); Markham (2020). These results of all 6 factors were relevant to the mentioned research in the aspect of using in-depth interview discussed by a group of experts. This was the methodology of the qualitative research to consider and confirm the details and factors to use as the conceptual framework. The academic documents, pieces of research or

related literature were studied to find the knowledge details which were considered and confirmed by a group of experts to get the knowledge to become more correct, accurate and complete.

Third Issue: The results of confirmatory factor analysis of 2NAL model were gained by using the methodology of the quantitative research to test the validity of the developed model measurement and to consider and confirm by using advanced statistics to test the validity of the model measurement which was developed from the 18 observed variables. It could say that 6 subordinate factors consisting of 1) Content Literacy: CL<sub>1</sub> 2) Intelligence Literacy: IL<sub>2</sub> 3) Digital Literacy: DL<sub>3</sub> 4) Self Learning Literacy: SLL<sub>4</sub> 5) Collaborative Literacy: CL<sub>5</sub> and 6) Curiosity Literacy: CL<sub>6</sub> were regarded as the factors of new normal appropriate learning model during COVID-19 pandemic for undergraduates of Thai Educational Institutions. The matching between the model and the empirical data collected by asking opinion from a group of experts of Thai educational institutions influenced all goodness of fit statistics to pass a criterion. These all showed that new normal appropriate learning model during COVID-19 pandemic for undergraduates of Thai Educational Institutions was useful and really matched the empirical data based on the context of Thai educational institutions from the expert's point of view. 2NAL model consisting of 6 factors and all observed variables which were considered and confirmed by using the confirmatory factor analysis could be used as the new normal appropriate learning model during COVID-19 pandemic for undergraduates of Thai Educational Institutions. The model and the empirical data were fit because all observed variables and the factors used to analyze were studied from the related documents and research (Abdullaha et al., 2020; Alvermann et al., 2019; Artetxe et al., 2018; Barnett 2020; David et al., 2020; Gess-Newsome et al., 2019; Jake 2020; Markham, 2020; Moreno-Guerrero et al., 2020; Muthupoltotage et al., 2018; Spruellet al., 2020; Suwanroj et al., 2019) and really discussed by a group of experts to consider and confirm. (Selman et al., 2018) This model could be improved to be the new normal appropriate learning model during COVID-19 pandemic for undergraduates of Thai Educational Institutions based on the context of the educational institution for developing the most effective learning for the learners in the 21<sup>st</sup> century. Also, it could be used for the preparation of manpower development to meet an economic model: Thailand 4.0 which was relevant to

the research results presented by Suwanroj et al. (2019) who found that Digital Literacy was the necessary basis for the learners to create or to build on their knowledge.

## 6. Conclusion

From the development of the new normal appropriate learning style during the COVID-19 pandemic for undergraduates of Thai Educational Institutions, the learning style of 2NAL model was designed to be in line with the empirical data. This means that the factors of learning style of 2NAL model consisted of 6 main factors based on 18 observed variables. Each factor included 1) Content Literacy: CL<sub>1</sub> 2) Intelligence Literacy: IL<sub>2</sub> 3) Digital Literacy: DL<sub>3</sub> 4) Self Learning Literacy: SLL<sub>4</sub> 5) Collaborative Literacy: CL<sub>5</sub> and 6) Curiosity Literacy: CL<sub>6</sub>. These factors were really suitable for the context of the new normal appropriate learning style during COVID-19 pandemic for undergraduates of Thai Educational Institutions in the age of learning management on the digital world because the learning and teaching in the mentioned situation focused on bringing existed knowledge and competency to apply and improve the professional knowledge by meeting the need of the society through the appropriate and necessary learning styles. The educational institutions, therefore, have encouraged the instructors and learners to use the learning style which is appropriate with the context until the situation will unfold and go back to normal.

## Acknowledgement

This work was supported in part by a grant from Nakhon Si Thammarat Rajabhat University.

## References

- [1] Abdullaha, N. S., Sumarwatib, S., Abd Azizc, M. I., Zidend, A. A., Abd Razake, N., and Jalilf, S. A. (2020) Life and Career Skills amongst Technical and Vocational Education and Training (TVET) Students, *The International Journal of Innovation, Creativity and Change*, 11(12), 637-654.
- [2] Almanthari, A. Maulina, S. and Bruce, S. (2020) doi:10.29333/ejmste/8240
- [3] Alvermann, D. E. and Sanders, R. K. (2019) doi:10.1002/9781118978238.ieml0005

- [4] Artetxe, M. Labaka, G. and Agirre, E. (2018) doi: arXiv:1805.06297
- [5] Bao, W. (2020) doi:10.1002/hbe2.191
- [6] Barnett B. (2020) Teacherpreneurs and the Future of Teaching & Learning. *International Journal of Innovation, Creativity and Change*, 3(1) 1-13.
- [7] Brockett, R. G., and Hiemstra, R. (2018), *Self-direction in adult learning: Perspectives on theory, Research and Practice*, Routledge.
- [8] Crawford, J. Butler-Henderson, K. Rudolph, J. and Glowatz, M. (2020) doi:10.37074/jalt.2020.3.1.7
- [9] David L., and Richard, S. (2020) Is it 'teaching' or just another broadcast channel that students are trying to tune into?, *International Journal of Innovation, Creativity and Change*, 2(2), 1-11.
- [10] Ding, S. Mirza, B. Lin, Z. Cao, J. Lai, X. Nguyen, T. V. and Sepulveda, J. (2018) doi: 10.1016/j.neucom.2017.02.102
- [11] Doe, T. (2015) Networked professional learning. *International Journal of Innovation, Creativity and Change*, 2(2), 26-47.
- [12] Ellis, V. and Spendlove, D. (2020) doi: 10.1002/berj.3607
- [13] Fernández-Sanjurjo, J. Fernández-Costales, A. and Arias Blanco, J. M. (2019) doi: 10.1080/13670050.2017.1294142
- [14] Gess-Newsome, J. Taylor, J. A. Carlson, J. Gardner, A. L. Wilson, C. D. and Stuhlsatz, M. A. (2019) doi: 10.1080/09500693.2016.1265158
- [15] Gillen, S. Jung, C. Kearns, M. and Roth, A. (2018). Online learning with an unknown fairness metric. In *Advances in Neural Information Processing Systems* 31(18), 2600-2609.
- [16] Hodges, C. Moore, S. Lockee, B. Trust, T. and Bond, A. (2020). The difference between emergency remote teaching and online learning, *Educause Review*, 27(2), 2-12.
- [17] Hoi, S. C. Sahoo, D. Lu, J., and Zhao, P. (2018) doi: arxiv.org/abs/1802.02871
- [18] Ilmiyah, S. and Setiawan, A. R. (2020) doi: 10.31237/osf.io/fpg4j
- [19] Jake, M. (2020) Building Teacher Capacity: A Job Embedded Approach, *International Journal of Innovation, Creativity and Change*, 2(2), 1-18.
- [20] Keith, T. Z. and Reynolds, M. R. (2018). *Using confirmatory factor analysis to aid in understanding the constructs measured by intelligence tests*, The Guilford Press, Washington DC.
- [21] Lin, H. Yan, Z. and Fu, Y. (2019) doi: 10.1016/j.jnca.2018.11.002
- [22] Markham, A. N. (2020) doi: 10.1177/1077800419859024
- [23] Moreno-Guerrero, A. J. García, M. R. Heredia, N. M. and Rodríguez-García, A. M. (2020) doi: 10.3390/math8030369
- [24] Muthupoltotage, U. P. and Gardner, L. (2018) doi: 10.1007/978-3-319-74817-7\_1
- [25] Nayeem, M. T. Fuad, T. A. and Chali, Y. (2018) Abstractive unsupervised multi-document summarization using paraphrastic sentence fusion, In *Proceedings of the 27th International Conference on Computational Linguistics*, 28(2), 1191-1204.
- [26] Selman, L. E. Brighton, L. J. Sinclair, S. Karvinen, I. Egan, R. Speck, P. and Puchalski, C. (2018). doi:10.1177/0269216317734954
- [27] Suwanroj, T. Leekitchwatana, P. and Pimdee, P. (2019) doi: 10.3926/jotse.645
- [28] Spruell, J. A. and Le Blanc, L. A. (2020). A course planning method to incorporate collaborative learning in information systems courses. *Journal of Information Systems Education*, 4(2), 6-11.
- [29] Van Lancker, W. and Parolin, Z. (2020) doi:10.1016/S2468-2667(20)30084-0
- [30] Zhou, L. Wu, S. Zhou, M. and Li, F. doi:10.2139/ssrn.3555520