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The Development of Digital Intelligence for Grade 10 Students of Sakolrajwittayanukul School Using Flipped Classroom Learning With Micro Learning*

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Abstract: The objectives of this study were 1) to develop Flipped Classroom Learning with Micro Learning, and 2) to compare the level of Digital Intelligence of students before and after using Flipped Classroom Learning with Micro Learning. Research tools consisted of five highest-quality lesson plans of Flipped Classroom Learning with Micro Learning, the post-class assessment of learning reflection given by students, and the Digital Intelligence test with a reliability of 0.79. The sample group was 160 of grade 10 students, semester 1, academic year 2021, Sakolrajwitthayanukul School, Sakon Nakhon Province. Statistics, mean, standard deviation, and dependent samples t-test were used in data analysis.

The results of the study found that (1) there were six components of Flipped Classroom Learning with Micro Learning including setting learning objectives, planning a sequence of lessons, creating teaching videos or resource browsers, creating self-knowledge, making in-class activities, and making assessments (2) the level of Digital Intelligence of students after using Flipped Classroom Learning with Micro Learning was higher than before using it with a statistical significance level of 0.05.

Key words: digital intelligence, flipped classroom learning, micro learning

1. Background and Significance of the Study

The United Nations Educational, Scientific and Cultural Organization (UNESCO - UN) has set 17 sustainable development goals which digital literacy is one of those (Office of the National Digital Economy and Society Commission, 2019). It is in line with the 2018 National Education Standards that define the desirable outcomes of education which emphasizes lifelong learning skills to keep up with the digital world, the world in the future, 21st century skills, digital intelligence, and learner competency at the basic education level, Competency 8, Media, Information, and Digital Literacy (Office of the Education Council, 2019). Therefore, it can be seen that Digital intelligence is a necessary skill to be developed by learners in the 21st century.

However, according to the DQ Impact Report 2018 conducted by DQ Institute, it showed that youth aged between 8–12 from 29 countries around the world had the risk of confronting cyber security with an average of 56%

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stating the more time they spend online, the higher the risk is (DQ Institute, 2018). Meanwhile, the results of the Digital Intelligence survey obtained from Thai youths all over the country revealed that the risk of cyber security had an average of 60% which is greater than the global average. This shows that Thai youths have digital intelligence lower than the global average (Saranon Inthanon, 2018). It is consistent with the data survey on online threats to Thai children in 2020 stating that the sample group of high school students aged between 12-18 relatively had the freedom of using online media. 89% of children believed that there were dangers or risks in the online world. The top three online risk behaviours among teens were shopping from unknown online stores (44%), accepting strangers' requests on social media (39%), adding personal information on social media (26%) (Srida Tantathipanich, 2020). According to the survey results, it showed that Thai youths have risky behaviours in using online media. Therefore, Digital Intelligence should be developed for learners from such age.

Due to the outbreak of the novel corona virus 2019, it had a huge impact on education. The most suitable educational innovation during the epidemic is hybrid learning, such as combining teaching technology with regular classroom teaching (Tuan Thongkaew, 2020). Flipped Classroom is a way of learning online at home and doing activities to expand knowledge or making assessments that the school requires students to learn on their own using technology and online networking. Moreover, a learning method that helps promote effective learning in Flipped Classroom is Micro Learning, such as learning from short clips, online quizzes, short articles, podcasts, infographics, games, etc. It is consistent with research findings saying that various forms of micro-learning media can actually improve students' achievement and skills to a higher level because of the concise, easy to understand, interesting, and easily accessible content it is (Laddawan Kongsomboon, 2019).

To this, the researcher sees the importance of developing digital intelligence for students by using Flipped Classroom with Micro Learning to develop a new teaching style that can develop students to be digitally intelligent and ready to become wise digital citizens.

2. Purposes of the Study

1) To develop Flipped Classroom Learning with Micro Learning
2) To compare the level of Digital Intelligence of students before and after using Flipped Classroom Learning with Micro Learning

3. Conceptual Framework

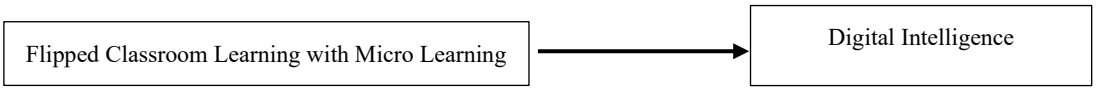

Figure 1 Conceptual Framework

4. Research Hypothesis

Students have a higher level of Digital Intelligence using Flipped Classroom with Micro Learning after learning than before learning.

5. Research Method

5.1 Research Design

This research is a Quasi - Experimental Research using one group pre-test – post-test design

5.2 Population and Sample Groups

The population used in this research was 643 high school students in the academic year 2021, Sakolrajwittayanukul School, Sakon Nakhon Province. The sample group in this study, 122 people, was calculated with G*Power program with influence size 0.30, tolerance 0.05, and power of test 0.95. In addition, the researcher added sample groups to complete the 4 classrooms, so the sample size was 160 people using purposive selection.

5.3 Research Tools

There were three types of tools used in the study:

1) Five plans of Flipped Classroom Learning with Micro Learning were assessed for content validity and the suitability of different components in the expert learning plan which had the highest level of content validity. The total mean was 4.95 and the standard deviation was 0.16.

2) The assessment of learning reflection of the teacher given by students on INSKRU's online assessment platform via the website https://inskru.com/evaluation.

3) A Digital Intelligence Test using the DQ Institute's standardized test available via https://www.dqtest.org/lang:th/ with a Cronbach's Alpha confidence value of 0.79, which is considered high confidence.

5.4 Data Collection

Phase 1 The researcher studied, analyzed, and integrate documents and research related to the development of Digital Intelligence using Flipped Classroom Learning with Micro Learning. Therefore, six elements of learning management were used in the design of five learning management plans as follows:

Lesson Plan	Flipped Classroom Learning + Micro Learning	In-class Activities + Micro Learning	Areas of Digital Intelligence
1. Social Change in Modern Era	Short 3 Clip Videos + Google Form	Discuss Today's Society Using Mentimeter	8 Areas of Digital Intelligence
2. The (appears to be) small problems of today's kids	3 Podcasts + Google Form	Analyze Problems from Contemporary Music	8 Areas of Digital Intelligence
3. Significant problems of adults	2 short articles + Google Form	Debate on Social Issues	8 Areas of Digital Intelligence
4. Self problems to National issues	8 Infographics + Google Form	Q&A with Thai Representatives	8 Areas of Digital Intelligence
5. Creative Problem Solving	Games + Google Form	Trick or Treat Game	8 Areas of Digital Intelligence

Figure 2 Shows Details of Flipped Classroom Learning with Micro Learning

Phase 2 The lesson plan was taken in practice to develop Digital Intelligence using Flipped Classroom Learning with Micro Learning. Students are encouraged to learn from Micro Learning on Google Classroom and answer knowledge-building questions on Google Forms before joining the class. The students take a Digital Intelligence Test before class. The teacher organizes learning activities in the classroom according to the lesson plans. After completing the learning activities in each plan, students are asked to make an assessment reflecting the results of the teacher's learning management. After completing all the learning management processes, students are asked to take a Digital Intelligence Test after the class.

5.5 Data Analysis

5.5.1 To find the quality of the learning management plan, Mean ($\overline{X}$), and Standard Deviation (S.D.) were used in analysing data.

5.5.2 Frequency, Mean ($\overline{X}$), and Standard Deviation (S.D.) are the statistics used in analyzing the data obtained from the assessment of learning reflection of the teacher given by students.

5.5.3 The statistics used for analyzing the data obtained from Digital Intelligence Test were Cronbach's Alpha, Mean ($\overline{X}$) (Pass criterion is the mean score is at a satisfactory level of 100 or more), Standard Deviation (S.D.), and dependent samples t-test.

6. Results

6.1 The development of Flipped Classroom Learning With Micro Learning

From studying, analyzing, and integrating documents and research related to Flipped Classroom Learning with Micro Learning, there were six components including 1) setting learning objectives 2) planning a sequence of lessons 3) creating teaching videos or resource browsers 4) creating self-knowledge 5) making in-class activities 6) making assessments. The researcher can conclude that Micro Learning such as learning from short clips, taking quizzes with answers on online tests, learning from short articles, podcasts, infographics, games can be used in component 3), component 4), and component 5 as shown

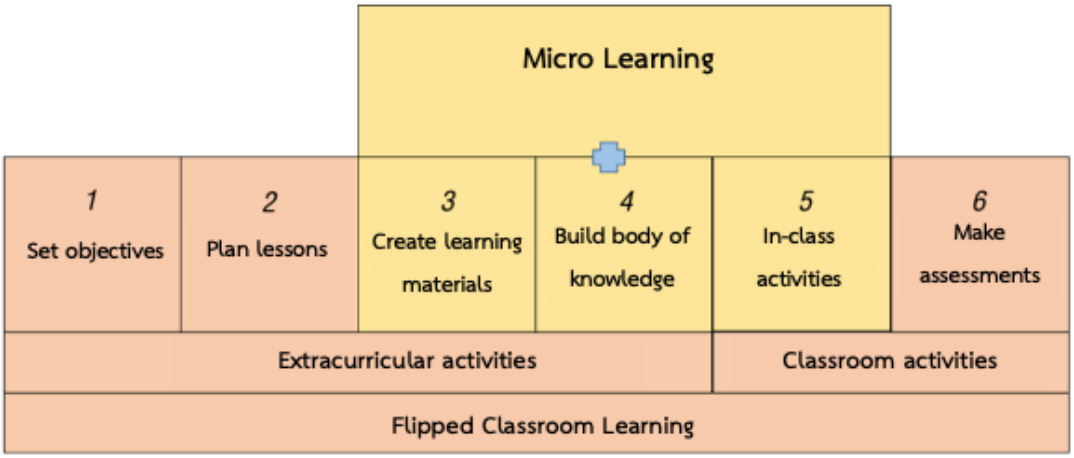

Figure 3 Shows the Components of Flipped Classroom Learning With Micro Learning

Flipped Classroom Learning with Micro Learning was used to design five lesson plans for learning management among Mathayom suksa 4 students at Sakolrajwitthayanukul School. It was found that the students' satisfaction level was at a very high level ($\overline{x}$ = 4.34 , S.D. = 0.75)

6.2 The results of the Assessment of the Level of Digital Intelligence Before and After Class Using Flipped Classroom Learning With Micro Learning among Mathayom Suksa 4students at Sakolrajwitthayanukul School.

Table 1 Comparison Results of Digital Intelligence Scores Before and After Class

Digital Intelligence (DQ) (Total score of **115)**	Before Class		After Class		t	Sig.
	Mean	S.D.	Mean	S.D.		
1. Privacy Management Skills (Total score of 115)	93.33	10.13	100.23	6.22	7.093*	.000
2. Critical Thinking Skills in Cyberspace (Total score of 115)	103.48	7.89	105.70	5.22	3.061*	.003
3. Digital Footprint Management Skills (Total score of 115)	98.71	8.27	104.36	7.41	6.408*	.000
4. Properly Showing Respect in Cyberspace Skills (Total score of 115)	99.33	6.16	102.16	5.60	4.584*	.000
5. Cybersecurity Management Skills (Total score of 115)	93.89	9.43	98.61	8.53	4.704*	.000
6. Cybersecurity Management Skills (Total score of 115)	94.71	4.44	96.63	4.62	3.663*	.000
7. Screen Time Management Skills (Total score of 115)	76.13	10.83	83.41	11.56	5.817*	.000
8. Digital Citizenship Skills (Total score of 115)	105.55	8.52	110.20	7.48	5.064*	.000
Total of Digital Intelligence	**95.61**	**4.07**	**100.16**	**3.73**	**9.744***	**.000**

n = 160, * A significance level of .05, Total score of 115, and Pass criterion is at 100 or more.

The results showed that the Digital Intelligence of students after studying was higher than before studying at the satisfactory level (Mean DQ = 100.16, SD = 3.73). This resulted in students having the higher level of Digital Intelligence than before studying with a statistical significance level of 0.05

7. Discussions

7.1 The Development of Flipped Classroom Learning with Micro Learning

From studying, analyzing, and integrating documents and research related to Flipped Classroom Learning with Micro Learning, there were six components including 1) setting learning objectives 2) planning a sequence of lessons 3) creating teaching videos or resource browsers 4) creating self-knowledge 5) making in-class activities 6) making assessments which was consistent with Pantira Kanhachai (2019), Sumai Bilbai (2019), Kitti Laaukul and Pornsuk Tantrarungrot (2019) which can be concluded that the components of hybrid learning in Flipped Classroom style was suitable for developing Digital Intelligence and self-learning behaviors. There were 8 instructional steps consisted of (1) Explanation step (2) Pre-test step (3) Self-learning step (4) Practice step (5) Exchanging in classroom step (6) Demonstration and practice step (7) Post-test step and (8) Conclusion step.

7.2 The Assessment of Digital Intelligence Before and After Using Flipped Classroom Learning With Micro Learning

According to the assessment of the level of Digital Intelligence before and after using Flipped Classroom Learning with Micro Learning through the Digital Intelligence test, it was found that the level of Digital Intelligence of students after using Flipped Classroom Learning with Micro Learning was higher than before using it with a statistical significance level of 0.05 which was at a satisfactory level. This was because Flipped Classroom Learning

enabled learners to study information and knowledge before doing activities in class. The activities in the classroom were activities that helped expand knowledge, stimulated the critical thinking process, or it was a group activity that helped students create new knowledge such as discussions, group activities, competitions activities, games, etc. This is consistent with the study of Nuchjaree Loiha et al. (2020) that studied educational management guidelines for the development of Digital Intelligence based on the concept of sufficiency economy principles. The concept of sufficiency economy consists of 4 dimensions: building a learning network, creating an environment for learning everywhere, developing critical thinking skills, and sharing by sharing. As stated earlier, it found that using the Internet or online media would greatly enhance the learners' Digital Intelligence skills. The researcher used Micro Learning as a tool which its strengths are concise, easy-to-understand, time saving, easily accessible, available any time, unlimited access, repetitive learning that will help develop better Digital Intelligence skills. Same result from the study by Napassanan Suwannawong and Panita Wanpirun (2018), it was conducted to examine the subject of digital learning management as a base for enhancing Digital Intelligence. There are four ways to learn Digital Intelligence including 1) social media that supports Digital Intelligence 2) mobile applications that support Digital Intelligence 3) Cloud Computing Technology that supports Digital Intelligence. 4) Web services that support Digital Intelligence.

As a result, it was found that Flipped Classroom Learning with various forms of Micro Learning which were adapted to all six elements of such learning style can improve Digital Intelligence skills for students.

8. Suggestions

8.1 Suggestions

For those who wish to apply the results of the research of Flipped Classroom Learning with Micro Learning, in component 5, classroom activities should be activities to expand prior knowledge with an emphasis on stimulating critical thinking or as doing activities as a group.

Suggestions for Future Research

Research should be done or find solutions to improve Digital Intelligence of students who were at the unsatisfactory level or those who must be closely monitored.

References

Laaukul K. and Tantrarungroj P. (2019). “The development of a learning activity series to promote digital literacy skills using brainstorming techniques by designing interactive infographics for secondary school students”, *Journal of Education, Faculty of Education, Srinakharinwirot University*, Vol. 20, No. 2, pp. 1–13.

Thongkaew T. (2020). “Design of education in a new way of life: Impact of the COVID-19 epidemic”, *Teachers’ Council of Thailand*, Vol. 1, No. 2, pp. 1–10.

Suwannawong N and Wanpirun P. (2561). “Digital learning management as a base for enhancing digital intelligence”, *Panyapiwat Journal*, Vol. 13, No. 1, pp. 279–293.

Loiha N et al. (2020). “Guidelines for educational management for the development of digital intelligence based on the concept of sufficiency economy”, *Journal of Education and Social Development*, Vol. 15, No. 2, pp. 410–420.

Kanhachai, P. (2019). “Developing a 5E flipped classroom learning combined with an infographic design process to promote scientific process skills and perspective knowledge for junior high school students”, master thesis, Faculty of Education, Chulalongkorn University.

Kongsomboon L. (2019). “The development of micro-learning for higher vocational certificate students in private vocational colleges in bangkok”, *Academic Journal, Bangkok Thonburi University*, Vol. 8, No. 2, pp. 51–62.

Tantathipanich S. (2020). *Survey on the Situation of Thai Children and Online Threats 2020*, Bangkok: Internet Foundation for the Development of Thailand.

Inthanon S. (2018). *DQ Digital Intelligence*, Bangkok: Child and Youth Media Institute (CYMI).

Office of the National Digital Economy and Society Commission (2019). *Digital Literacy Course for Thai Citizens*, Bangkok: Office of the National Digital Economy and Society Commission.

Electronic Transactions Development Agency (2020). *Report on the Survey Results of Internet Users in Thailand 2020*, Bangkok: Ministry of Digital Economy and Society.

Office of the Education Council. (2019). *Guidelines for the Development of Learner Competency at the Basic Education Level*, Bangkok: 21 Century CO., LTD.

Bilbai S. (2019). "Developing ICT competencies and self-leaded learning behaviors of teacher professional students with the system of the blended teaching process in a flipped classroom style", *Electronic Journal of Open and Distance Innovative Learning*, Vol. 9, No. 1, pp. 57–68.

DQ Institute. (2018). "DQ Impact Report 2018", accessed on March 1, 2021, available online at: https://www.dqinstitute.org/2018dq_impact_report/.