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ทักษะการรู้ดิจิทัลเพื่อการจัดการทรัพยากรธรรมชาติและสิ่งแวดล้อมอย่างยั่งยืนของนักเรียนชั้นมัธยมศึกษาในโรงเรียนศรีกระนวนวิทยาคม อำเภอกระนวน จังหวัดขอนแก่น

The Effect of Digital Literacy Training Program on Sustainable Natural Resources and Environmental Management for Seventh Grade Students at Srikranuanwittayakom School in Khon Kaen Province

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บทคัดย่อ

วัตถุประสงค์: บทความนี้มุ่งเพื่อศึกษาทักษะการรู้ดิจิทัลเพื่อการจัดการทรัพยากรธรรมชาติและสิ่งแวดล้อมอย่างยั่งยืนของนักเรียนชั้นมัธยมศึกษาในโรงเรียนศรีกระนวนวิทยาคม อำเภอกระนวน จังหวัดขอนแก่น

วิธีการศึกษา: ใช้ระเบียบวิธีการวิจัยเชิงปริมาณ โดยใช้แบบสอบถามในการเก็บรวมรวมข้อมูล วิเคราะห์ข้อมูลด้วยสถิติพื้นฐานและการวิเคราะห์ความแตกต่างด้วยสถิติ T-test for dependent หน่วยการวิเคราะห์ข้อมูลระดับปัจเจกบุคคล คือ นักเรียนมัธยมศึกษาปีที่ 1 ของโรงเรียนศรีกระนวนวิทยาคม อำเภอกระนวน จังหวัดขอนแก่น จำนวน 100 ราย ที่มีส่วนร่วมในโครงการอบรมเชิงปฏิบัติการเพื่อสร้างยุวอาสารักษ์ทรัพยากรธรรมชาติและสิ่งแวดล้อม ประจำอำเภอกระนวน จังหวัดขอนแก่น และภายหลังการอบรมได้เข้าร่วมการเรียนการสอนที่มีการบูรณาการการใช้ชุมชนเป็นฐาน ผ่านการปฏิบัติการภาคสนามโดยการใช้ระบบการจัดการฯ ไปใช้เก็บข้อมูลทรัพยากรธรรมชาติและสิ่งแวดล้อมในชุมชน 1 เดือน

ข้อค้นพบ: ผลการศึกษาพบว่า ชั้นมัธยมศึกษาส่วนใหญ่มีความรู้ความเข้าใจเรื่องทักษะการรู้ดิจิทัลในระดับปานกลาง แต่เป็นที่น่าสังเกตว่าหลังผ่านการเรียนการสอนแบบบูรณาการใช้ชุมชนเป็นฐานมีความรู้ความเข้าใจในระดับมากเพิ่มขึ้น จากร้อยละ 12.00 ก่อนเข้าร่วมโครงการอบรมเชิงปฏิบัติการฯ เป็นร้อยละ 20.0 หลังผ่าน

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การเรียนการสอนแบบบูรณาการใช้ชุมชนเป็นฐาน ซึ่งเมื่อเปรียบเทียบทักษะการรู้ดิจิทัลเพื่อการจัดการทรัพยากรธรรมชาติและสิ่งแวดล้อมอย่างยั่งยืน พบว่า ก่อนเข้าร่วมโครงการอบรมเชิงปฏิบัติการฯ และหลังผ่านการเรียนการสอนแบบบูรณาการใช้ชุมชนเป็นฐาน ของนักเรียนชั้นมัธยมศึกษาปีที่ 1 มีค่าเฉลี่ยคะแนนแตกต่างกันอย่างมีนัยสำคัญทางสถิติที่ระดับ 0.01 สะท้อนให้เห็นว่าการบูรณาการวิจัยเข้าสู่บทเรียน รวมกับการออกแบบกระบวนการเรียนการสอนโดยใช้ชุมชนเป็นฐาน ทำให้นักเรียนเกิดการเรียนรู้ในทักษะในศตวรรษที่ 21 ได้ดียิ่งขึ้น ซึ่งนักเรียนสามารถใช้ทักษะการรู้ดิจิทัลในการแก้ไขปัญหาและประยุกต์ใช้ในการเรียนได้มากขึ้นร้อยละ 100 หลังจากผ่านกระบวนการเรียนรู้ด้วยระบบการเรียนรู้เสมือน Vi-Learning ดังนั้น จึงควรสร้างนิสัยในการเรียนรู้เพื่อพัฒนาทักษะการรู้ดิจิทัลสำหรับนักเรียนอย่างต่อเนื่อง

การประยุกต์ใช้จากการศึกษานี้ : ผลจากการศึกษานี้สามารถนำเอารูปแบบการจัดการเรียนการสอนนี้ไปประยุกต์ใช้ในบริบทที่เกี่ยวข้อง ส่งผลให้มีการขยายความร่วมมือระหว่างสถาบันการศึกษา ระดับอุดมศึกษากับระดับมัธยมศึกษาให้มีความเข้มแข็งในการพัฒนาระบบการศึกษาของไทย โดยเฉพาะอย่างยิ่งในการยกระดับการจัดการเรียนการสอน การออกแบบการเรียนรู้ และสื่อดิจิทัลเพื่อการจัดการทรัพยากรธรรมชาติสิ่งแวดล้อมที่สามารถนำใช้ในการเรียนการสอนเพื่อสร้างสังคมแห่งการเรียนให้กับกับนักเรียนต่อไปในอนาคต

คำสำคัญ: ทักษะการรู้ดิจิทัล การรู้เท่าทันดิจิทัล การจัดการทรัพยากรธรรมชาติ การจัดการสิ่งแวดล้อม

Abstract

Purpose: This research explores the digital literacy skills for management of sustainable natural resources and environment of the secondary school students at Srikranuanwittayakom School, Kranuan District, Khon Kaen Province.

Methodology: This quantitative study employed questionnaires to collect data from 100 Matayom one (7^{th} grade) students who participated in the workshop for creating youth volunteer for natural resources and environment conservation of Kranuan District. After the workshop, these respondents participated in the integrated community based instruction and undertook field practicum where they collected data on the community natural resources and environment through the management system approach. Analysis of the data was conducted using basic statistics and paired sample t-test.

Findings: The analysis of the data revealed that majority of the participants possessed the digital literacy skills at the moderate level; and it was noted that after the integrated community based learning, their literacy skills increased from 12% to 20%. When comparing these skills with those for sustainable natural resource and environment management, it was found that their literacy scores significantly varied at 0.01. This indicates that integration of research into the instruction and integrated community based learning process enable

students to acquire more 21st century learning skills through the virtual learning. Therefore, information literacy skills should be continuously embedded in the students.

Application of the study: Findings from this study can be used as a model for teaching and learning or tools for expanding cooperation between universities in upgrading the quality of the Thai education system, especially in the development of teaching and learning and the design of learning and digital media for natural resource and environment management.

Keyword: Digital literacy, Digital literacy skills, Digital intelligence, Environmental management, Natural resources management

1. Introduction

Since learning in the 21st-century had changed the society, economy, politics, environment, and technology instantaneously, the digital world where information had also rapidly developed in all dimensions. These notions resulted in the human resources turns into the vital driving forces in a country's development towards a sustainable economy, society, politics, and culture. (Office of the Education Council, 2017). As mentioned, the education system has undergone educational reforms by coining the term of 'the 21st century skills' as important and relevant to complex lifestyles which consists of various and different skills, such as learning passion, creative and collaborative learning, focusing on technology skills, including desirable attitudes and values. The majority of these skills focus on critical thinking skills in earning skills and communication skills instead of memorizing (Saavedra and Opfer, 2012).

Similarly, the Thailand education system has also adopted 21st-century skills, especially digital literacy, as compulsory skills to learners because traditional teaching and learning from print media has been transformed into digital formats by increasing the number of learning resources from the internet (Leahy & Dolan, 2010). Under the learning processes and approaches (National Education Commission, 1999), education had defined the learner outcomes as a combination of knowledge, skills, proficiency and fundamental competency in information literacy as essential and necessary skills for the young learners, which emphasize the learners' autonomy and information literacy skills to aware and literate on digital information (Tunhikorn, 2019; The Partnership for 21st Century Skills, 2011).

With respect to the research objectives, Srikranuanwittayakhom school, located at Kranuan district in Khon Kaen province, recognizes the importance of enhancing 21st-century skills for learners and promotes the integration of research into lessons. As a result, instructors

had a chance in designing teaching curriculum and learning environments under a new paradigm called 'Community Based Learning (CBL)' focuses on students' practices from working in real situations with the community interactions. These notions resulted in the Wor 21204: Sciences and Problems Solving inserted content with research by requiring students to play a role as a youth volunteer to conserve natural resources and the environment at Kranuan district, Khon Kaen province. The students were encouraged to understand and have a positive attitude toward natural resources and environment, including knowledge in using digital media with practicing learning activities also known as Learning by doing; emphasis on practice and knowledge management in terms of concepts, content, processes, and outcomes through a sustainable natural resource and environmental management system at Kranuan district, Khon Kaen province (www.innonar.info), which considered as the opportunity for learners to interact and practice with the community as a source of learning instead of learning from only textbooks.

In this study, the researchers projected the digital literacy skills for sustainable natural resources and environmental management for the seventh-grade students from Srikranuanwittayakhom school to participate in training to conserve natural resources and the environment in Kranuan district, Khon Kaen province. In the assessment process of the digital literacy skills, the assessment has divided into two phases-first phase: the students participated in the training program on 22 March 2021 to brush up the knowledge, understanding, and awareness of the importance of digital literacy for natural resource and environmental management, second phase: evaluated the digital literacy skills after the students experienced with teaching management in the community and adopted sustainable natural resource and environmental management system in Kranuan district, Khon Kaen province (www.innonar.info) to collect data in the community for a month (on 23 April 2021). The study results will be beneficial to improve teaching and to learn in the 21st - century skills in schools and improve and develop sustainable natural resource and environmental management systems.

2. Purpose

1) To evaluate the digital literacy skills for sustainable natural resources and environmental management of the seventh-grade students at Srikranuanwittayakhom school, Kranuan district, Khon Kaen province.

2) To compare the digital literacy skills for sustainable natural resources and environmental management of the seventh-grade students at Srikranuanwittayakhom school, Kranuan district, Khon Kaen province.

3. Methodology

This study employed quantitative research, which consisted unit of analysis from personal data, i.e. one hundred students who enrolled in Wor 21204 Science and problems solving in seventh- grade students at Srikranuanwittayakhom School, Kranuan district, Khon Kaen province. These students were required to attend the training program for incubating the young volunteers' program to conserve natural resources and the environment in Kranuan district, Khon Kaen province. Nevertheless, forty- three students registered the young volunteers' program to conserve natural resources and the environment in Kranuan district and assigned to collect knowledge regard a sustainable natural resource and environmental management system in Kranuan district, Khon Kaen province (www.innonar.info) according to the instructional design with the integration of community- based teaching and learning management**.** In this study, questionnaires were used as a data collection tool which divided into two stages as were: 1) before conducting the training program of sustainable natural resource and environmental management on 22 March 2021, in Kranuan district, Khon Kaen province, and 2) after completed Science and problems solving course for a month on 23 April 2021, when the students have already practised in the community. The data were analyzed by employing descriptive statistics such as frequency, percentages, mean and standard deviation to analyze knowledge, understanding of digital technology awareness, including differences analysis by t- test for dependent samples, to compare mean between two independent samples due to the data were collected from two sets of data from the same group of students to compare digital literacy skills for sustainable natural resource and environmental management in seventh-grade students at Srikranuanwittayakhom School, Kranuan district, Khon Kaen province.

The study of digital literacy skills for sustainable natural resources and environmental management under the project for young volunteers in Kranuan district, Khon Kaen province, aimed to promote the 21st- century skills to the students and applied for data collection, proper usage of digital technology in the community, including learning phenomena and changes in the community**.** In the training session, the contents not covered only

organization knowledge management, which aimed to understand and raise awareness of the importance of digital literacy for natural resource and environmental management in Kranuan district, but also promoted the knowledge and technology skills to operate system appropriately. The training contents were as follows.

3.1. Digital literacy skills for natural resource and environmental management: focus on digital literacy skills that students can apply to the 21st century and develop student competency as a part of natural resources and environment development and management at the community level effectively. These notions were based on the belief that the students should not learn from only books or teachers, but they should be able to access knowledge or information to help them make critical decisions about choosing various information. These would enable learners to contribute to society's development or problem-solving and acquire lifelong learning skills through digital under the training, which consisted of three criteria: information learning skills, digital literacy skills, and digital intelligence (NSTDA, 2016). This digital intelligence aims to provide the youth in all countries with quality education of digital citizen skills and live in the online world from the advancement of technology. Digital intelligence consisted of three-digital intelligence levels, eight dimensions, twenty-four competencies, knowledge, skills, attitudes, and values, and eight moral digital bits of intelligence (Park, 2016c)

3.2. Fundamental digital literacy knowledge and understanding: this considered as a comprehensive concept of the ability to use, understand, create and access digital media, including digital technology usage in nowadays such as computers, phones, tablets, computer programs, internet, and various social media for the most benefit in communication, performance, and collaboration or working processes development or working systems to be more inventive and effective (Wannapiroon, 2017). Gilster (1971) defined digital literacy skills as the ability to understand and use information in various ways from multiple sources. Similarly, Cornell University (2009) defined information literacy skills as the ability to find, evaluate, use, exchange, and create information content using information technology and the internet as tools. Additionally, American Library Association (2013) also defined it as competency to information and communication technologies to discover, evaluate, create, and communicate data which requires knowledge and digital literacy skills. These digital literacy skills can be divided into three parts (Awareness Network, 2010) as were: 1) *Use* refers to skills in using

computers and internet from necessary techniques to advanced techniques, 2) *Understanding* refers to set of skills that help learners understand the context and assessment of digital media to be able to make decisions about what they have found from online world, 3) *Create* refers to the ability to produce content and information materials through a variety of digital media tools in a word processor program and composing an email, including modification ability. Therefore, digital literacy refers to various skills interrelated between media literacy, technology literacy, information literacy, visual literacy, communication literacy, and social literacy, which are essential and necessary for a multitude of benefits for citizens, such as students or adult workers.

Furthermore, Allan Martin (2009) postulated the stage of digital literacy in three stages, as shown in Figure 1., firstly, digital competency is the foundation of digital literacy comprised of technical knowledge-digital competency learning as integration from knowledge, aptitudes, attitudes, learning management (European Commission, 2004). Secondly, digital usage or level of thinking and adaptation in an appropriate way, including applying in specific professions or the context of knowledge (Bhornchanit Leenaraj, 2017). Thirdly, digital transformation or the process of bringing technology to re-invent for development, creativity, significant changes stimulation beneath the knowledge of individuals and society. Apart from these three stages of digital literacy, computer literacy also plays a vital role at all stages, especially digital usage and digital transformation (Martin, 2009).

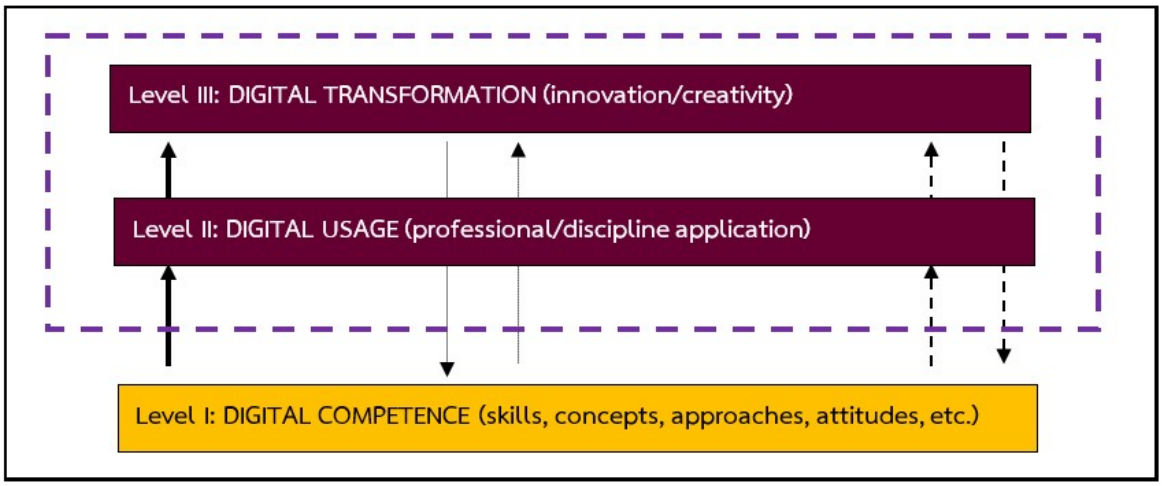

Figure 1 Levels of Digital Literacy (Martin, 2009)

4. Research results

4.1. Digital literacy skills evaluation for sustainable natural resources and environmental management.

4.1.1. General characteristics of the seventh-grade students in Srikranuanwit-tayakom school, Kranuan district, Khon Kaen province

The results indicated that the majority of the students were female at 79.0 percentages, and were male at 21.0 percentages. In aspect of house registration data, it also found that most of the students had their parents work as farmers as the main occupation in this district at 36.0 percentages, followed by trading or personal business at 29.0 percentages. On the one hand, the parents work as labor, government or enterprise officer were found at 21.0 percentages and 14.0 percentages, respectively. Interestingly, the occupation which related to environment and business may contribute more knowledge and understanding regard natural resources and the environment, including knowledge adaptation from information technology to use in daily life.

4.1.2. Digital literacy skills for sustainable natural resources and environmental management

The results indicated that the majority of the seventh-grade students had a moderate level of knowledge and understanding in digital literacy skills for sustainable natural resources and environmental management (4 – 6 points) before and after participating in the training. The level of knowledge and understanding of digital literacy skills for natural resource and environmental management were at 45.0 percentages and 54.0 percentages respectively. Furthermore, the findings also indicated that after the student had completed integrated learning from the community, the students had a high level of understanding of digital literacy skills for natural resource and environmental management (7-9 points), from 12.0 percentages to 20.0 percentages respectively, with average scores before and after completing integrated learning at 4.1 and 4.9, respectively (Table 2).

Table 2 Levels of digital literacy skills for sustainable natural resources and environmental management classified by pre- training and post- training in integrated learning from the community

Levels of Digital literacy for sustainable natural resources and environmental management	**Percentages**	
	Pre-training	**Post- training**
Fair (0 – 3 points)	43.0	26.0
Moderate (4 – 6 points)	45.0	54.0
High (7 – 9 points)	12.0	20.0
Total	**100.0 (100)**	**100.0 (100)**
Mean	4.1	4.9
S.D.	2.0	1.8
Minimum	0.0	1.0
Maximum	8.0	9.0

Turning into the knowledge and understanding of digital literacy skills for sustainable natural resources and environmental management by item. The results revealed that before participating in the training, the students had the highest level of knowledge and correct understanding of essential skills of digital literacy (item 3) at 67.0 percentages, followed by knowledge and understanding in distinguishing credibility of digital sources (item 8), knowledge of plagiarism (item 9) and correct understanding and knowledge of the characteristics and information literacy abilities in each individuality (item 1), were at 55.0 percentages, 48.0 percentages, and 46.0 percentages, respectively. Meanwhile, some students had a misunderstanding on online risk management (security skills) (item 2), and knowledge of creative commons symbols (item 10) were 87.0 percentages and 71.0 percentages, respectively.

After completing integrated learning from the community, the results from post-training indicated that the students changed their level of knowledge and understanding. The knowledge in important skills of digital literacy (item 3) reached 85.0 percentages as well as knowledge and understanding in distinguishing credibility of digital sources (item 8), and knowledge of plagiarism (item 9) reached 66.0 and 68.0 percentages, respectively. On the one hand, the students had an understanding of online risk management (security skills) (item 2), and knowledge of creative commons symbols (item 10) increased to 14.0 and 48.0 percentages, respectively (Table 3).

Table 3 Levels of digital literacy skills for sustainable natural resources and environmental management classified by pre- training and post- training in integrated learning from the community by items

Levels of Digital literacy for sustainable natural resources and environmental management	**Percentages**				**Total**
	Pre-training		**Post- training**		
	correct	incorrect	correct	incorrect	
characteristics and information literacy abilities in each individuality.	46.0	54.0	47.0	53.0	100.0
Online risk management (Security skills)	13.0	87.0	14.0	86.0	100.0
Essential skills of digital literacy	67.0	33.0	85.0	15.0	100.0
Copyright work characteristic	32.0	68.0	31.0	69.0	100.0
Life and career skills	37.0	63.0	28.0	72.0	100.0
Level of digital intelligence	43.0	57.0	46.0	54.0	100.0
Digital Citizenship	35.0	65.0	54.0	46.0	100.0
Distinguishing credibility of digital resources	55.0	45.0	66.0	34.0	100.0
Plagiarism	48.0	52.0	68.0	32.0	100.0
Creative Commons symbols knowledge	29.0	71.0	48.0	52.0	100.0

4.1.3. The comparison of digital literacy skills for sustainable natural resources and environmental management.

The results from before and after participating in the integration of community-based teaching and learning indicated that the students had different average scores regarding their knowledge and understanding of digital literacy skills for sustainable natural resources and environmental management were significantly different at 0.01. The mean before participating in training less than after learning was 4.05 and 4.87, respectively (Table 4).

Table 4 The average scores of knowledge and understanding of digital literacy skills for sustainable natural resources and environmental management of students, classified by pre-training and post- training in integrated learning from the community

Attitude	$\bar{X}$	S.D.	N	t
Pre- training	4.05	1.986	100	3.174
Post- training	4.87	1.851	100	

*df =99 level of significance = 0.002

5. Discussion

The results from the study of Digital literacy skills for sustainable natural resources and environmental management of the seventh-grade students at Srikranuanwittayakhom school, Kranuan district, Khon Kaen province indicated that the majority of the students had a moderate level of knowledge and understanding in both before and after participating the integrated learning in the community. Interestingly, the level of digital literacy skills had increased significantly from 12.0 percentages when in the pre-training stage and increased to 20.0% after experiencing integrated learning from community-based teaching and learning. This is consistent with the study by Hidayat, Fauziah & Subekti (2019), which revealed that able to use digital literacy skills to solve problems and apply them in their studies after going through a virtual learning process (Vi-Learning) were 100 percentages. Thus, this can be concluded that the researchers should create a learning habit to develop digital literacy skills for students continuously.

Additionally, when comparing sustainable natural resources and environmental management, it was found that the scores from before and after participating in the integration of community-based teaching and learning were significantly different at 0.01l. The results revealed that the score after the student had participated in the community was higher than the score before the student participated in the training. These reflected that the level of understanding in the students had increased and elicited their competency in managing the local natural resources.

This is consistent with Muangsawang (2015) study, which found that the factors of innovation process engagement, economic readiness, and technology knowledge management can apply for sustainable community development. Therefore, this can be mentioned that participating in training builds students' knowledge and understanding about digital literacy and

allows students for a combination of knowledge, skills, expertise, and fundamental decisions about information and digital systems usage. These reflected the increased level of knowledge in creating knowledge and understanding about management and innovations for natural resource and environmental management. Similar to the efforts to promote the essential skills for 21st -century learning (The Partnership for 21st Century Skills, 2011), which focuses on digital literacy such as information, media and technology skills, highly important skills for the students in the study area.

Therefore, this can be concluded that integrating research into lessons provided a way for teachers to develop a new way of teaching and learning community-based. Thus, this is considered a new paradigm for learning in the 21st-century context that emphasizes students' potential development to effectively handle sustainable natural resources and environmental management in the community. Simultaneously, this study also creates knowledge from implementing a sustainable natural resource and environmental management system in Kranuan district, Khon Kaen province. (www.innonar.info). As the research result, the research can share knowledge with users to develop and use natural resources effectively by using community as learning-based as the strategy to link content between the books with the community, through the integration of knowledge in various subjects and practical in real-life which occurred in the community by emphasis on thinking skills, problems solving, learning through real experiences and real-world evaluation. Additionally, this study was also a guideline for creating new knowledge and being a model of teaching and learning management in relevant contexts. Resulted in the occurrences of cooperation between higher education institutions and secondary schools has been expanded to strengthen the development of the Thai education system, especially enhancing teaching and learning management, learning design, and digital media for natural resources and environmental management in teaching and learning to create a learning society for students in the future.

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