

Digital literacy of undergraduate students using assessment for learning in applied computer course during the COVID-19 pandemic

Thananun Thanarachataphoom^{a*}, Keattisak Chankeaw^b

^aFaculty of Education, Sasetart University, Thailand.

^bBusiness Administration Program, Kanchanaburi Campus, Mahidol University, Thailand.

*Email: Thananun.t@ku.th

Article History: Received: 1 October 2021, Accepted: 15 November 2021, Published: 1 December 2021.

Abstract: This research is the study of Digital literacy of undergraduate students using assessment for learning in applied computer course during the COVID-19 pandemic. This research is the study of Digital Literacy (DL) of undergraduate students using assessment for learning in applied computer course during the COVID-19 pandemic. To develop an assessment for learning in applied computer course. To study digital literacy knowledge of students in the course in applied computer course, online course. The population consist of 46 persons. Undergraduate student's bachelor of Science in Food Technology Applied Computing in Mahidol University. Statistics used for this research. Because it uses the entire population in research. The statistics used consisted of Cronbach Alpha coefficient, Frequency, Mean, Standard deviations were used to analyze the data. The investigators found that to develop an assessment for learning in applied computer course. Assessment for learning can improve undergraduate students' ability to use DL and DL knowledge of students in the course. The results showed that access, analyze, create, evaluate of those who have improved by using such an assessment model and the development score (DS): 73.27% was learners have a high level of development.

Keywords: Digital literacy, Assessment for learning, COVID-19

1. Introduction

The 21st century (Horoshko, Horoshko, Bilyuga, & Horoshko, 2021) is the era that has evolved from the industrial society and literacy of the 20th century to the era of the global community (Riel Miller, 2020). The internet and digital literacy (DL) have become an infrastructure in the daily life of the world's population, making it possible to communicate. Send information to each other easily and quickly (Peña-Ayala, 2021). The survey found More than 3 billion people in the world use the internet network system. Both searching for information to communicate and transact (Egan, Maguire, Christophers, & Rooney, 2017). Adaptation from an information society to a learning society in which information. It determines the wealth of the world's population social and economic infrastructure (Peña-Ayala, 2021). The 21st century consists of digital data and artificial intelligence technologies (Riel Miller, 2020). Help communicate extensive digitalization of business and commerce (Rahmah, 2015). This creates a new type of society known as the digital economy society (Horoshko et al., 2021). When today's society has stepped into a digital economy, the society must bring digital technology, including digital communication networks, computers, and software linked together (Riel Miller, 2020). The use of information is considered to create opportunities in many fields. (Moreno-Morilla, Guzmán-Simón, & García-Jiménez, 2021).

Information development in digital form learners need a variety of skills (team, 2020). In addition to knowing Information literacy such as Digital Literacy, Media literacy, Computer literacy, Multimedia literacy (Denise Leahy, 2014; Julien, 2015). To be able to use that digital information effectively in the 21st century (TeachThought, 2020), today's education must change the way of teaching and learning from the past. books and textbooks (Peña-Ayala, 2021). It is the use of digital information media in teaching and learning, especially learning resources on various websites that have a variety of disciplines. which the learners can choose freedom by Interests (Garcia & Ferrando, 2014).

Digital Literacy (DL) (Julien, 2015) The American Libraries Association working group and the initiator of the DL Campaign (ALA, 2020). DL as The ability to recognize and technical skills in using various information and communication technologies to find, evaluate, create and communicate information as needed. (Richard Simpson, 2014). Educational institutions and organizations, libraries promote information literacy (ALA, 2020). DL refers to a person's knowledge, skills, and behaviors within a digital environment (Walton, 2016). People exercise these capabilities on an everyday basis using the internet, social media, and devices (Julien, 2015). Therefore, needs to be modified to focus on promoting DL skills. To be in line with the current situation that information technology advances including changing the behavior of using digital information of people and organizations (Wu, Zhou, Li,

& Chen, 2022). In addition to defining DL to be clear and suitable for the learning conditions. of society in the present era. Cause mutual understanding in the library librarian group and has set up a public policy to use as a guideline to campaign to promote this skill to the people of the whole country which at the international level, Australia, United Kingdom Republic of Ireland, New Zealand, etc., are aware of the importance and want to develop people to be DL people by campaigning and creating standards.

DL refers to the skills to understand and use today's digital technologies such as computers, phones, tablets, computer programs, the internet and social media(Blau, Shamir-Inbal, & Avdiel, 2020). The benefit in communication, operation and working together or used to develop work processes or system in the organization. To be up-to-date and effective as possible. Skills are very important for living in today's society(Guo & Huang, 2021). which is a learning society that is getting complicated every day and more complicated and understand and use technology creatively, using IT knowledge to be more than just entertainment. It will be beneficial to oneself and society(List, 2019). DL skills(Tomczyk, 2020; Vélez & Zuazua, 2017) can be divided into 4 important parts: 1) Access to digital technology tools effectively. 2) Analyze the ability to use digital technology. 3) Evaluate is the ability to produce content. 4) Creativity and data processing(List, 2019). Each section is detailed as follows.The access and use of digital technology resources and information is the foundation for development learners need to understand the importance of the internet and be able to access information from the internet through a variety of channels. including the advantages and disadvantages of each channel. To be able to use Search Engine to find the required information from the Internet effectively. It is also necessary to understand the different types of digital media and their applications in today's work.Analysis refers to the usability required to use computers and the Internet. analytical skills and abilities related to the word "Analysis and application" covering from basic techniquesand learning to use tools such as the use of computer programs and applications in various situations such as Microsoft Office programs, web browsers, other data processing programs and other tools to more advanced techniques for applying knowledge, such as programs that help in data search or search engine online research database. They also could analyze data for useful purposes.Create content that is relevant to the situation. Create media through a variety of digital media tools. including creating works from various ready-made programs that correspond to the work, analyzing results, processing data to present information. Evaluate the credibility of the media or content that is presented on the Internet before it can be used. It also assesses the credibility of websites such as private, government or private websites before using them as references. Assess the relevance of information to issues of interest and assess the value of information that can be used as a reference.

Formative assessment is used for educational measurement and evaluation (Olsen et al., 2021; Veugen, Gulikers, & den Brok, 2021; Wang, 2008). This involves the process of collecting information by observing an inquiry, reviewing work, or exams (Curtis, 2011; Senye-Mir, Arumí-Prat, Pla-Campas, & Ramírez, 2016).To obtain information about knowledge, abilities, and skills as well as characteristics of learners to use the assessment results to promote learners' learning and improve learning management of instructors.(Chen, Gamble, Lee, & Fu, 2020).Provides conditions for evaluating and re-thinking the learning opportunities intended to enable students(Julien, 2015). To achieve their learning goals (Ruiz-Primo, 2011).The research literature on formative assessment is aimed at the students and how they can evolve from dependency on teacher-led feedback to being able to generate their feedback on learning and progression and thus develop as independent learners who can monitor, evaluate and regulate their learning (Hansen & Ringdal, 2018)

Assessment for Learning (AfL) is an assessment, decision making, obtaining information about learners (C and ersson & Palm, 2017; L and ersson, 2019).Which teachers/instructors can utilize in planning learning activities changing teaching strategies(Barana & Marchisio, 2016; Purnama, Ulfah, Machali, Wibowo, & Narmaditya, 2021).Feedback is an important part of formative assessment (Faber, Luyten, & Visscher, 2017). Modifying learners' learning strategies consist of pre-assessment or diagnostic assessment which is an assessment based on various basic information of learners such as basic knowledge achievement characteristics and learning behaviors of learners, aptitudes, interests, problems, and needs (Kay, 2010).By such assessment, the teacher can do it from the beginning of learning (Buldu & Buldu, 2010).The crucial skills in the toolkit of the 21st-century learner and indeed the key to effective learning in higher education (Egan et al., 2017).Since the outbreak of the COVID-19. Thailand's education model has also changed dramatically. To study ON-SITE, it must be converted to a form of distance learning (Remote Learning) or online learning. Online tutoring is a teaching and learning process in which an instructor provides content, exercises, and a measurement process. It is available online via web-based or mobile-based applications where learners can study from any location. The learners are convenient and suitable for learning remote teaching. It also means teaching and learning where teachers and learners are scattered everywhere and communicate with each other easily. Therefore, it is necessary to use communication tools for communication to be complete enough to enable learning. Long distance communication can be achieved by using technology. Teaching through information technology availability is required in many areas, including tools, network, program/platform, content, and teacher and student readiness.

2. Significance Of The Study

The information and communication technology to transform human learning patterns. By bringing various communication tools such as telephone systems, television systems, and computer systems that interact with users. Coupled with the use of diverse sources of knowledge, users can learn things based on their interests, and information and communication technologies have the potential to reduce time and distance constraints. As a result, changes in learning information can occur at anytime, anywhere. bring benefits to lifelong learning.

Digital learning has an impact on the development of learning styles. Content presentation style and behavior of learners This is due to the physical shift of traditional books to digital learning content. Therefore, using digital learning content, learners need to be adapted to be able to use this content. The learners therefore have to study the students' confidence in using the media format. presenting content in digital format for further development and quality improvement as more digital learning content is used.

3. Review Of Related Studies

21st century skills are paramount: 1) Agility and Adaptability, able to handle difficult situations and find solutions to difficult problems. Able to face changes, communicate, play a variety of roles understand others. 2) Initiative and Entrepreneurialism. It is an assessment of the creativity of the students as a whole. both the ability. Solving problems and performing various tasks. 3) Effective oral and written communication characteristics of evaluating oral and written reporting ability write in response to feedback and write constructively; and 4) access to information. Accessing and Analyzing Information. The learning and innovative skills of the 21st century world is more complex than the 20th century, where learners need literacy, writing and arithmetic's skills to help them prepare. Readiness for learners to be able 1) critical creativity for work 2) brainstorming methods and generate new ideas and innovate 3) creative communication methods 4) generate ideas that will allow others to accept and learn from failure 5) inductive and deductive thinking methods 6) Methods of analysis and Solve problems effectively 7) understand the evidence good arguments and judges require evidence and arguments, and 8) work together with diverse people, teamwork, leadership (Wagner, 2008). Assessment of 21st century skills therefore focuses on 1) creating a balance in qualitative assessments 2) emphasizing the benefits of feedback from learners' practice to improve work 3) using technology to enhance learning test, measure and evaluate for the highest efficiency and 4) the student's portfolio to be standardized and quality. A high-quality measure should include specific quality criteria. All assessments must meet criteria, namely the purpose of the assessment. The learning objectives are clear and appropriate. There is a suitable assessment method, there is a good sampling of practice and the assessment must be accurate, free from bias and distortion which is the principle.

Assessment for learning has an important objective to improve learners' learning as they occur. While the learning activities have not ended, the main objective of student assessment is assessment for learning. Assessment for learning is the collection of information that has been planned and thought carefully to obtain information from the learner completely enough to help the learner. understand what learners have learned in terms of knowledge learners' skills and abilities including learning strengths and weaknesses as well as seeing the value of what was learned and attitudes towards learning of learners. Most importantly, the process of assessment of student learning must be a harmonious and natural part of the process of learning management and the learner's learning process. promotion learner learning teachers will use every moment of the learning activities in progress along with the assessment activities. Various assessment techniques (observing participation in classroom activities, discussions, performance audits, etc.) That will allow teachers to see a complete picture of how learners learn. Instructors will analyze and interpret meanings from learning behaviors and learners' performance to obtain information about learners as they arise. During the learning process, those information and information are used by teachers to monitor and improve their teaching. As well as giving feedback to learners, the role of learners is to openly provide information about their own learning. Learners will not only participate in learning activities, but also participate in the reflection of their own and group learning outcomes to the teacher and to the class. In addition, learners use the information obtained from the assessment to determine their own learning goals and consider decision-making in improving self-learning. This is expressed by the quality of the work the learners perform. Chaiso (2017) states that this type of assessment defines "Activities carried out with planning Together with the learning management process and used by teachers and learners by collecting information on learners' various learning especially during the course, then analyzed and interpret the information obtained in order to draw conclusions about the learner's learning with strengths and weaknesses and make decisions for teachers to improve self-learning management as learners learn how to improve their learning."

The student-centered assessment (Office of the basic education commission, 2015). DL refers to the skill in applying the tools, equipment and digital technologies that exist today such as computers, telephones, tablets, computer programs and online media be used for benefit in communication, operation and working together or use it to develop skills learning process (Tomczyk, 2020). DL refers to an individual's ability to find, evaluate, and clearly communicate information through typing and other media on various digital platforms. It is evaluated by an individual's grammar, composition, typing skills and ability to produce text, images, audio and designs using

technology. The American Library Association (ALA) defines DL as the ability to use information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills. While DL initially focused on digital skills and stand-alone computers, the advent of the internet and use of social media, has resulted in the shift in some of its focus to mobile devices. Similar to other expanding definitions of literacy that recognize cultural and historical ways of making meaning, DL does not replace traditional forms of literacy, but instead builds upon and expands the skills that form the foundation of traditional forms of literacy. DL should be a part of the path to knowledge.

The DL is the ability of using both digital hardware and software to study, work, entertain, communicate and participate in creating as well as producing digital content. Thus, users should have analysis skills and digital content evaluation skills. Moreover, users should have responsibility and social ethics under the digital ecosystem. Therefore, to clearly understand the fundamental, the objective of article is to explain the evolution of the digital literacy, the meaning of the DL and the synthesis of the DL skills. The results could be concluded that the DL skills were comprised of 7 skills, as the following: (1) Accessing skill; the capacity to select and use the digital information technology appropriately. (2) Analysis skill; the capacity of reading and comprehending the content as well as the signals accurately. (3) Evaluation skills; the capacity of judging the quality and the benefit of the content from various sources. (4) Creative skills; the capacity to effectively create the content with the digital technology tools. (5) Communication skills; the capacity to appropriately select the channels to communicate the digital content to the target, under the digital environment. (6) Reflection skills; the capacity to express the opinion, the interaction, and the content connection to others, and (7) Action-taking skills; the individual capacity to work and participate with others in sharing knowledge and properly solving problems that are benefit to the overall society (Khamcharoen, 2019). In this course, there is Course Learning Outcome (CLO) design in the course that corresponds to the DL for 4 skills, which are Access, Analyze, Create, Evaluate.

4. Objectives Of The Study

- To develop an assessment for learning in applied computer course.
- To study digital literacy knowledge of students in the course in applied computer course.

5. Hypotheses Of The Study

- Assessment for learning can improve my undergraduate students' ability to use digital literacy.
- Learning achievement assessment help improve the DL capabilities of undergraduate students.

6. Population And Sample

Population: 46 people studying. Undergraduate student's bachelor of Science in Food Technology Applied Computing in Mahidol University. Course Title: Computer Program Applications and Credit 2 credit. Course Module: General education course.

6.1. Statistical Techniques Used in the Present Study

Statistics used for this research. Because it uses the entire population in research. The descriptive statistics used consisted of Frequency, Mean, Standard deviation were used to analyze the data.

Table.1. showing the Cronbach Alpha coefficient.

Digital literacy (DL)	No. of items	Cronbach Alpha coefficient
Access	4	0.894
Analyze	4	0.772
Create	4	0.879
Evaluate	4	0.891
All variable	16	0.950

Table.2. showing the descriptive statistic of DL variable

	Mean	Minimum	Maximum	Range	Maximum/Minimum	Variance	N of Item
Item Means	3.538	3.133	3.967	0.833	1.266	0.054	16

After finding out the quality of the questionnaire from the expert assessment. Then will continue to improve the questionnaire according to the recommendations of experts. Before using this questionnaire to try out with 30 non-sample groups in this research and to calculate reliability. The results of try out will be used to modify the questionnaire to be complete and correct. need the most. To study the reliability of the questionnaire is a content validity test by determining the confidence of the test. The complete set of questions according to the Cronbach Alpha method must not be lower than 0.70 at the 95% confidence level.

7.Result

Course Title: computer program applications and course descriptive. Basics for computer utilization; office programs including document file, presentation file, excel file for computing mathematical models; basic program for statistical analysis and interpretation; presentation platform for mathematical and statistical data. This course is designed to have a 15-week teaching process. Able to summarize the assessment process in the course as follows:

7.1 To develop an assessment for learning in applied computer course.

Table.3.Methods and tools used in the assessment.

Assessment: According to the learning objectives Assessment period: Throughout the course of the course Assessor's Role: Prospective Proactive <u>This course is designed to have a 15-week teaching process</u>							
Course Objectives / Course Learning Outcomes (CLOs)	Observation	Questioning	Self and Peer Assessment	Learning Journal Students	Feedback is the evaluation results returned	Test/ Examination	Work sheet/Homework
Understand the importance of applying technology in daily life	week 1-16	week 1-16	week 1-2	All week	week 1-2	week 8	week 1-4
Apply computer basic program correctly and suitable for various document	week 1-16	week 1-16	week 4-7	All week	week 4-7, 9-12		week 4-7
Apply mathematical model and process the data correctly	week 14-16	week 14-16	week 14-16	All week	week 11-13	Week 15	week 14-16
Input analyze process the data and present statistical and mathematical data correctly	week 11-16	week 11-16	week 11-16	All week	week 8-13		week 8-13

To make learning in accordance with the objectives of the course Assessment in this course consists of 9 homework assignments and 2 exams in week 8,15.

Learning contract is an agreement between the teacher and the learner in the first session and during the course of the content learning session and how to use the assessment to suit the needs of the learners. It is a flexible and negotiable method between the teacher and the learner, based on the goal of learning, considering the learning objectives and evaluation criteria.

Observation is an assessment in which the teacher describes the behaviour occurring with two types of data collected: 1) a quantitative approach, which is a systematic observation of behaviour in the classroom using a behavioural observation model that has identified issues in observing the behaviour and 2) the qualitative approach was to observe the behaviour in the lecture-based classroom and the social context in the classroom. These two types of observations provide effective assessment guidelines and teachers can adapt to the situation.

Questioning is commonly used in the classroom where theorists divide questions into two broad categories: Initial questions are questions that the teacher asks to ask the learner's previous knowledge. Students can use their analytical thinking skills to answer questions. In order to answer that question, learners must be able to create ideas from the information they have learned. The benefit of using questions in the classroom by teachers is that the questions stimulate learners' interest and induce curiosity in finding answers, keeping students interested in what the teacher is saying and engaging in learning. Asking questions at a high level, they want to encourage learners to think and expand. Cognition learners think and organize their answers. Sometimes teachers can have students come together in small groups to exchange ideas before answering a question or teachers provide guidelines in the form of supplementing knowledge to learners.

Self and peer assessment is an assessment that can be used in conjunction with an instructor assessment. Learners will reflect on what they have gained from learning. Is there anything that should be developed further? This allows learners to examine their own learning and develop their ability to judge and assess their own and peers' work, as well as to recognize their strengths. Disadvantages of work and bring their own weaknesses to develop in continue learning. This will allow students to be proud of themselves (Self Esteem) to accept their development.

Test and Examination. This course is assessed with an exam which takes place in Week 8 and Week 15 to assess the overall picture of the course. The exam is a measure of knowledge. Students' understanding of using computers and assessing skills in DL.

Work sheet and homework are an important component of teaching and learning management. to achieve the set objectives and is a review of the knowledge that students learn inpractice of research skills and to use the free time to be useful. The study that takes place at the university focuses on memorization. Homework is meant to help the short-term memory that is inherited from the teacher. To become a long-term memory by repeating Because the more you do, the more you will remember. This kind of study therefore has a final necessity exam. The duty of the teacher is to point out the wrong. and the judgment has fallen without considering the way of thinking and learning process that occurs with learners but focusing on the final answer is important.

Learning journal students apply the knowledge and ideas gained from doing worksheets. Let's write an unstructured reflection and write a reflection of each person's learning. make teachers aware of ideas. The feelings of learners who have many writing methods such as note-taking are learners to record events that occur in the classroom. Writing in a daily journal means students write a journal about their feelings arising from learning in the classroomand reflective writing is that learners write to express their knowledge from the record of what they have learned, how they have learned and learn how to use. The benefit of using the Learning Journal method is that learners can track their own development and make the students' ideas. More clarity and the ability to link previous experiences with new knowledge instructors assist learners with writing experiences that are useful for learning analysing questions-based learning.

Feedback is the evaluation results returned to the learner or the person being assessed in order to use the assessment results to improve and develop themselves. Giving back to the students the results of the assessment has a positive effect on the development or may have an impact on the development as well. Assessors should study the pattern. There are three forms of feedback assessment to learners for the effectiveness of developing feedback classifications: 1) Motivational feedback. Motivational feedback is a form of positive motivation, such as compliments, rewards, good grades. Giving positive advice 2) Evaluative feedback by grading or scoring on specific tasks. for learners to know their current work for improvement 3) To give feedback as in this form, learners will know how to improve learning to reach goals by the teacher giving advice methods for students to improve their work as well as to encourage students to be enthusiastic about learning through thinking and decision-making in those recommendations.

Principles in the selection of assessment techniques Herman, Aschbacher and Winters (1992 cited in Berry, 2008) outlined the guidelines for selecting the appropriate assessment method as follows:

- 1) The technique must be consistent with the course objectives. This is because such conformity will lead to clear assessment results.
- 2) Assessment techniques must reflect the content and skills that the instructor expects ofthe learners. Show students' performance and progress. The assessment will reflect the actual ability of learners.
- 4) Technical assessment must be practical and relative experience of the class.
- 5) Technical evaluation should support the integration between subjects. Because this course extends from statistics) and basic computers.
- 6) Assessment techniques must have a structure that represents a measure of the purpose of learning. The selection of assessment techniques for learning is critical that the instructor understands the techniques for their effective use. of a clear learning assessment,it was accepted to be developed for both teachers. which can be used to adjust learning management and learners to develop learning.

To study DL knowledge of students in the course in applied computer course.46 people the result show that the most of them were female, 35people (76.09%) and male 12 people (23.91%).

Table.4. The average of DL variable

Digital Literacy (DL)	Minimum	Maximum	\bar{x} (n=46)	Std. Deviation
Access.				
You can search more than one source.	2	5	3.81	.710
Access information through various search engines.	3	5	4.00	.632
Choose information research database.	2	5	3.50	.655

Digital Literacy (DL)	Minimum	Maximum	\bar{x} (n=46)	Std. Deviation
Access the program download resources provided by university.	2	5	3.53	.845
Analyze				
Classify each type of information system	1	4	3.17	.775
Specify the type of program that corresponds to the job type.	2	5	3.47	.736
Be able to distinguish facts and opinions of the authors of the information	2	5	3.61	.838
Identify the differences between the computer operating system and the phone operating system.	1	5	3.75	.996
Create				
Create content that corresponds to the given situation.	2	5	3.42	.806
Use a Word Processing program	1	5	3.33	1.014
Use a presentation program	2	5	3.42	.841
Use a spreadsheet program	1	5	3.14	.931
Evaluate.				
Assess the credibility of media or content presented on the Internet.	2	5	3.72	.741
Assess the credibility of the website before using it as a reference	2	5	3.67	.926
Select information related to the topic of interest/study.	2	5	3.69	.710
Evaluate the value of information that is used as a reference.	2	5	3.56	.695

The question about of digital literacy show that you can search more than one source. ($\bar{x} = 3.81$). Access information through various search engines. ($\bar{x} = 4.00$). Choose information research database. ($\bar{x} = 3.50$) Access the program download resources provided by university. ($\bar{x} = 3.53$). Classify each type of information system. ($\bar{x} = 3.17$). Specify the type of program that corresponds to the job type. ($\bar{x} = 3.47$). Be able to distinguish facts and opinions of the authors of the information. ($\bar{x} = 3.61$). Identify the differences between the computer operating system and the phone operating system. ($\bar{x} = 3.75$). Create content that corresponds to the given situation. ($\bar{x} = 3.42$) Use a Word Processing program. ($\bar{x} = 3.33$). Use a presentation program. ($\bar{x} = 3.42$). Use a spreadsheet program. ($\bar{x} = 3.14$). Assess the credibility of media or content presented on the Internet. ($\bar{x} = 3.72$). Assess the credibility of the website before using it as a reference. ($\bar{x} = 3.67$). Select information related to the topic of interest/study. ($\bar{x} = 3.69$). Evaluate the value of information that is used as reference. ($\bar{x} = 3.56$).

Table.5. The average of DL variable.

Digital Literacy (DL)	Minimum	Maximum	\bar{x}	Std. Deviation
Access	2.50	4.75	3.70	.522
Analyze	2.25	4.75	3.50	.563
Create	1.75	4.75	3.32	.701
Evaluate.	2.25	5.00	3.65	.684

There is descriptive statistic between each DL variable the results showed that undergraduate student's Bachelor of Science in food technology, Applied Computing course in Mahidol University have DL comprehension skills based on averages as follows: Access ($\bar{x} = 3.70$), Analyze ($\bar{x} = 3.50$), Create ($\bar{x} = 3.32$), Evaluate ($\bar{x} = 3.65$).

Development score (DS) the process of change. It is a study of learning achievement before learning and learning principles of learners using a score comparison has the following equation (Sirichai, 2013):

$$GS = \frac{(Y-X)}{(F-X)} * 100 \quad (1)$$

Define:

- GS (%) refers the percentage of student progress. (percentage).
- F refers the full score of both the first and last measurements.
- X refers the first measurement score.
- Y refers the score of the last measurement.

The criteria for interpreting scores are as follows:

- 1-25% learners have an low level development.
- 26-50% learners have intermediate level development.
- 51-75% learners have a high level of development.
- 76-100 learners have a very high level of development.

Table.6. Pre and post-study assessments.

Digital Literacy (DL)	Pre-study (\bar{x})	Post-Study (\bar{x})
Pre-Post	3.47	4.12

The results showed that access, analyze, create, evaluate of those who have improved by using such an assessment model and the development score (DS): 73.27% was learners have a high level of development.

8. Conclusion

To develop an assessment for learning in applied computer course. Assessment for learning can improve my undergraduate students' ability to use digital literacy and digital literacy knowledge of students in the course in applied computer course student can achievement assessment help improve the DL capabilities of undergraduate students and the development score (DS): 73.27% was learners have a high level of development.

References (APA)

ALA. (2020). Education and Information Literacy: An Interpretation of the Library Bill of Rights. 1. Retrieved from <https://www.ala.org/advocacy/intfreedom/librarybill/interpretations/education>

Andersson, C., & Palm, T. (2017). The impact of formative assessment on student achievement: A study of the effects of changes to classroom practice after a comprehensive professional development programme. *Learning and Instruction, 49*, 92-102. doi:10.1016/j.learninstruc.2016.12.006

Andersson, L. (2019). Do the formative aspects of education really matter for educational assortative mating? Cues from a natural experiment. *Research in Social Stratification and Mobility, 64*. doi:10.1016/j.rssm.2019.100435

Barana, A., & Marchisio, M. (2016). Ten Good Reasons to Adopt an Automated Formative Assessment Model for Learning and Teaching Mathematics and Scientific Disciplines. *Procedia - Social and Behavioral Sciences, 228*, 608-613. doi:10.1016/j.sbspro.2016.07.093

Blau, I., Shamir-Inbal, T., & Avdiel, O. (2020). How does the pedagogical design of a technology-enhanced collaborative academic course promote digital literacies, self-regulation, and perceived learning of students? *The Internet and Higher Education, 45*. doi:10.1016/j.iheduc.2019.100722

Buldu, M., & Buldu, N. (2010). Concept mapping as a formative assessment in college classrooms: Measuring usefulness and student satisfaction. *Procedia - Social and Behavioral Sciences, 2(2)*, 2099-2104. doi:10.1016/j.sbspro.2010.03.288

Chen, I. H., Gamble, J. H., Lee, Z.-H., & Fu, Q.-L. (2020). Formative assessment with interactive whiteboards: A one-year longitudinal study of primary students' mathematical performance. *Computers & Education, 150*. doi:10.1016/j.compedu.2020.103833

Chaiso, P. (2017). Evaluation of learners' learning: an important process for the teaching profession. Bangkok: Department of Education, Faculty of Education, Kasetsart University. (Copied documents) (in Thai)

Curtis, S. M. (2011). Formative assessment in accounting education and some initial evidence on its use for instructional sequencing. *Journal of Accounting Education, 29(4)*, 191-211. doi:10.1016/j.jaccedu.2012.06.002

Denise Leahy, D. D. (2014). Digital literacy A vital competence for 2010. *School of Computer Science and Statistics*.

- Egan, A., Maguire, R., Christophers, L., & Rooney, B. (2017). Developing creativity in higher education for 21st century learners: A protocol for a scoping review. *International Journal of Educational Research*, 82, 21-27. doi:10.1016/j.ijer.2016.12.004
- Faber, J. M., Luyten, H., & Visscher, A. J. (2017). The effects of a digital formative assessment tool on mathematics achievement and student motivation: Results of a randomized experiment. *Computers & Education*, 106, 83-96. doi:10.1016/j.compedu.2016.12.001
- Guo, J., & Huang, J. (2021). Information literacy education during the pandemic: The cases of academic libraries in Chinese top universities. *The Journal of Academic Librarianship*, 47(4). doi:10.1016/j.acalib.2021.102363
- Hansen, G., & Ringdal, R. (2018). Formative assessment as a future step in maintaining the mastery-approach and performance-avoidance goal stability. *Studies in Educational Evaluation*, 56, 59-70. doi:10.1016/j.stueduc.2017.11.005
- Horoshko, O.-I., Horoshko, A., Bilyuga, S., & Horoshko, V. (2021). Theoretical and Methodological Bases of the Study of the Impact of Digital Economy on World Policy in 21 Century. *Technological Forecasting and Social Change*, 166. doi:10.1016/j.techfore.2021.120640
- Julien, H. (2015). *Digital Literacy* (Vol. 3). The University at Buffalo, USA: The University at Buffalo, USA.
- Kay, S. P. R. a. K. (2010). *21st Century knowledge and skills in educator preparation* (1 ed. Vol. 1). AACTE Company: ACCTE.
- Khamcharoen, P., & Polnigongit, W. (2019). Digital Literacy: Evolution, Definition, and Skills. *Journal of Applied Informatics and Technology*, 1(2), 72-81. <https://doi.org/10.14456/jait.2018.6>
- List, A. (2019). Defining digital literacy development: An examination of pre-service teachers' beliefs. *Computers & Education*, 138, 146-158. doi:10.1016/j.compedu.2019.03.009
- Moreno-Morilla, C., Guzmán-Simón, F., & García-Jiménez, E. (2021). Digital and information literacy inside and outside Spanish primary education schools. *Learning, Culture and Social Interaction*, 28. doi:10.1016/j.lcsi.2020.100455
- Olsen, J. M., Lagunas, M. C. W., Wildenberg, C., Sohn, K. M., Hanson Brenner, G., Jadack, R. A., & Pehler, S.-R. (2021). Using standardized exams for formative program evaluation. *Teaching and Learning in Nursing*, 16(4), 371-374. doi:10.1016/j.teln.2021.06.006
- Peña-Ayala, A. (2021). A learning design cooperative framework to instill 21st century education. *Telematics and Informatics*, 62. doi:10.1016/j.tele.2021.101632
- Purnama, S., Ulfah, M., Machali, I., Wibowo, A., & Narmaditya, B. S. (2021). Does digital literacy influence students' online risk? Evidence from Covid-19. *Heliyon*, 7(6), e07406. doi:10.1016/j.heliyon.2021.e07406
- Rahmah, A. (2015). Digital Literacy Learning System for Indonesian Citizen. *Procedia Computer Science*, 72, 94-101. doi:10.1016/j.procs.2015.12.109
- Richard Simpson, O. A. O. (2014). New Technologies in Higher Education – ICT Skills or Digital Literacy? *Social and Behavioral Sciences*. doi:10.1016/j.sbspro.2014.10.120
- Riel Miller, W. M. a. B. S. (2020). *21st CFentury Technologies*: Organisation for economic co-operation and development.
- Ruiz-Primo, M. A. (2011). Informal formative assessment: The role of instructional dialogues in assessing students' learning. *Studies in Educational Evaluation*, 37(1), 15-24. doi:10.1016/j.stueduc.2011.04.003
- Senye-Mir, A. M., Arumí-Prat, J., Pla-Campas, G., & Ramírez, E. (2016). Effects of Formative Assessment on the Learning-to-learn Skills of Teacher Training Students. *Procedia - Social and Behavioral Sciences*, 228, 196-201. doi:10.1016/j.sbspro.2016.07.029
- Sirichai Kanjanawasee. (2013). *Classical test theory*. Bangkok: Chulalongkorn University Printing House. (in Thai)
- TeachThought. (2020). 9 Learning Tools Every 21st Century Teacher Should Be Able To Use. 1. Retrieved from <https://www.teachthought.com/the-future-of-learning/9-digital-learning-tools-every-21st-century-teacher-should-be-able-to-use/>
- Team, E. (2020). The Comprehensive List of Digital Skills Students Need. 1. Retrieved from <https://equip.learning.com/digital-skills-list>
- Tomczyk, L. (2020). Digital literacy and e-learning experiences among the pre-service teachers data. *Data Brief*, 32, 106052. doi:10.1016/j.dib.2020.106052
- Vélez, A. P., & Zuazua, I. I. (2017). Digital Literacy and Cyberconvivencia in Primary Education. *Procedia - Social and Behavioral Sciences*, 237, 110-117. doi:10.1016/j.sbspro.2017.02.050
- Veugen, M. J., Gulikers, J. T. M., & den Brok, P. (2021). We agree on what we see: Teacher and student perceptions of formative assessment practice. *Studies in Educational Evaluation*, 70. doi:10.1016/j.stueduc.2021.101027
- Walton, G. (2016). "Digital Literacy" (DL): Establishing the Boundaries and Identifying the Partners. *Academic Librarianship*, 22(1). doi:<https://doi.org/10.1080/13614533.2015.1137466>
- Wagner, T. (2008). The Global Achievement Gap. [Online]. Retrieved November 10, 2021, from: <https://slideplayer.com/slide/6648735/>

- Wang, T.-H. (2008). Web-based quiz-game-like formative assessment: Development and evaluation. *Computers & Education, 51*(3), 1247-1263. doi:10.1016/j.compedu.2007.11.011
- Wu, D., Zhou, C., Li, Y., & Chen, M. (2022). Factors associated with teachers' competence to develop students' information literacy: A multilevel approach. *Computers & Education, 176*. doi:10.1016/j.compedu.2021.104360