Assessment of High School Students' Learning and Development of Qualities and Competencies: A Case Study

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Abstract

This study aims to assess high school students' learning outcomes, their achievement of goals and fulfilling academic requirements and how the entire teaching and learning process takes place. The study, consisting of an experimental group and a control group was conducted for pre-test and post-test comparisons of the academic performance of 88 10th grade students. 44 students were selected as the experimental group that underwent a specific teaching strategy to monitor their development of qualities and competencies in one semester, and the remaining 44 students acted as the control group. The data collected after the tests were analyzed using SPSS software (V20). The results showed that the students in the experimental group had better academic results than those in the control group. The findings of this study have implications for policy, further research as well as approaches for the assessment of students' development of qualities and competencies in Vietnam.

Contents

Contribution of this paper to the literature
This study contributes to existing literature by assessing high school students' learning outcomes, their achievement of goals and fulfilling academic requirements and how the entire teaching and learning process takes place.

1. Introduction

In countries all over the world, there has been a general trend in shifting from teaching processes focusing on objectives and contents to ones focusing on organizing the teaching and learning process, in order to shape students' competencies and qualities. In line with this change in focus, the assessment of students has also changed to areas of competence and quality-based development. When a program is designed based on the approach to capacity building, not much importance is attached to knowledge; teaching and learning methods and organization become the main areas of focus. Teachers need to be trained to know how to create situations that are conducive to learning, form friendly and positive interaction environments and help all students have the opportunity to express their personal views and discuss and give opinions, thereby making students active   by promoting their interest and confidence (Bernd & Nguyen, 2014). A successful lesson requires a teacher to make all students, the weak, good and excellent, be active to discover and gain experience during the lesson, and be able to transform themselves in positive ways.

The policy of innovating teaching methods necessitates teaching creatively in order to enable learners form the ability to observe, gather information, conduct self-assessment and develop problem solving and communication skills. However, all of these competencies and skills must be demonstrated and responded to during the assessment process. If viewed from this perspective, the innovation and design of the assessment process is extremely important. It becomes the point of reference for the entire teaching process and the entire process of revising the textbooks because the innovated assessment process forces other processes to change as well.

Assessment of the learning process includes activities of observing, monitoring, exchanging, checking and commenting on the learning and practice processes of students; advising, guiding and motivating students; giving qualitative or quantitative comments on learning outcomes and the formation and development of students' competences and qualities. These assessment activities are aimed at helping students learn from their own experiences and comment on each other in the process and adjust the way of learning by themselves, thereby gradually forming and developing the ability to apply knowledge and self-study ability and the ability to detect and solve problems in a communicative and cooperative environment, thus enhancing students' interest in learning in the educational process.

In Vietnam, General Education is making a transition from content-based educational programs to ones that focus on competence-based development, that is, from being concerned about what knowledge students can obtain to being concerned about what students can do through learning. To ensure a successful transition, it is essential to implement changes in the teaching methods, from ones focusing on knowledge transmission to ones concentrating on how to learn, how to apply knowledge, practice skills and develop competences and qualities.   At the same time there must be a change in the way of assessment from memory testing to the assessment of the ability to apply knowledge to solving problems, focusing on formative assessment to improve the quality of the teaching and education activities.

Assessments need to aim at the development of students' qualities and competencies based on standardized levels of knowledge, skills, attitudes and expressions, in line with educational goals; assessments should be able to help students work on their learning methods. Regular assessments should be given emphasis for all students. This includes assessment of classroom activities; assessment through study records and study notebooks; assessment through students' reporting on the results of implementing a learning project, scientific research, practical tasks and experiments; assessment through presentations (assignments, video clips etc.) and learning products, thus combining formative assessment with summative assessment. It combines teacher assessment with self-assessment (Kilic, 2016) and peer assessment (Abdou, 2017) , and assessment of parents and the community. It is necessary to appreciate each student's progress and not compare one student with another. Importance should be attached to motivating and encouraging students' interests and positivity and overcoming difficulties in learning, while helping students develop their individual talents and ensuring timeliness, fairness and objectivity to prevent pressure exerted on students, teachers and parents.

1.1. Research Questions

Q1: Does formative assessment have an impact on student learning outcomes?
Q2: How does teacher support in the teaching and learning process help students develop competencies and qualities?
Q3: What are students' perceptions of their own change processes experienced along the path of quality and competency development?
Objectives: The objective of the study is to evaluate the learning outcomes of 10th grade students in informatics, with the impact of regular assessment.
Specific objectives: Short-term objective: To evaluate the results periodically (midterm exams) for 10th grade students in informatics.
Long-term objective: To help students develop their competencies and qualities in the field of informatics under the 2018 general education program of the Ministry of Education and Training in Vietnam.

2. Research Content

2.1. Definitions

In the teaching process, assessment is considered a continuous process and a part of teaching activities. According to Nguyen Cong Khanh, assessment refers to students and teachers' disposition to anticipate work to be done next and helps students make progress.

Learning performance and Assessment of learning performance.

According to Tran (2020) in the area of learning performance modern teaching theories state that learning is, by nature, the acquisition and processing of information mainly by intellectual manipulations based on learners' biological capital and personal achievement, thereby appropriating knowledge from the treasure of human culture and scientific concepts,.   These concepts are recreated by using them as tools to absorb other concepts or open up new ideas, and expanding them to a higher level by mastering the theoretical system to apply in practice, as well as by exploring and creating knowledge.

Nguyen (2018) in his work, "The theoretical basis of assessment of high school students' learning quality" introduced the understanding of learning performance as follows: "Learning performance is commonly understood through two different conceptions in practice as well as in science".

In the area of Assessment of learning performance, Tran (2015) introduced the concept of assessment of learning performance as the process of collecting and processing information about learners' qualifications and abilities to implement defined learning objectives, in order to form the basis for teachers' pedagogical decisions, for the school's progress and for the students themselves to help them make more progress in their learning.

2.2. Literature Review

Assessment is an important process to find out what learning experiences students have gained as a result of instruction. It seeks answers to the following questions: 1) in what ways do students differ and 2) how much have students changed? Students' achievement of the goals set in courses or programs helps educators and educational administrators assess the effectiveness of teachers' instruction and to suggest ways to improve the teaching and learning process. In order to ensure the quality and effectiveness of students' learning, it is necessary to apply a modern point of view to student assessment (Earl & Katz, 2006). The modern perspective on testing and assessment is oriented towards the development of students' qualities and competences, focusing on formative assessment to promptly detect the progress of students, thereby enabling the adjusting and self-adjusting of teaching and learning activities in the instructional process. This point of view clearly shows assessment as learning and assessment for learning. In addition, assessment of learning is also carried out at the end of the educational process to confirm what students have achieved compared with the learning outcome standards.

The current development of information technology has a great impact on supporting students and improving learning outcomes (Irving, 2015). One way that technology can significantly facilitate the teaching and learning process is that it helps improve teachers' ability to make formal assessments of learners' skills and knowledge during their instruction. Providing immediate feedback during the formative assessment process with the aim of improving student performance is considered very important in learning and teaching (Elmahdi, Al-Hattami, & Fawzi, 2018). Various studies shed light on the development of technology and its effects in the field of education (Agormedah, Ansah, Betakan, & Parker, 2019; Heflin, Shewmaker, & Nguyen, 2017; Lin & Wu, 2016; Lin, Chen, & Liu, 2017; Rugube & Govender, 2022; Wu & Tai, 2016).

Assessment should be closely integrated with teaching as it deals with learning to form and develop students' competencies. Teachers plan and develop specific assessment strategies and processes (Wang, Sun, & Jiang, 2018). These assessment strategies are directly related to improving student performance in periodical tests and exams. Research   on the influence of information and communication technology (ICT) on student motivation and academic achievement (Ammar, Alqahtani, Albraa, & Rajkhan, 2020; Heemskerk, Volman, Admiraal, & ten Dam, 2011) has identified special strategies that help low-achieving students improve their academic performance. By using various information technology tools during the Covid-19 pandemic (Eileen, Costello, O'Brien, & Hickey, 2021), teachers have been able to raise the reliability and validity levels of assessment information (Erwin Akib, 2015). During the Covid-19 pandemic period, teachers have also flexibly used ICT to support formative assessment through multiple forms of exercises integrated into the online learning system (OLS) (Ishfaq, 2020). With the use of such assessment methods, the teacher plays a key role in the assessment of learning, but students are also involved in the assessment process. Students can conduct self-assessment to better adjust their learning activities.

3. Research Methodology

Selection of sample: A group of 44 10th grade students was selected as the experimental group with teachers' strategies adjusted to monitor students for one semester.

Study Design: The design consisted of an experimental group and a control group formed for comparisons in the pre-test and post-test with respect to the academic outcomes of 88 students in grade 10, in term 1 of the 2021-2022 academic year. The topic of Computer Networks and the Internet was taught to both groups at the same time with a 2-phase assessment:

Phase 1: Regular assessment/formative assessment.

Phase 2: Midterm assessment.

Group A: (N=44) Control group (no adjustment in the teacher's strategies).

Group B: (N=44) Experimental group (with adjustment to the teacher's strategies on online instruction and support on the websites: *http://danhgiananglucthpt.edu.vn/*; *http://splearning.vn/* with exercises and content review tools related to regular and periodic exams).

In both phases, the experimental group was supported by the teacher's strategies through an online assessment support system on the websites: http://danhgiananglucthpt.edu.vn/; http://splearning.vn/ before the regular assessment, midterm assessment and final assessment in the classroom. Throughout the 9 weeks in semester 1, the experimental group was supported by the exercise tools through 2 phases, as follows:

From week 1 to week 8, there were 4 additional contents and exercises learned with the guidance of the teacher. During these first 8 weeks there were 3 tests (1 pre- test and 2 post- tests)

Week 9 Mid-term Assessment: The essence of this study was the teacher's adjusted strategies in the learning process. Assessment tools for both groups used through tests were designed according to the levels which ranged from awareness, understanding and application to high application. Both experimental and control groups were assessed on the levels of knowledge related to the contents of the topic in Chapter 4.5 (Computer networks and the

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Internet - Informatics grade 10) in the second week in the pre- test. An identical test was used to check the performance of students in both groups. The duration of the multiple- choice test (test 1) was 30 minutes and the duration of the essay and multiple- choice test (test 2) was 90 minutes. The test answer sheets were then collected and scored to compare the results achieved by the two groups.

Phase 1: From week 2 to week 8, both groups worked on related topics in semester 1. Group A was the experimental group which worked with the support of the teacher's instruction and online assessment system, and Group B was the control group. For the purpose of formative assessment, the aim was to determine whether there was any difference in learning outcomes between the control group and experimental group. The topics were taught to both groups, and two tests on formative assessment in the form of multiple choice -questions and essay style were given to both groups.

Phase 2: After 8 weeks, both groups had a periodic in-class test in week nine with the content focusing on topics covered over the eight weeks in the form of essays and multiple choice questions, set at a ratio of 7-3 (70% multiple choice and 30% essay). The results were then analyzed and evaluated.

4. Research Results and Discussion

4.1. Research Results

Table 1. Number of males and females in the experimental group (EG) and control group (CG)

Group	Male	Female	Total
EG	24	20	44
CG	23	21	44
Total	47	41	88

Table 1 shows the males accounted for 53.4% and females 46.6% of the sample population.

Table 2. Comparison of Paired samples test for experimental group and control group in the pre-test

Test		Mean	N	Cronbach's Alpha	Std. Deviation	Std. Error Mean
Test 1	Pre Test	6.989	44	0.917	1.900	0.286
	Post Test	6.830	44		1.617	0.243

Table 3. Comparison of paired samples test for experimental group and control group

Comparison between two pairs of groups		Paired Differences					T	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Pre Test – Post Test	0.159	0.768	0.116	-0.075	0.393	1.373	43	0.177>0.05

Table 3 presents the Paired Samples Test for the experimental group and control group. In the pre – test both groups sat for test 1. The results are shown in Table 2. The reliability of the results of the first test show Cronbach's Alpha coefficient at $0.917 \geq 0.6$ and Sig. (2-tailed) =.177>0.05, which shows that the results of both experimental class and control class were similar.

In the post-test, both experimental group and control group sat for a midterm exam. The results obtained are as follows:

Table 4 presents the differences in Mean and Std. Deviation of the experimental group and the control group.

Table 4. Differences in Mean and Std. Deviation between the experimental group and control group

Test		Mean	N	Std. Deviation
Test 2	EG2	7.284	44	1.757
	CG2	6.909	44	1.685
Test 3	EG3	7.465	44	1.245
	CG3	7.215	44	1.519
Test 4	EG4	7.738	44	1.323
	CG4	7.13	44	1.604

Table 5. Paired differences in 3 tests between the experimental group and control group

Test		Paired Differences					T	P- Value	Df
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Test 2	EG -CG	0.375	0.405	0.061	0.251	0.498	6.138	0.000	43
Test 3	EG -CG	0.250	0.488	0.074	0.102	0.398	3.397	0.001	43
Test 4	EG -CG	0.602	0.489	0.074	0.453	0.751	8.167	0.000	43

Table 5 presents the paired differences in 3 tests between the experimental group and control group.

Case 1: EG-CG for test 2

In the post test (test 2) the mean difference between the experimental group and control group is .375 with a p-value of <0.05, which proves that the adjusted strategies and support of OLS in the study were effective in helping students improve in their performance. Although the difference in the mean values between the control group and the experimental group has changed, the independent T-test results of the control group and

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experimental group show p = .000 (p < 0.05). However, this difference is small, that is, the increase in mean values of the control and experimental groups is completely random. The result of effect size between the experimental and control groups shows t = 6,138, which is within the average effect size. However, the difference between the two groups is statistically significant.

Case 2: EG-CG for test 3.

In the differences in mean value and the level of effect size between the experimental and control groups in Test 3, the mean difference between the experimental group and control group is .250. The independent T-test results of the experimental group and control group is 0.000 (p < 0.05), so the difference in mean values in the post test is significant, not due to random probability but rather due to the effectiveness of the adjusted measures. However, this difference is small. The results of effect size in the post-test for the two groups show t = 3.397, which is a small effect size. This means that the impact of the post-test on the mean difference is small. The difference, however, is meaningful, practical and reliable.

Case 3: EG-CG for test 4.

Similarly, with the independent t-test result of the experimental group and the control group being 0.000 (p < 0.05), the difference in the mean values in the post-test is significant, not due to random probability but due to the effectiveness of the adjusted measures. The difference in the mean value between the experimental group and the control group in the post-test is 0.602, and t = 8.167; the value is quite big. This means that the effect size of the mean difference is very big, demonstrating that the difference is meaningful, practical and reliable.

To finish the 8- week formative assessment, a midterm 5th test was administered in week 9 to both groups. The results are shown in the following table:

Table 6. Difference between Mean and Std. Deviation between the experimental group and control group

Group	Mean	N	Std. Deviation
CG5	7.27	44	1.717
EG5	7.807	44	1.415

Table 7. Paired differences between the experimental group and control group in midterm test

Group	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
CG5 - EG5	-0.534	0.499	0.075	-0.686	-0.382	-7.102	43	0.000

Based on Tables 6 and 7, the difference in mean values between the experimental group and control group is .534, with a p-value of <0.05, which proves that the formative assessment with teacher support is effective in helping students improve their performance. Tables 6,7 and 8 also show that the differences in the mean values between the control group and the experimental group changed compared with that in the pre-test. Specifically, the average difference between the experimental group and control group in test 5 is .534 and the independent T-test results of the control group and experimental group show p = .000 (p < 0.05). The effect size between the experimental group and control group shows t = 7,102, which is within a fairly large effect size. Therefore, the difference between the two groups is statistically significant.

In order to increase the reliability of the study, a variance test was done based on the results of the mean values and the variances of the experimental group and control group on the hypothesis (H0): "Differences in the variances between the experimental group and control group are not significant". To confirm that the result was statistically significant, the results of the characteristic parameters of the samples were obtained from SPSS20 software. Table 6 shows that $\overline{X}_{EG} > \overline{X}_{CG}$ and the absolute value of EG and CG is: |t Stat| = 7.102 >1.96 larger than the standard z value (1.96), thus rejecting H0. This confirms that the difference in mean scores between the experimental group and control group is statistically significant.

The results in Tables 6 and 7 and chart 1 show that the mean difference between the experimental group and control group in the post-test is 0.534 (7.807 − 7.272), the variance is .499 and T-test shows p=0.000<0.05, thus rejecting H0: "The difference in the variances between the experimental group and the control group is significant".

Specifically, those who followed the teacher-led approach with the support of an online learning system had better results than those who followed the conventional classroom instruction. Therefore, on the basis of this result, it can be concluded that formative assessment with the support of the online learning system is much more effective than the conventional instruction.

Table 8. Differences in mean and Std. Deviation between the experimental group and the control group in pre- test and post test

Group		Mean	N	Std. Deviation
Pair 1	EG1	7.273	44	1.56
	E2G5	7.807	44	1.415
Pair 2	CG1	7.170	44	1.66
	C2G5	7.272	44	1.717

Table 9. Paired differences between the experimental group and the control group in pre test and post test

Group	Paired Differences							
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		t	df	Sig. (2-tailed)
				Lower	Upper			
EG1 - EG5	-0.534	0.409	0.062	-0.658	-0.409	-8.659	43	0.000
CG1 - CG5	-0.102	0.477	0.072	-0.247	0.043	-1.422	43	0.162

Tables 8 and 9 show the difference in mean values between the pre - test and post-test for the control group is -.102. In the pre-test and post-test of the experimental group, the difference is -.534. Although the difference in the mean values between the pre -test and post-test changed for the control group, the independent T-test shows pCG =.162 (p>0.05). This difference is not significant, that is, the increase in the mean value of the control group in the post-test is totally random. In contrast, pEG1 in the pre-test and post-test (EG) has a mean difference of -.534 and p = 0.000 (p<0.05), so this difference is significant, that is, it is not random but the result of effective support. The effect size of the pre-test and post-test for the control group is t =1.422, which is within the small effect size, and could be considered as showing no change. Therefore, the difference between the 2 groups is not statistically significant. In contrast, in the pre-test and post-test of the experimental group, the effect size is t =8.659, which is within the large effect size. Therefore, the difference between the 2 groups is statistically significant.

Next, to assess the satisfaction level of 44 students in grade 10 informatics with the support of an online learning system, a survey using 10 items was conducted after the post-test. . The results are given in Tables 10 and 11.

Table 10. Reliability of 10 survey items

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0.756	0.775	10

Table 11. Students' feedback after the post-test

No	Response	Strongly agree	Agree	Not sure	Dis-agree	Strongly disagree	Mean
1	Testing - Assessment is very important for students	18 (40.9%)	24(54.5%)	2(4.5%)	0(0%)	0(0%)	4.36
2	Formative assessment helped me learn more actively	6(13.6)	29(65.9)	7(15.9)	2(4.5)	0(0.0)	3.89
3	The online learning system helped me learn more effectively	17(38.6)	22(50.0)	5(11.4)	0(0.0)	0(0.0)	4.27
4	Content of lesson summaries on the web helped me learn in a focused manner	8(18.2)	18(40.9)	14(31.8)	4(9.1)	0(0.0)	3.68
5	Exercises to supplement the information in each lesson helped me perform more effectively in the midterm exam	18(40.9)	22(50.0)	3(6.8)	1(2.3)	0(0.0)	4.30
6	The Mid-term exam followed the review content on the system closely	20(45.5)	17(38.6)	6(16.6)	1(2.3)	0(0.0)	4.27
7	Web-based online support system helped me develop my learning ability	11(25.0)	28(63.6)	5(11.4)	0(0.0)	0(0.0)	4.14
8	Teachers' video lectures and E-learning lessons on the web helped me master the knowledge imparted to students	6(13.6)	15(34.1)	18(40.9)	5(11.4)	0(0.0)	3.50
9	Courses with the support of learning systems like this one helped me learn more effectively	3(6.8)	10(22.7)	26(59.1)	5(11.4)	0(0.0)	3.25
10	The results achieved fulfilled my personal wishes	17(38.6)	17(38.6)	9(20.5)	1(2.3)	0(.0)	4.14

Comments: Table 11 shows that students strongly agreed with the item, "Testing - Assessment is very important for students," with a mean value of 4.36, ranking it the highest in the list of 10 questions. Next, up to 65.9% of the students believed in the statement, "Formative assessment helped me learn more actively," even though the mean was only 3.89. Meanwhile, the item "Web-based online support system helped me develop my learning ability" was highly accepted by the students, at 63.6%. The results can be good when students attach great importance to the online support system, which is also very relevant during the COVID-19 pandemic. On the item, "Exercises to supplement the knowledge of each lesson helped me perform more effectively in the midterm exam," 90.9% of the students agreed or strongly agreed with this item. That confirms that teachers had built an assessment tool that was very suitable for the contents of each topic. Moreover, for the item, "Web-based online support system helped me develop my learning ability", the students said that they really found their learning ability had increased (89.6% of students agreed or strongly agreed). However, there were still nearly 23% of students who disagreed or partially agreed with the item, "Courses with the support of learning systems like this one helped me learn more effectively"; more than 51% held similar views for the item "Teachers' video lectures

and E-learning lessons on the web helped me master the knowledge imparted to students" and 41% of students disagreed or partially agreed with the item, "Content of lesson summaries on the web helped me learn in a focused manner". However, more than 72% of students agreed that, "The results achieved fulfilled my personal wishes". This result also confirms the level of student satisfaction with teachers using the learning system to help students improve their learning capacity as well as their learning outcomes.

4.2. Discussions

The results of this study show that assessment must aim at the development of students' qualities and competencies by reaching the levels of knowledge, skills, attitudes and expressions of students' qualities and competencies based on secondary/high school education goals; assessment needs to be emphasized to help students with learning methods. Regular assessment should be carried out for all students in the form of classroom activities; assessment through study records and study notebooks; assessment through students' presentations of results in implementing a learning project or scientific research, reports on results of practices and experiments; assessment of presentations (essays, slides, video clips, etc.) on the results of performing learning tasks (hereinafter referred to as learning products); combining formative assessment in the process of teaching and learning and summative assessment at the end of the semester and at the end of the school year. Teacher assessment is combined with self-assessment, peer assessment and parents and community assessment. Each student's progress is appreciated while comparing one student with another should be avoided. It is necessary to attach importance to motivating and encouraging students' interest and positivity, and overcoming difficulties in learning and training as well as helping students develop their individual talents and ensuring timeliness, fairness and objectivity without putting pressure on students, teachers and students' parents.

Currently, there are lots of conceptions of assessment of learning performance. There is a general point of view that assessment of learning performance is the systematic collection, review and use of information about the curriculum that has been applied to improve students' learning and development outcomes.

Assessment of learning and development of students' qualities and competencies should focus on the ability to creatively apply knowledge to different situations. Assessment of learning in subjects and practical activities is the main measure to determine the level of achievement of teaching objectives, which plays an important role in improving students' academic performance (Ha, 2019). The research by Assoc. Prof. Dr. Nguyen Cong Khanh also shows that assessment of learning and development of students' qualities and competencies, through the standards of output products are not only knowledge and skills, but mainly the ability to apply the knowledge, skills and attitudes required to perform a learning task of a certain standard. The general orientation in assessment of learning is to build exam questions and tests according to the matrix; the assessment in the teaching and learning process is done through tests with questions and exercises based on 4 levels of requirements:

- Identification: students recognize or describe correctly learned knowledge and skills when required.
- Comprehension: students clearly express knowledge or describe skills learned in their own language in their own way, are able to add activities of analysis, explanation and comparison and directly apply (based on the model) learned knowledge and skills to solving problems.
- Application: students connect and rearrange the knowledge and skills learned to successfully solve situations and problems similar to learned situations and problems.
- Further application: students can apply knowledge and skills to solving new problems which are not similar to those that have been guided and give reasonable responses to a new situation or problem in study or in life. Based on the level of the development of students' competence in each semester and each grade, teachers and schools determine the proportion of questions according to the 4 levels required in the tests, based on the principle of ensuring the suitability for students and gradually increasing the rate of questions at the level of application and further application.

5. Conclusions

The main implication of this study is that it is essential for educators to use ICT-assisted formative assessment to monitor student learning outcomes. In addition to the involvement of students in the formative assessment through learning activities, video lectures and lessons can be integrated into the online learning system to help students conduct self-assessment to develop their study skills. In order to achieve the learning objectives, teachers need to pay particular attention to the mechanisms that help develop a conducive learning environment where each learner values mutual support or personalization of learning. To help students fully benefit from self-assessment activities, teachers need to take into account the activities and processes that motivate students to build a learning environment as reflected in the results of the research. Through testing and assessment, teachers draw experiences and adjust teaching and educational activities right in the process and at the end of each teaching and educational stage; promptly detect the efforts and progress of students to motivate and encourage students; detect difficulties that cannot be overcome by students and give advice and help make appropriate comments about the outstanding advantages and limitations of each student in order to take timely remedial measures to improve the quality and efficiency of students' learning and training activities. In line with its aims and objectives, this study has partly confirmed that regular assessment/formative assessment has a positive impact on student learning outcomes with the support of ICT. The results of this study are similar to those of the study by Karaman (2021); Andersson and Palm (2017a). The process enables students to improve their academic achievement through the way teachers support the web-based online systems http://danhgiananglucthpt.edu.vn and http://splearning.vn with online lessons, lesson summaries, videos on key contents of the topics of 8 weeks, and more especially, essay exercises and multiple choice exercises to help students check their results by themselves. Through the support of teachers, it is also possible to answer the question "How does teachers' support in the teaching process help students develop qualities and competences"? Simultaneously with the results shown inTable 12, it is proved that students responded positively to this study. However, there are many other factors that can directly affect student achievement, such as assessment of student progress or improving student engagement with ICT support. The

findings of this study suggest that formative assessment, teachers' instruction and the use of ICT in the learning process help improve student learning outcomes. However, the findings are limited by the number of formative assessment studies conducted in Vietnam. Other limitations are related to students' different educational backgrounds and conducting only the types of assessment given on the web-based online learning management system. In future research, it is necessary to investigate and compare more variables such as subject areas, forms of formative assessment and response ways and response time taken by students after the course and during the learning process.

References

Abdou, N. (2017). Peer/Self assessment and student learning. *International Journal of Teaching and Learning in Higher Education*, *29*(2), 255-269.

Agormedah, E. K., Ansah, E. A., Betakan, M. B., & Parker, D. (2019). Instructional technology integration: Understanding Senior High School business studies teachers' concerns. *American Journal of Social Sciences and Humanities*, *4*(4), 486–497.Available at: https://doi.org/10.20448/801.44.486.497.

Ammar, Y., Alqahtani, Albraa, A., & Rajkhan. (2020). E-Learning critical success factors during the COVID-19 pandemic: A comprehensive analysis of e-learning managerial perspectives. *Science*, *10*, 216.Available at: https://doi.org/10.3390/educsci10090216.

Andersson, C., & Palm, T. (2017a). 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.Available at: https://doi.org/10.1016/j.learninstruc.2016.12.006.

Bernd, M., & Nguyen, V. C. (2014). *Modern teaching theories - The basis of innovation in teaching objectives, content and methods.* Hanoi: University of Education Publishing House.

Earl, L. M., & Katz, S. (2006). Rethinking classroom assessment with purpose in mind Assessment for learning, assessment as learning, assessment of learning. Sourced from Western and Northern Canadian Protocol, 3-53. Retrieved from: https://digitalcollection.gov.mb.ca/awweb/pdfopener?smd=1&did=12503&md=1.

Eileen, W., Costello, A., O'Brien, M., & Hickey, G. (2021). Teachers' use of technology and the impact of Covid-19. *Irish Educational Studies*, *40*(2), 235-246.Available at: https://doi.org/10.1080/03323315.2021.1916559.

Elmahdi, I., Al-Hattami, A., & Fawzi, H. (2018). Using technology for formative assessment to improve students' learning. *Turkish Online Journal of Educational Technology*, *17*(2), 182-188.

Erwin Akib, M. N. A. G. (2015). The validity and reliability of assessment for learning (AfL). *Education Journal*, *4*(2), 64-68.Available at: https://doi.org/10.11648/j.edu.20150402.13.

Ha, D. T. (2019). *Management and assessment of the learning performance of vocational students toward the competence-based approach.* Dissertation in Educational Science. Vietnam Institute of Educational Sciences 2019.

Heemskerk, I., Volman, M., Admiraal, W., & ten Dam, G. (2011). Inclusiveness of ICT in secondary education: students' appreciation of ICT tools. *International Journal of Inclusive Education*, *16*(2), 155-170.

Heflin, H., Shewmaker, J., & Nguyen, J. (2017). Impact of mobile technology on student attitudes, engagement, and learning. *Computers & Education*, *107*, 91-99.Available at: https://doi.org/10.1016/j.compedu.2017.01.006.

Irving, K. (2015). Technology-assisted formative assessment. *Improving K-12 STEM Education Outcomes through Technological Integration*, 380.

Ishfaq, M. (2020). ICT in assessment: A backbone for teaching and learning process. *United International Journal for Research & Technology*, *1*(3), 38-40.

Karaman, P. (2021). The effect of formative assessment practices on student learning: A metaanalysis study. *International Journal of Assessment Tools in Education*, *8*(4), 801-817.Available at: https://doi.org/10.21449/ijate.870300.

Kilic, D. (2016). An examination of using self-, peer-, and teacher-assessment in higher education: A case study in teacher education. *Higher Education Studies*, *6*(1), 136-144.Available at: https://doi.org/10.5539/hes.v6n1p136.

Lin, C. S., & Wu, R. Y. W. (2016). Effects of web-based creative thinking teaching on students' creativity and learning outcome. Eurasia Journal of Mathematics. *Science & Technology Education*, *12*(6), 1675-1684.

Lin, M. H., Chen, H. C., & Liu, K. S. (2017). A study of the effects of digital learning on learning motivation and learning outcome. *Journal of Mathematics Science and Technology Education*, *13*(7), 3553-3564.

Nguyen, C. T. (2018). Assessment for learning on learner performance in informatics at high school. *Journal Hanoi National University of Education*, *63*(11A), 41-50.

Rugube, T. T., & Govender, D. (2022). Evaluation of a software model for integrating learning management systems and massive open online courses. *International Journal of Innovative Research and Scientific Studies*, *5*(3), 170–183.Available at: https://doi.org/10.53894/ijirss.v5i3.493.

Tran, K. D. (2015). Competence and learning capacity. *Journal Hanoi National University of Education*, *63*(357), 19-21.

Tran, T. T. (2020). *Developing the capacity for assessment for learning for students majoring in Mathematics Education.* Dissertation in Theory and Methodology of Mathematics Teaching. Thai Nguyen in 2020.

Wang, D., Sun, Y., & Jiang, T. (2018). The assessment of higher education quality from the perspective of students through a case study analysis. *Frontiers of Education in China*, *13*(2), 267-287.Available at: https://doi.org/10.1007/s11516-018-0014-0.

Wu, T.-J., & Tai, Y.-N. (2016). Effects of multimedia information technology integrated multi-sensory instruction on students' learning motivation and outcome. *Eurasia Journal of Mathematics, Science and Technology Education*, *12*(4), 1065-1074.Available at: https://doi.org/10.12973/eurasia.2016.1552a.