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Designing and Using Icons for Primary Pupils' Performance Self-Assessment and Peer Assessment in the Third-Grade Natural and Social Sciences Subject to Meet Educational Innovation Requirements

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ABSTRACT: *Developing assessment tools for conducting self-assessment and peer assessment-as well as organizing various forms of these assessments-must align with the cognitive and psychological characteristics of primary school pupils. Such tools should limit the use of written information and instead increase the use of intuitive, visually appealing icons that represent teaching content. Using icons for self-assessment and peer assessment is fully consistent with the psychological characteristics of primary school pupils. This research introduces a process for designing and using icons to support self-assessment and peer assessment. Researchers designed 213 icons across six topics in the Third-grade Natural and Social Sciences Subject to serve pupils in conducting these assessments. Additionally, the study experimentally applied the designed icons to support self- and peer-assessment during the instruction of each lesson within the selected topics. Experimental results show that the icons-designed based on the subject matter of Third-grade Natural and Social education-are highly suitable for use in self-assessment and peer assessment when implemented in practice. During assessment activities, the diversity of icons tailored to thematic content enhances pupils' interest and enthusiasm as they engage in self- and peer-assessment.*

KEYWORDS: **Self-assessment, peer assessment, icons, Natural and Social Sciences Subject.**
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1. Introduction

When implementing educational reform, in parallel with the innovation of teaching methods, it is necessary to renew the examination and evaluation of educational results at the same time. In the 2020–2021 academic year, with the renewal of the primary school curriculum, assessment in education was also updated according to Circular 27/2020/TT-BGDĐT issued on September 4th, 2020. Through assessment activities: *"Pupils are allowed to self-review and participate in commenting on their learning products and those of their peers in the process of performing learning tasks to learn and do better"* (Ministry of Education and Training, Circular 27, 2020). The aim of these assessment activities is not only to provide a judgment and/or feedback on pupils' performance but also to help them revise and improve their learning process. Assessment processes can help pupils understand the success of their learning activities and recognize both strong points and critical issues (Concina, 2022). It can be seen that one of the evaluation orientations for developing the quality and competencies of pupils is self-assessment and peer assessment.

Self-assessment and peer assessment bring many benefits to the teaching and learning of both teachers and pupils. Self- and peer assessments are viewed as processes that can support pupils' autonomous learning, social exchange, and critical thinking (Bozkurt, 2020). Pupils' self-assessment in education involves a wide variety of mechanisms and techniques through which students describe and evaluate the quality of their learning processes and products (Panadero *et al*., 2016). Self-assessment helps pupils gain a clearer view of the learning results they have achieved,

understand their learning process, recognize their strengths and weaknesses, identify reasons for any low performance (Papanthymou & Darra, 2023), and have a direction for improvement. Self-assessment develops autonomy, metacognitive skills, personal and intellectual development, as well as social skills (Leach, 2012). It also contributes to helping pupils form qualities such as honesty, self-esteem (Taratori-Tsalkatidou, 2015), cognitive control, a sense of lifelong learning (Wride, 2017), and deep learning (Leach, 2012). In peer assessment, pupils comment on and evaluate each other, increasing interaction among learners and between learners and teachers (Thuy & Le, 2021), while developing communication and social bonds. Self-assessment and peer assessment help teachers evaluate pupils more comprehensively and objectively. Through these assessments, pupils develop skills to become critical and creative thinkers, effective communicators, and more productive learners (Harrison *et al*., 2015), which in turns provides teachers with guidance to make teaching more effective in the future.

In the context of the 2018 General Education Curriculum, assessment contributes to the development of pupils' competencies and requires active participation from both teachers and pupils (Tuan & Tri, 2020). In primary education, assessment includes formative and summative assessment. Formative assessment is a long-term process aligned with the goals of developing pupils' qualities and competencies. It can be considered a broad strategy that includes many smaller strategies, such as self-assessment and peer assessment (Thuy & Le, 2021). Taras (2010) emphasized that formative assessment supports the use of self-assessment, as it enhances learning and is one of the most important skills pupils need for effective learning, future professional development, and lifelong learning. Teachers and pupils need to focus on formative assessment to gather learning information and promptly adjust the teaching and learning process, aiming at the holistic development of pupils. In the 2018 Natural and Social Sciences Subject curriculum in primary school, formative and summative assessments do not use grades but provide only comments. Teachers can use various assessment tools, such as checklists, scales, and rubrics. To quickly and effectively record formative assessment, teachers can use icons to support assessment tools flexibly, adapting them to each learning topic in the subject and enabling pupils to perform self-assessment and peer assessment.

Using icons helps teachers design self-assessment and peer assessment tools or sheets more easily by saving presentation space (Horton, 1996). If the icons are designed based on the teaching content in the Natural and Social Sciences Subject, self-assessment and peer assessment using these icons can help pupils better remember the knowledge they have learned, as well as the results of the assessment, preparing them for self-correction in future learning. The icons require a variety of design elements, such as colors, shapes, and lines, which must be harmoniously combined (Van *et al*., 2003). Well-designed icons provide pupils with new and pleasant experiences through rich visual forms (Yan, 2011), supporting their interest and enjoyment in self-assessment and peer assessment.

Icons have no regular language elements such as inflections, numbers, gender, punctuation, articles, or linear order (Leemans, 2001), creating a distinction between symbolic language and written language. Using icons helps pupils perform self-assessment and peer assessment by allowing quick and instant recognition, helping them overcome language barriers (Perlovsky, 1999), and providing opportunities for better recall of meanings (Horton, 1996). As a result, teachers can easily obtain information about pupils' learning outcomes and achievement levels according to curriculum requirements, giving them guidance to adjust teaching to suit pupils' abilities. When pupils use icons for self-assessment and peer assessment, it also contributes to developing their ability to manage these assessment forms, which is related to competencies such as self-control, self-directed learning, communication, and cooperation, etc.

In fact, teachers have used icons to support the assessment of pupils. However, the number of icons has been small, and repeated use can cause

boredom for pupils. Therefore, to make self-assessment and peer assessment more engaging and effective, it is necessary to design diverse icons to support assessment. What is the basis for designing a system of icons to assess various topics in teaching? What steps can teachers take to design icons, and how should they be used? This study introduces the design of icons for pupils' self-assessment and peer assessment in the Third-grade Natural and Social Sciences Subject and presents an experiment on the use of these icons to evaluate their effectiveness and pupils' interest in using icons for self- and peer-assessment.

2. Literature review

2.1. Self-assessment

Self-assessment in education involves a wide variety of mechanisms and techniques through which the student describes and assesses the quality of learning processes and their products (Panadero *et al*., 2016). Self-assessment is the process by which pupils assess themselves on the level of achievement of the requirements in the teaching content, the level of qualities and competencies based on specific and clear criteria, and comment on their strengths and weaknesses to adjust accordingly to achieve better learning.

Self-assessment is "a highly developed level of self-consciousness" (Dung, 2016) that helps pupils develop skills to become critical and creative thinkers (Harrison *et al*., 2015). Self-assessment generates feedback that promotes learning and improvements in performance (Andrade, 2019). That is, pupils gain a clearer view of their learning results, understand their learning process, and recognize their strengths and weaknesses, allowing them to adjust their learning accordingly. Andrade (2019) stressed that if there is no opportunity for adjustment and correction, self-assessment is almost pointless. Self-assessment is considered effective within formative assessment, which relies mainly on comments and feedback rather than focusing on scores and rankings. The purpose of using self-assessment in teaching should be to change one's own learning behavior rather than to evaluate the final results of pupils' learning. When this is the goal of self-assessment, pupils are likely to perform it more honestly. Tejeiro *et al*. (2012) found that student and teacher assessments tended to be very similar when self-assessment was not included in the final results, whereas over-assessment increased significantly when self-assessment was included in the final results.

Self-assessment also contributes to helping pupils develop honesty, responsibility to themselves, a sense of lifelong learning, and deep learning (Leach, 2012). Student self-assessment supports the cultivation of self-esteem and self-confidence (Papanthymou & Darra, 2023). Self-assessment is closely related to self-regulation of learning; in fact, pupils' self-assessment can go beyond being treated as a mere evaluation, becoming an essential competence for self-regulation (Brown & Harris, 2013), which is a part of human life (Taratori-Tsalkatidou, 2015).

2.2. Peer Assessment

In peer assessment, pupils comment on and evaluate each other, increasing interaction both between learners and between learners and teachers (Thuy & Le, 2021). Liu and Carless (2006) state that peer evaluation is a communication technique that allows pupils to engage in conversations about their own performance and academic requirements. Peer assessment can be defined as the process by which pupils' work is evaluated by their peers based on predetermined standards (Tunagür, 2021). Analyzing these definitions, it can be seen that peer assessment is the process by which pupils collect information from their classmates about the level of achievement of the requirements of the teaching content and the level of qualities and competencies, based on specific and clear criteria, to provide feedback that helps pupils address weaknesses and promote strengths to improve their learning and contribute to enhancing the quality of education.

Peer assessment helps teachers assess pupils in a more comprehensive and objective way. Through peer assessment, pupils develop skills to become critical thinkers, creative thinkers, effective communicators, and more productive learners (Harrison *et al*., 2015). Peer assessment

can also support learner autonomy, which is significant (Yang *et al*., 2006). Peer assessment allows pupils to critically engage with the assessed material, compare and contrast performance with their peers, and identify gaps or errors in their own knowledge (Topping, 1998). Peers may use similar and more accessible language, as well as reduce negative feelings associated with being evaluated by an authority figure (Liu *et al*., 2016).

Peer assessment helps enhance opportunities for interaction and communication between pupils. It can be viewed as a form of social interaction in the classroom (Vygotsky, 1978). This type of interaction helps build mutual feedback between pupils, contributing to their own development. Dochy *et al*. (1999) concluded that peer assessment can have a positive effect on learning but may be hampered by social factors such as friendships, collusion, and perceived fairness. From there, pupils learn to be responsible for their comments and assessments about their classmates. Topping (1998) argued that the effects of peer assessment are as good as or better than the effects of teacher assessment. Giving pupils evaluation experiences similar to those of their teachers, such as peer feedback—which is widely acknowledged as a fruitful context for improving engagement and developing evaluative competencies—is one strategy for developing feedback-enabling processes (Cartney, 2010).

Peer assessment can help instructors by assisting them in identifying the strengths and weaknesses of their students (Baniabdelrahman, 2010). Peer assessment plays a crucial role in formative assessment, and with appropriate implementation, it can also be used as a component of summative assessment. In formative assessment, peer assessment has particular advantages for the development of both pupils and teachers. Peer assessment can be carried out in many different forms, including qualitative assessment such as peer grading, or quantitative assessment through oral or written feedback (Topping, 2017). Through these various forms of peer assessment in formative assessment, teachers gain a clearer understanding of pupils' abilities. It can be seen that peer assessment provides teachers with more information about pupils' learning results, enabling them to make informed adjustments to future teaching activities.

2.3. Icons

Yen (2019) stated that "an icon is an image with symbolic meaning." Kha and Phuong (2020) proposed the definition of icons in philosophy: "icons are indirect reflections of things and phenomena and are self-assessments in memory." In terms of psychology, icons are products of memory (Son *et al*., 2018). In the field of culture and art, icons are considered a creative method to reflect and perceive the world (Hai, 2002). This study recognizes that icons are intuitive because they result from images that people have previously perceived. Icons are general because they often carry common signs and characteristics of things and phenomena. This study proposes the definition that icons are graphic images that represent a concept, activity, or state.

Icons are commonly used in several environments, including tourist maps, cell phones, instruction manuals, automobile dashboards, traffic and safety signs, and airport wayfinding systems, and they define much of the self-assessment ability of the products or systems they are part of (Korpi & Ahonen-Rainio, 2010). Icons convey information quickly. Each icon contains a meaning about an object or phenomenon in reality. Using icons when communicating is a good solution to reduce the number of words needed in expression (Windl *et al*., 2022) and to improve changes in scale and reading speed (Nakamura & Zeng-Treitler, 2012). Therefore, icons help recipients remember information better. Simple icons are located more efficiently in a visual search task than complex icons (McDougall *et al*., 2006) and are more legible. Thus, icons can be recognized quickly and instantly, creating opportunities for users to better recall meanings (Horton, 1996).

Using icons helps make communication more vivid and reduces complexity. Simplicity is recognized as an appreciated attribute of products among users (Blijlevens *et al*., 2009). Icons are

highly appreciated and loved when they bring users a new feeling with rich visual forms (Yan, 2011). Icons have no regular language elements such as inflections, number, gender, punctuation, articles, or linear order (Leemans, 2001), creating differences between symbolic language and written language. Adams *et al*. (2010) found that the essential parts of an object that contribute most to its recognition should be enhanced, whereas unnecessary elements should be removed. Icons can be used widely. The advantage of icons over text is that they are language-free (Pappachan & Ziefle, 2008), helping users overcome language barriers (Perlovsky, 1999) between regions and countries around the world. Users are not dependent on the vocabulary or grammatical principles of each country or region; instead, meaning is conveyed through images. However, Korpi and Ahonen-Rainio (2010) argued that designers need to take differences in cultures into account when designing icons. Some ideas acceptable in one culture may be unacceptable or even offensive in another. Therefore, it is important to consider cultural differences in the meanings of symbols and colours (Efroni *et al*., 2022). Through an overview of related studies, the author found that icons are widely used in daily communication. However, the use of icons in pupils' self-assessment and peer assessment has not been studied. This study aims to design icons and use them to support elementary school pupils in self-assessment and peer assessment.

2.4. Design Icons Used for Primary School Pupils to Perform Self-assessment and Peer Assessment in the Natural and Social Sciences Subject

Firstly, icons need to meet the requirements of the teaching content in the Grade 3 Natural and Social Sciences Subject, which includes six learning topics: Family, School, Local Community, Plants and Animals, People and Health, and Earth and Sky. Based on the requirements of each topic, researchers select objects and natural, social, and human factors to design icons that suit the teaching content. Each learning topic will have a set of icons for pupils to use in self-assessment and peer assessment.

Secondly, icons need to match the psychological and cognitive characteristics of primary school pupils. For example, visual memory is more developed than logical memory, so pupils are more likely to notice what is bright, new, and unexpected. Therefore, the icons need to be designed visually and vividly, with a variety of shapes and colors to attract pupils during self-assessment and peer assessment.

Thirdly, icons need to have consistency in the use of lines, shapes, colors, and sizes. They should be harmonious and simple, avoiding excessive details that make the icons complex. Icons should be designed so that pupils can immediately identify their meaning.

Finally, icons are designed so that teachers can organize pupils' self-assessment and peer assessment flexibly and creatively. Teachers can assign icons to assessment tools such as rubrics, scales, and checklists for pupils to use, or design them as stickers or handheld tools.

Icons were designed using Adobe Illustrator (2021) with Custom format; width and height are 200 Pixels; color mode is CMYK color; raster effects at high level (300pi).

Organizing for pupils to use icons to support self-assessment and peer assessment can be done by following these steps:

Step 1: The teachers determine the goal and timing for organizing pupils to perform self-assessment and peer assessment during the lessons.

Step 2: The teachers select the assessment tool to use with icons for pupils to assess.

Step 3: The teachers design the detailed contents to be assessed.

Step 4: The teachers select icons suitable for the contents, teaching activities, and the assessment tool.

Step 5: The teachers complete the assessment tool with icons and conduct a pre-test of it for pupils.

Step 6: The teachers organize pupils to conduct self-assessment and peer assessment according to the plan.

Step 7: The teachers summarize and analyze the evaluation results and draw conclusions.

Table 1. Description of Icons Designed in the Topics in the Natural and Social Sciences Subject in Third grade

Learning topics	Number of icons in topics	Some illustrative icons
Family	41	
School	31	
Local Community	35	
Plants and Animals	51	
People and Health	27	
Earth and Sky	28	

3. Methodology

The experimental process was carried out in Grade 3 (33 pupils) at a primary school in Ho Chi Minh City, Vietnam, including 15 girls and 18 boys. The experiment took place during the teaching of the topic *People and Health* (Natural and Social Sciences Subject, Grade 3, Creative Horizon book series). After conducting the experiment, the researchers surveyed teachers' perspectives on the effectiveness of the icons when applied to pupils' self-assessment and peer assessment. The 41 teachers who participated in the survey are currently teaching general subjects in elementary schools, excluding those teaching gifted subjects such as music, art, physical education, foreign languages, and computer science.

The lessons used to support self-assessment and peer assessment were "*Circulatory Organs*" and "*Nervous Organs*." The icons for these lessons were selected to support pupils' self-assessment and peer assessment across different classroom teaching activities (Table 2).

In the self-assessment for the lesson *Circulatory Organs*, pupils used an evaluation sheet with criteria, with answers divided into three levels: Good, Pass, and Needs Effort, each illustrated by an icon. In the lesson *Nervous Organs*, pupils answered the criteria on the assessment sheet using two levels: Yes/No, each represented by an icon. In peer assessment, pupils conducted evaluations in the *Circulatory Organs* lesson by voting with an evaluation sheet using criteria to assess their classmates' drama activities related to the learning topic. In the *Nervous System* lesson, pupils worked in groups to create drawings simulating the human nervous system and then voted on the most accurate and visually appealing drawings by pasting icon stickers on other groups' drawings. The group receiving the most stickers was considered the highest-rated group.

Table 2. Icons Used for Experiment

Assessment form	Lesson	Icons used for assessment
self-assessment	Circulatory organ	
self-assessment	Nervous organ	
peer assessment	Circulatory organ	
peer assessment	Nervous organ	

After the experiment, the researchers conducted a survey of pupils' and teachers' opinions on the icons. Pupils' opinions focused on two main aspects: the benefits of performing

self-assessment and peer assessment with icons, and their desire to perform self-assessment and peer assessment with icons. The evaluation criteria in the form were divided into three levels of achievement: Good, Pass, and Needs Effort, in accordance with Circular 27 of the Ministry of Education and Training on assessment of primary pupils (Ministry of Education and Training, 2020). The results of pupils' self-assessment, peer assessment, and the survey of pupils after the experiment were compiled, coded, and analyzed by the researchers using SPSS software version 22.0, with main functions related to frequency, percentage, mean, and standard deviation (SD). The convention of average scores corresponding to the levels was as follows: from 1 to under 1.67 (Needs Effort), from 1.67 to under 2.34 (Pass), and from 2.34 to 3.00 (Good).

However, the survey for teachers focused mainly on the characteristics of the icons and the effectiveness of using icons for pupils' self-assessment and peer assessment. After the experiment, the researchers proceeded to adjust the icons accordingly. Icon sets were sent to primary teachers in Ho Chi Minh City for feedback via a survey. The criteria in the survey were designed with five levels: Completely Disagree, Disagree, Neutral, Agree, and Completely Agree. The survey results were synthesized and analyzed using SPSS version 22.0 with descriptive statistics. The means corresponded to the following levels of agreement: from 1.00 to 1.80 (Completely Disagree), from 1.81 to 2.60 (Disagree), from 2.61 to 3.40 (Neutral), from 3.41 to 4.20 (Agree), and from 4.21 to 5.00 (Completely Agree).

4. Results

4.1. Experiment Results

4.1.1. The Results of Pupils' Self-assessment with Icons

Pupils performed self-assessment with rubric with criteria built on the requirements to achieve the content of the lesson (Table 3). Answers for each criterion are divided into 3 levels Good, Pass, Need to try with 3 corresponding icons in the scale as follows:

The criterion "Feel the class fun and lively" had the highest mean (2.76, SD 0.50), followed by the criterion "Count the beats of the heart or blood vessels in 1 minute" with a mean of 2.64 (SD 0.60). The criterion "Show the path of the blood in the blood circulation diagram" had the lowest mean, at 2.12 (SD 0.70). It can be seen that most pupils were able to self-assess their own learning. The self-assessment based on the lesson criteria was performed by the majority of pupils at the levels of Pass and Good.

Pupils self-assessed using a sheet with criteria based on the requirements to achieve the teaching content of the lesson *Nervous Organs* (Fig. 1). Answers for each criterion were divided into two

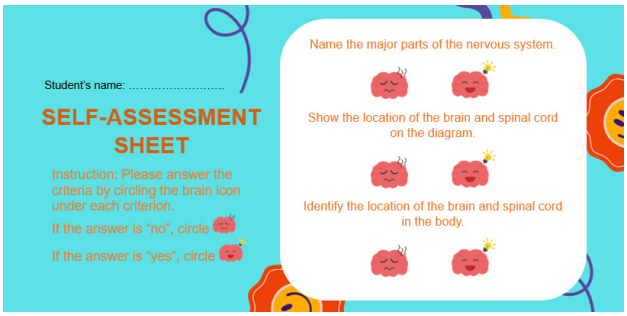

Figure 1. Self-assessment Card of the Lesson "Nervous Organs"

Table 3. Results of Pupils' Self-assessment with Icons in the Lesson "Circulatory organs"

Criteria	Mean	SD
Show the path of the blood in the blood circulation diagram	2.12	0.70
State the function of the heart and blood vessels	2.52	0.62
State the function of the circulatory system	2.27	0.67
Count the beats of the heart or blood vessels in 1 minute	2.64	0.60
State the importance of the heart to life	2.39	0.83
Feel the class fun and lively	2.76	0.50

Table 4. Results of Student's Peer Assessment Results in the Lesson "Circulatory Organ"

Criteria	Levels	
	Yes	No
Name the major parts of the nervous system.	63.6	36.4
Show the location of the brain and spinal cord on the diagram.	66.7	33.3
Identify the location of the brain and spinal cord in the body.	84.8	15.2

levels, Yes and No, in the assessment tool using a checklist. The students' self-assessment results are presented in Table 4.

The results of pupils' self-assessment in the lesson *Nervous Organs* showed that most of the criteria based on the lesson requirements were chosen by pupils as "Yes." The criterion "Identify the location of the brain and spinal cord in the body" had the highest percentage, with 84.8% of pupils selecting it. "Name the major parts of the nervous system" and "Show the location of the brain and spinal cord on the diagram" were chosen by 63.6% and 66.7% of pupils, respectively.

4.1.2. Results of Student's Peer Assessment Results with Icons

The research had pupils peer-assess their peer groups' performance in activities using a ballot with criteria. The answers for each criterion were divided into three levels: Good, Pass, and Needs Effort, corresponding to the three levels in the scale tool and represented by three icons. The results of pupils performing the assessment are presented in Tables 5 and 6.

There were two situations for pupils to participate in the play (Table 5). The group of pupils who played Situation 1 had the highest mean in the criterion "The solution your friends used to the problem in the play was effective" (2.24, SD 0.61). The group of pupils who played Situation 2 had the highest mean in the criterion "Your friends explained why they used this solution," with a mean of 2.09 (SD 0.72). The criterion "Your friends acted naturally, actively" had the lowest mean in both situations, with 2.06 (SD 0.86) in Situation 1 and 1.73 (SD 0.72) in Situation 2.

In the lesson "Nervous Organs", pupils performed peer assessment by sticking icons on other group's learning products, which were drawings. The results of selecting the correct and most beautiful drawings are detailed in table 6.

The results in Table 6 show that the drawing of Group 1 was rated by the most pupils as correct and the most beautiful, with 11 pupils placing an icon sticker on this group's drawing (33.3%), followed by Group 4 with 7 pupils voting (21.2%). Group 5 received the fewest votes, with 2 pupils (6.1%). This experiment differed from previous ones because the assessment method using icons was not circling or marking them on a sheet, but sticking icon stickers on the drawings. The experimental results show that, despite this

Table 6. Results of Student's Peer Assessment Results in the Lesson "Nervous Organs"

Group	The Number of Student Sticking Icons	Percentage (%)
Group 1	11	33.3
Group 2	4	12.1
Group 3	5	15.2
Group 4	7	21.2
Group 5	2	6.1
Group 6	4	12.1
Total	33	100.0

Table 5. Results of Student's Peer Assessment Results in the Lesson "Circulatory Organ"

Criteria	Situation 1		Situation 2	
	Mean	SD	Mean	SD
The solution your friends used to the problem was that the play was effective.	2.24	0.61	1.97	0.77
Your friends explained why they used this solution.	2.27	0.63	2.09	0.72
Your friends acted naturally, actively.	2.06	0.86	1.73	0.72

change in the form of using icons for evaluation, pupils were still able to perform the assessment using the icons designed by the research group.

4.2. Survey Results of Pupils about the Benefits and Desire to Use Icons for Self-assessment and Peer Assessment

After conducting the experiment, the study surveyed pupils' opinions on the benefits of using icons and their desire to use them in self-assessment and peer assessment while studying the Grade 3 Natural and Social Sciences Subject by answering questions in the survey. The survey results are shown in Tables 7 and 8.

Among the benefits proposed by the researchers, "Easy to assess" had the highest rate of pupils choosing it, with 60.6% selecting this option. In self-assessment, the statement "Time saving" was chosen by 24.2% of pupils, while 9.1% of pupils thought that the icons helped them remember the results longer. In peer assessment, the statement "Easy to assess" was agreed upon by the most pupils, with a rate of 30.3%. The two benefits "Time saving" and "Remember results longer" had lower percentages, with 33.3% and 14.3% of pupils selecting them, respectively. It can be seen that the pupils in the experimental class believed there were definite benefits to using icons for self-assessment and peer assessment in the Natural and Social Sciences Subject.

The results show that the percentage of pupils who really wanted to use icons for self-assessment was 60.6%. In self-assessment, only 6.1% of pupils did not want to use icons, while 33.3% chose to use them occasionally. In peer assessment, the level "Really want to do" was still the highest, with 51.5% of pupils choosing it. The percentage of pupils hoping to use icons for peer assessment was 42.4%. Finally, the lowest rate was for pupils who did not want to use icons in peer assessment, at 6.1%, the same as in self-assessment. In short, the desire to use icons for assessment in the Grade 3 Natural and Social Sciences Subject was positive; the icons motivated pupils to carry out self-assessment and peer assessment.

4.3. Results of Teacher Survey about Using Icons for Primary Pupils in Self-assessment and Peer Assessment

The survey results had Cronbach's Alpha coefficient of 0.936, showing that the survey results were good. The results of the survey of teachers about the icons after the experiment are shown in table 9.

Table 7. Benefits of Using Icons for Self-assessment and Peer Assessment

Benefit	Self-assessment		Peer Assessment	
	Number of Pupils	Percentage (%)	Number of Pupils	Percentage (%)
Easy to assess	20	60.6	10	30.3
Time saving	8	24.2	8	24.2
Remember results longer	3	9.1	9	27.3
Other	2	6.1	6	18.2
Total	33	100.0	33	100.0

Table 8. Desire of Pupils to Use Icons for Self-assessment and Peer Assessment

Level of Desire	Self-assessment		Peer Assessment	
	Number of Pupils	Percentage (%)	Number of Pupils	Percentage (%)
Really want to do	20	60.6	17	51.5
Want to do	11	33.3	14	42.4
Do not want to do	2	6.1	2	6.1
Total	33	100.0	33	100.0

Table 9. Results of the Survey of the Teacher's Opinions

Criteria	Mean	SD
The icons match the requirements of the content of teaching Natural and social sciences subject 3rd grade (2018)	4.04	0.77
The icons are intuitive, vivid, suitable for the psychological and cognitive characteristics of primary school pupils.	4.14	0.93
Icons are aesthetic.	4.17	0.89
Instructions to use icons are clear and easy to understand.	3.87	0.87
The instructions to use icons are easy to follow.	3.74	1.05
Organizing for pupils to perform self-assessment and peer assessment with icons will save time.	3.76	0.12

The survey results show that almost all teachers agreed with the criteria proposed by the researchers. The criterion "Icons are aesthetic" was most agreed upon by the teachers, with a mean of 4.17 (SD 0.89). Two criteria, "The icons match the requirements of the teaching content of the Grade 3 Natural and Social subject (2018)" and "The icons are intuitive, vivid, and suitable for the psychological and cognitive characteristics of primary school pupils," both had the same mean of 4.04 (SD 0.77 and 0.93, respectively). The criterion "Organizing pupils to perform self-assessment and peer assessment with icons will save time" had the lowest mean, at 3.60 (SD 1.12).

5. Discussion

In general, pupils can perform self-assessment and peer assessment activities with icons. In the self-assessment activity for the *Circulatory Organs* lesson, most criteria were rated by pupils as Pass and Good. Four criteria achieved a Good level, with average scores from 2.39 to 2.76, and two criteria achieved a Pass level, with average scores from 2.12 to 2.27. Additionally, six criteria had standard deviations from 0.5 to 0.7, showing that pupils' answers were fairly consistent. However, the criterion "State the importance of the heart to life" had a higher standard deviation of 0.83, which may be explained by the uneven ability of pupils to synthesize and generalize information. The results show that the majority of pupils met the requirements in the teaching activities. In the *Nervous Organs* lesson, most pupils answered Yes to all criteria, predominating over No answers, which ranged from 36.4% to 15.2% across the three criteria (Table 4). During the experiment, the researchers found that no pupil rated themselves at the Needs Effort level, the lowest level, indicating that primary pupils often tend to evaluate themselves higher than reality while also wanting good results to satisfy teachers and relatives (Hue *et al*., 2014). In both the *Circulatory Organs* and *Nervous Organs* lessons, the criteria focused on specific activities and behaviors (Hue *et al*.,2014), which aligns with the cognitive characteristics of primary pupils, enabling them to recognize, understand, and perform self-assessment and peer assessment easily.

In the peer assessment activity on "*Circulatory Organs"*, all criteria were generally rated as Pass, with situation 1 having average scores ranging from 2.06 to 2.27, and situation 2 showing slightly lower averages between 1.73 and 2.09. The standard deviations were relatively high, indicating notable differences in peer assessments across pupil groups. Notably, the criterion related to acting style—"Your friends acted naturally, actively"—received the lowest means: 2.06 for situation 1 and 1.73 for situation 2. Although primary pupils can often express emotions naturally when encountering familiar scenarios, the role-play situations—tight socks affecting blood circulation (situation 1) and vigorous exercise affecting the heart (situation 2)—may be unfamiliar and abstract for them. As a result, pupils struggled to act appropriately for these scenarios.

Regarding the survey results on pupils' opinions about using icons for self-assessment and peer assessment, the benefit most frequently selected was "Easy to assess," with 60.6% for self-assessment and 30.3% for peer assessment.

This indicates that using icons can enhance pupils' interest in communication and evaluation (Yan, 2011). As shown in Figure 1, icons also save space and reduce the need for lengthy text (Windl *et al.*, 2022). These positive perceptions contributed to pupils' strong desire to continue using icons for evaluation, with "Really want to do" receiving the highest percentages: 60.6% for self-assessment and 51.5% for peer assessment. Regarding primary school teachers' opinions, the criterion "Icons are aesthetic" received the highest agreement, with a mean of 4.17 (SD 0.89), indicating that the icons were perceived as visually appealing and simple (Blijlevens *et al.*, 2009).

Regarding the survey results on primary teachers' opinions about the set of icons, the criterion "Icons are aesthetic" received the highest agreement, with a mean of 4.17 (SD 0.89), indicating that the icons were visually appealing and simple (Blijlevens*et al.*, 2009). In contrast, the statement "Organizing for pupils to perform self-assessment and peer assessment with icons will save time" received the lowest average score of 3.60. This may be because the organization of self- and peer assessment depends on both teachers' approaches and pupils' individual cognitive characteristics, which can affect the time required for assessment. The criterion "The icons match the requirements of the content of the Natural and Social Sciences Subject for Third grade (2018)" had a mean of 4.04 (SD 0.77), and teachers also found the icons intuitive, vivid, and suitable for the psychological and cognitive characteristics of primary pupils. Whether using icons saves time depends on factors such as pupil ability and the organizational form chosen by the teacher (e.g., evaluation cards or hand-held icons). Overall, with a five-level agreement scale, teachers' satisfaction with the icon set was 4.09 (SD 0.67), corresponding to "satisfied," suggesting that the icons can be used reasonably and effectively for self- and peer assessment. This aligns with student survey results, where only 8 pupils (24.2%) reported using icons for self- and peer assessment.

The experimental results and survey data from both teachers and pupils indicate that the icons designed by the researchers were suitable for primary pupils and could effectively support self-assessment and peer assessment in practice. However, this research focused only on the design and initial use of the icons. The authors noted that further work is needed, including investing more time and technology in refining the icons and testing them with a larger sample of primary pupils to ensure broader applicability and effectiveness.

6. Conclusions and Recommendation

The research focused on designing an icon set consisting of six small icon sets corresponding to six learning topics in the Third-grade Natural and Social Sciences curriculum. Experimental results showed that the majority of pupils found the icons made self-assessment and peer assessment easier. Teacher surveys indicated that the icon set was aesthetic, attractive to primary pupils, and aligned with the curriculum requirements. Most teachers reported being satisfied with the icon set, demonstrating its practical applicability. The authors emphasize the importance of continuing to refine and expand the icons to better support both teachers and pupils, thereby enhancing the effectiveness of assessment and contributing to overall education quality. Further research is encouraged on the technology platforms used to design icons, potential challenges pupils face in using them, and testing the icons with larger groups of pupils.

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