PENCIL Model: การพัฒนารูปแบบการออกแบบหนังสือนิทานอิเล็กทรอนิกส์โดยใช้การเล่าเรื่องแบบดิจิทัลในสภาพแวดล้อมเกมมิฟิเคชันเพื่อส่งเสริมความคิดสร้างสรรค์และความสุขในการเรียนสำหรับนักเรียนประถมศึกษาตอนปลาย [1]

PENCIL Model: Development of Fairy Tales Electronic Book Design Model Using Digital Storytelling in Gamification Environment to Enhance Creative Thinking and Happiness in Learning for Upper Primary Students

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บทคัดย่อ

การวิจัยนี้มีวัตถุประสงค์เพื่อพัฒนาร่างรูปแบบการออกแบบหนังสือนิทานอิเล็กทรอนิกส์โดยใช้การเล่าเรื่องแบบดิจิทัล ในสภาพแวดล้อมเกมมิฟิเคชันเพื่อส่งเสริมความคิดสร้างสรรค์และความสุขในการเรียน หรือเรียกว่า รูปแบบ PENCIL ใช้ วิธีวิจัยแบบผสมผสาน งานวิจัยนี้เป็นส่วนหนึ่งของวิทยานิพนธ์ เครื่องมือที่ใช้ในการวิจัย ได้แก่ แบบสัมภาษณ์และแบบ ประเมิน กลุ่มตัวอย่างที่ใช้ในการวิจัย คือ ผู้เชี่ยวชาญ จำนวน 7 คน ซึ่งเก็บข้อมูลโดยการสัมภาษณ์และวิเคราะห์ข้อมูล ด้วยวิธีวิเคราะห์เนื้อหา และผู้ทรงคุณวุฒิ จำนวน 5 คน ซึ่งเก็บข้อมูลจากแบบประเมินและวิเคราะห์ข้อมูลด้วยค่าเฉลี่ย ผลการวิจัยพบว่า การออกแบบหนังสือนิทานอิเล็กทรอนิกส์รูปแบบ PENCIL ประกอบด้วย 5 องค์ประกอบ ได้แก่ 1) การ เล่าเรื่องแบบดิจิทัล 2) สภาพแวดล้อมเกมมิฟิเคชัน 3) บทบาทผู้เรียนและผู้สอน 4) ทรัพยากรการเรียนรู้ และ 5) การวัด และประเมินผล ขั้นตอนการพัฒนามี 6 ขั้นตอน (PENCIL Model) ได้แก่ 1) การวางแผนและระดมสมอง 2) การสืบค้น ข้อมูลและสร้างสตอรี่บอร์ด 3) การสร้างเรื่องเล่าจากการเล่าเรื่อง 4) การตรวจทานและสะท้อนคิดร่วมกัน 5) การเผยแพร่ บนสื่อสังคม 6) การประเมินผลการเรียนรู้ ผลการประเมินรูปแบบ PENCIL พบว่า มีความเหมาะสมในการใช้งานอยู่ใน ระดับมากที่สุด

Abstract

The objective of this research was to develop the design model of fairy tales electronic book by digital storytelling in gamification environment to enhance creative thinking and happiness in learning which is called "PENCIL Model" by using the mixed method research. This research was a part of the dissertation title, which used the data collecting instruments such as interviews and evaluated form. The populations of a sampling group of this research were seven experts who have collected the data through interviews and analyzing the data by using the contents, and five experts whose data were received through evaluated forms and analyzing the data by using the mean value. The research result found that the fairy tales electronic book design based on PENCIL Model consists of 5 components; 1) digital storytelling, 2) gamification environment, 3) role of learner and teacher, 4) learning resource, and 5) measurement and evaluation, which contained by 6 processes (PENCIL Model) 1) Planning a Story Map and Brainstorming 2) Exploring Resources and Making Storyboard 3) Narrative Storytelling 4) Checking the Story and Reflecting 5) Interactive Social Media Posting and 6) Learning Evaluation. The PENCIL Model certification model assessment found that this model was the most appropriate to use as the trial.

Introduction

Nowadays, technological advancement is being developed rapidly. Many businesses replace human resources with machines which offer a more complex problem-solving process and high working efficiency than human. Such a situation leads to massive changing among the worldwide labor market. In 2018, total human worker was at 71% while the machine was at 29%. In 2022, we expect that the human will be replaced by tools around 58% and remaining human workers will be around 42%. This makes many industries create courses to develop manpower skill, encourage creative thinking skill, critical thinking, communication, and negotiation skill to increase the human capabilities which differentiate them from technology ability (World Economy Forum, 2018). These reasons lead the concerned people of the 21th-century education to realize the essentials of modifying the learning pattern to match with labor market's demand.

Since 1990, many countries had more emphasized on the creative learning and teaching method in schools because of the world's adjustment under globalization (Harris, 2016). The creative activity is an event which can be inset in the class. Creativity becomes the dominant role of an individual nationally. It is necessary to apply complex problem-solving skills which we usually face in daily life. We need to rely on our thinking talent, creativity, and the goal of learning (Aree Phanmanee, 2002; Kriangsak Charoenwongsak, 2013; Wang, 2012). The creativity can be developed through the learning activity such as reading and writing because of thinking skill is related to language skill (Piaget, 2002; Vygotsky, 1986 as cited in Wang, 2012). The developmental promotion of primary students between 10-12 years old, we should give their opportunity to investigate, create, and do the things by themselves due to this span of age is the great age for reading. Their attitude about art and music will be quickly progressed since the children start to develop interests in conceptual thinking, complex and creative thinking, future, imaginary, and being a great role model (Krirk Yunphan, 1996; Ligon, 1957, as cited in Aree Phanmanee, 2014)

The digital storytelling is the learning model, which is student-centered. This is a learning activity that can establish a meaningful experience to a student by expressing the point of view, and attitude in their way via digital storytelling. The learners can learn from creating and sharing the story to sympathize with others (Noawanit Songkram, 2011; Williams, Bedi, & Goldberg, 2006) The fairy tales storytelling is the way to enhance moral, ethics, sharing the knowledge and culture to children. It is the imagination story (Kulaya Tantiplacheeva, 1998; Somsak Paripurana, 1999; Suphak Anukul, 2002; Wannee Sirisoontorn, 1999) which is designed as electronics book to be easy to access by various devices so that it encourages the freedom of learning because learners can study anywhere and anytime as their convenience (Saowaluk Yansombat, 2002; Supaporn Sippawes, 2002). The storytelling in a form of electronics book in gamification environment can support the progress of children since they will be relaxed, happy, and enjoy through the

interaction, and participation which further their emotional level to persuade learners with every internet connected device.

From the survey result, Thai children's attitude reflects the point of view of youth about the Thai learning system in the present, such as lacking of opportunity and standard of education. Thai students are the most grub in the world, but they cannot apply the knowledge that they gain from the class in their daily lives. They cannot learn the course that they prefer. The learning system starts with the book and ends with the test. Some instructors teach in an annoying way that makes children loss interests and ignore the content. Two third of children suggest that the education system should be changed because the courses are rather emphasize on theory more than taking an action that can be applied in daily life. When we did the survey about children's happiness in learning under the present education system, the average point was only 5.78 out of 10 (Quality Learning Foundation, 2014) which stimulates the concerned organizations to state a revolution of the Thai education system to develop children's quality of life that they actually need. So, the real goals of education are creating the happiness of learners, building learners to be goodies and cultivated. This is the main driver to develop sustainable social efficiency than setting the goal for competition (Hawken, 2007). Therefore, the importance of creative thinking and happiness of learning can motivate the children to be eager for knowledge; have the right attitude with the teacher, and school. The researchers were interested in creating the design model of fairy tales electronic book by digital storytelling among gamification environment to encourage creativity and happiness in learning via studying about the process and component of a model designed as well as enhance the creativity and happiness in learning. This research has demonstrated the result of technology and education concept through digital storytelling from learner's views among the gamification environment according to related gamified pedagogy, to encourage students to become self-motivated learners who are interested in learning more from the course content and each other. Moreover, this research also encourages the creativity and happiness in learning of primary student in 21st-century to become a model of human resource development and learning creativity to develop the country sustainability which focuses on creating the attitude and behavior which result in a positive relationship between teacher and student as well as raise up the school to be the sustainable happiness learning center.

Methods

This research is the research and development which consists of 2 objectives; 1) to develop a design model of the fairy tales electronic book and 2) to examine the quality about a design model of fairy tales electronic book. The research methodology is separated into 2 phrases as followings;

Phase 1: To develop the model of fairy tales that researchers study, analyze, and synthesize the idea, theory, and research related to the book, fairy tales, fairy tales electronic book, digital storytelling, gamification environment, creative thinking and the happiness in learning together. To analyze and acquire the result, a sampling group of 432 teachers and 612 upper primary students of the Basic Education Commission from 4 regions of Thailand is required. The sampling size is controlled by the formula of Cochran (1996). Then, we apply the research of state and need the sampling group's results to create the master of a model. After that, we developed the master of the model to draft model and passed to the experts for examination about the quality and certification that the content is relevant to the detail of the master model.

Phase 2: the study of an expert's suggestion by interview. After we presented the draft model from phrase 1 to the 7 experts who have an experience of at least 3 years in educational technology and communication (2 experts), course syllabus, digital storytelling, creative thinking, fairy tales book, and psychology in order to analyze and share their opinion through interview method to improve and adjust the draft model as their advises. After that, the process of the model to inquire about the suitability of usage by evaluation form. We submit the draft model to 5 experts who have an experience at least 5 years, used to publish the academic paper and be acceptable in part of educational technology and communication, course syllabus, digital storytelling, creative thinking, and psychology to consider and evaluate in term of communication, appropriateness of components.

The tools of research methodology and collective data are;

1) The research methodology tools consist of the master of a model which includes the objective, principle, basic development concept, the process of learning and elements which are collected the data by study, analysis, and synthesize the theory, method, and related researches together to analyze the opinions of teachers and students which obtain from phase 1 and develop into the draft model.

2) The data collecting tools consist of the structural interview where the tools and development processes are arranged with the draft model then compiled to be the question of each the process to allow the experts to consider and share their opinion in term of communication, content coverage, usage appropriateness, as well as the additional suggestion. Another tool is the certification model assessment of model suitability by setting the questions about issues of evaluation which covers the overall components and process of fairy tales electronic book design. The evaluation scales are divided into five levels following the Likert rating scale ranging from entirely inappropriate to most appropriate.

For the data collecting process, the researchers presented the draft model to 7 experts to consider in part of the communication, content coverage, usage appropriateness as well as asking for advice about the component The process of creating a draft model through

interview method was via created interview dialogue. Then, the researchers applied the draft model which has already adjusted as an expert's suggestion to 5 experts for evaluating and certification that consistent as the content about components appropriateness and process.

The data analysis from the interview can be considered by the content and essential issue consistency which obtains from the data collecting process to compare with the central concept. Then, we applied the expert's suggestions to improve and adjust the components and method of the model, the certificate model assessment, and analyze the assessment evaluation result of the content from the experts by calculating to find the mean and standard deviation (SD). After that, researchers applied the expert's suggestion to improve and adjust to complete the model.

Results

The draft model of fairy tales electronic book design including 5 components as followings; 1) digital storytelling, 2) gamification environment, 3) role of learner and teacher, 4) learning resource, and 5) measurement and evaluation, which consist of 6 processes (PENCIL Model) 1) Planning a Story Map and Brainstorming 2) Exploring Resources and Making Storyboard 3) Narrative Storytelling 4) Checking the Story and Reflecting 5) Interactive Social Media Posting and 6) Learning Evaluation. To assess the PENCIL Certification Model found that this model was the most appropriate in part of usage.

Two issues of PENCIL Model which are applied to design such fairy tales book are component and development process. The five main components of PENCIL Model consist of;

1. Digital storytelling is the media usage which integrates the digital technology together through the education system design to transfer the knowledge, the point of view, emotional content, and liveliness of story writing which creates by the ability of author in term of art, literature, and searching the information from the Internet for digital content such as animation, voice, picture, video, or message. The content should express the reader to feel challenged, aspire to follow up and feel like participating in the conversation. To sum up, the art of presentation does not only lead to meaningful learning but also makes the readers feel valu-able as well.

2. The gamification environment is the process to arrange the learning environment which is not contained by gamification context to motivate and stimulate the interest or change the learner's behaviour to be more enjoying and encourage learning through competitive activities. There are six processes of PENCIL Model as follows;

2.1 Exercise is the practice that follows six entrusted tasks related to the learning process to develop the capability of players.

2.2 Achievement is the position when the player has achieved their goals or mission.

We defined three levels of learners which are considered by their tasks success. Three areas consist of 1) student, 2) designer, and 3) professional designer.

2.3 The rewarding system given to the teacher or learner in a form of sign or logo obtained by individual ability, behaviour or wins from the competitions. They were valuable rewards or unique gifts such as great sharing, great helper, great content, or great storytelling.

2.4 Synchronizing with the community: The score summary of participants in terms of a social group by creating the table to present the student's score on the leaderboard which contains student's name, photo, position, and evaluated score from teacher and learner.

2.5 Result transparency: The transparent display design to show the progress of results clearly.

3. Roles of learner and teacher consist of:

3.1 Roles of learner consist of operating the activities in the class as an individual and in a group, responsible to the entrusted tasks, ensuring the computer usage is ready, performing as a writer, as well as adopt and exchange the opinion, and comment from others, go along with others and be able to search for information from the internet for digital content such as animation, voice, picture, video, and message.

3.2 The roles of the teacher consist of being the facilitator of carrying out the activities in the class, preparing the learning tools, planning for the course schedule, giving advice for the learning method, and evaluating the learner's capability. The teacher should be able to introduce the course, kind, adopt the opinion or comment of students, let the student participate in freedom, do not judge the student's ability, do not punish the student, build the enjoyable the atmosphere in the class, and motivate the students to participate with the class activities.

4. Learning resources consist of two tools :

4.1 Digital resource means that various digital information accessible to obtain the data that matches user's needs with convenience, fast, and conservation. We must define the search objective, and type of information technology we need to investigate such as message, slide, motion, and search for the information by the search engine designed to be searching tools on internet-connected devices such as www.google.com or www.yahoo.com to support self-learning and long life learning.

4.2 Learning on supported websites (www.suk.tools or http://suk.tools) means that the fairy tales electronics book designed by digital storytelling among gamification environment to enhance the creativity and happiness in learning. These are the leading website that support the learning activities by being application websites which are designed and developed by six processes of PENCIL Model concept. The learner can access the websites through every internet connected device anywhere and anytime.

5. Measurement and evaluation consists of 3 tools:

5.1 The evaluation form is evaluated by teachers and students on http://www.suk.tools which apply the criteria of digital storytelling that is developed by Noawanit Songkran (2011) as Scoring Rubrics. This type of scoring is divided into three parts. 5.1.1 contents, 5.1.2 presentation technique, and 5.1.3 creative thinking and watching over the emotion and feeling.

5.2 The creativity evaluation form is the pre-test and post-test evaluation of student through TCT-DP (The Test for Creative Thinking-Drawing Production) which is developed by Jellen & Urban (1989) and post-test assessment of teacher following CPSS (The Creative Product Semantic Scale) developed by Besemer and Treffinger (1981) Narumon Chansukwong (2008) and Phattananusorn Sathapornwong (1990). The type of this evaluation form is Semantic Differential which contains three dimensions: novelty, resolution, and elaboration. Along with synthesis as well as 11 concepts with each concept consists of each subscale which is the word or sentence in opposite meaning and the gap of 2 parts are seven blanks.

5.3 The happiness in learning measurement form which evaluates by 5 Likert scales and the interview about happiness in learning that consists of 3 indicators;

The model of fairy tale electronic books design contains six processes (PENCIL Model) as the following;

1. P - Planning a Story Map and Brainstorming is the way of planning to create the individual workpiece by using the tools, and story map as a frame to specify the guideline of contents which consist of title, objective, plot, characters, background, theme, and conclusion to brainstorm among the group members to exchange the idea together.

2. E - Exploring Resources and Making Storyboard is the way to search for information such as the contents planned on story map as well as set the framework to show the completed story of each fairy tale through storyboard by showing the detail which is displayed on each page like a message, slide, and motion. This process is the exhaustive design process of fairy tales books before creating the manuscript.

3. N - Narrative Storytelling is the process that creates the individual fairy tales book through the components of digital storytelling by inventing from the storyboard that we did before.

4. C - Checking the Story and Reflecting is the process to allow classmates to share their opinions and workpieces to be considered thoughtfully and check the content through reflecting on each view of piece together as well as adjusting and improving the part by using the tools and reflection outline.

5. I - Interactive Social Media Posting is the process of sharing workpiece on online media and letting classmates or others comment on the work.

6. L - Learning Evaluation is the process to evaluate the learning result by a teacher, student, individual and classmates. The criteria of digital storytelling evaluation are Rubric

scoring which measured by evaluating of own and at least three classmates. The final evaluating is done by a teacher who considers f 3 parts: content, presentation technique, and creative thinking which related to watching over the emotion, feeling, and measure about happiness in learning.

The appropriate certificate evaluation assessment result which scores by five experts about the learning model can be summarized as shown in Table 1.

Table 1 The opinion level of each expert to PENCIL Model

Evaluation list	No. of expert					Mean	SD	Appropriate level
	1	2	3	4	5			
1) The objective of electronics book design	4	5	5	5	5	4.8	0.45	Most appropriate
2) The basic principle and concept of electronics book design development	4	5	5	5	5	4.8	0.45	Most appropriate
3) The learning through PENCIL Model for Six processes	4	5	5	4	4	4.4	0.55	Very suitable
4) The component of electronics book design	4	5	5	4	5	4.6	0.55	Most appropriate
5) Tools of electronics book design	3	5	5	5	5	4.6	0.89	Most appropriate
6) Learning evaluation	4	5	5	5	5	4.8	0.45	Most appropriate
Overall Average						4.67	0.56	Most appropriate

The table 1 shows that the experts conclude that the PENCIL Model is most appropriate to apply for learning (Mean = 4.67). Moreover, they also suggest to improve the learning model from their interview comments about the identification of the tools, and components of gamification in each process should be specified that what we should do and use in each process. Furthermore, the process and components also should unique to the research. Model writing should be represented by the symbol to convey the meaning that most people understand.

The picture, color, and message which displays on the image might be meaningfully related to the research

Moreover, the name of each process is still not proper to a primary student and the learning process also unclear that the student might misunderstand and cannot apply these processes in their daily life. Experts suggest us to change the name of 6 methods as followings: "Brainstorming" change to "Planning a Story Map and Brainstorming", "Designing" change to "Exploring Resources and Making Storyboard", "Developing" change to "Narrative Storytelling", "Editing" change to "Checking the Story and Reflecting", "Sharing" change to "Interactive Social Media Posting", and "Evaluating" change to "Learning Evaluation". The creativity evaluation by pre-test and post-test should be the workpiece under the same criteria, so the researchers changed the creativity evaluation to be evaluated by a teacher and evaluate for creativity from drawing by a student on pre and post-learning. The period of each activity should be specified to get the most effective result. The researcher has examined with sampling group and found that each process cannot complete within 1 hour. Thus, we have changed to 2 hours per each process and found the result is more efficient and effective than 1 hour. From the interview and study, the researcher has adjusted and improved the draft model refer to the expert's suggestion ' the detail of the revised draft model as shown in figure 1.
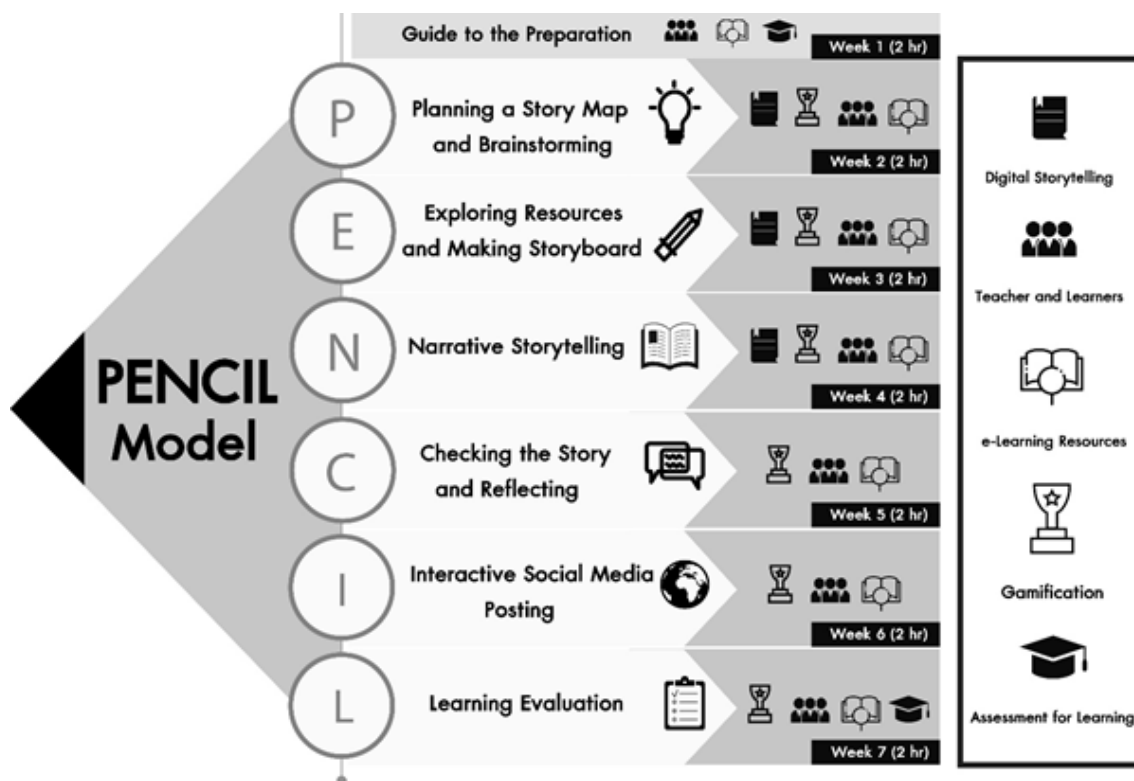

Figure 1 Draft model of fairy tales electronic books (PENCIL Model)

After the researchers have ultimately drawn up the draft model of fairy tales electronic books, we developed the draft model to fairy tales electronic books design system through 6 processes of PENCIL Model by www.suk.tools or http://suk.tools. The word "SUK" stands for "Storytelling Your Knowledge" which reads in the Thai language as "SUK (means happiness)" to mean that this tool can encourage happiness through storytelling related to student's knowledge. This system is an application website developed to use on web technology channel that users can access by inputting the URL on a web browser without installing other additional programs. The qualification of fairy tales electronic books designed consists of the following parts;

1. The library which shows all lists of fairy tales books on the system which separates the display into two groups: new release books and the best book that everyone can access the system to search for the exciting book.

2. Searching means users can search for the fairy tales book in the system by fill in the title of fairy tales book, conclusion, keyword, and author on the searching blank.

3. Displaying of fairy tales book is shown when a user clicks on the cover page of a fairy tales book.

4. Signing in with selecting the role as teacher or student.

5. Showing all books (collecting source of everyone's workpiece) to mark by the teacher using seven badges which consist of reward when the student completes each task, Top Story!, Top Team!, Great Writing!, Great Content!, Great Sharing!, and Great Helper!. Moreover, students also can give four badges to classmates as Great Writing!, Great Content!, Great Sharing!, and Great Helper!. Additionally, we can evaluate the student's work by Rubric scoring. The evaluation is the final task which needs four criterias which are 1. At least three classmates, 2 assess the student. The student evaluates themselves, 3. The teacher evaluates the student, and 4. The student evaluates the classmate.

6. Summarizing the score and showing as a leaderboard to present the scoring a reward of the student as individual and group.

7. Sharing the book with general people, students, and teachers by distributing the URL on social media.

8. My class means the class that all students attend and shows all the lessons that the teacher creates and can check all students' work. When the student enters the course, they will find 6 processes of learning which are the essential tasks and consist of; Task 1: P – Planning & Brainstorming, Task 2: E – Exploring & Making Storyboard, Task 3: Narrative Storytelling, Task 5: I – Interactive Posts, and Task 6: L – Learning Evaluation.

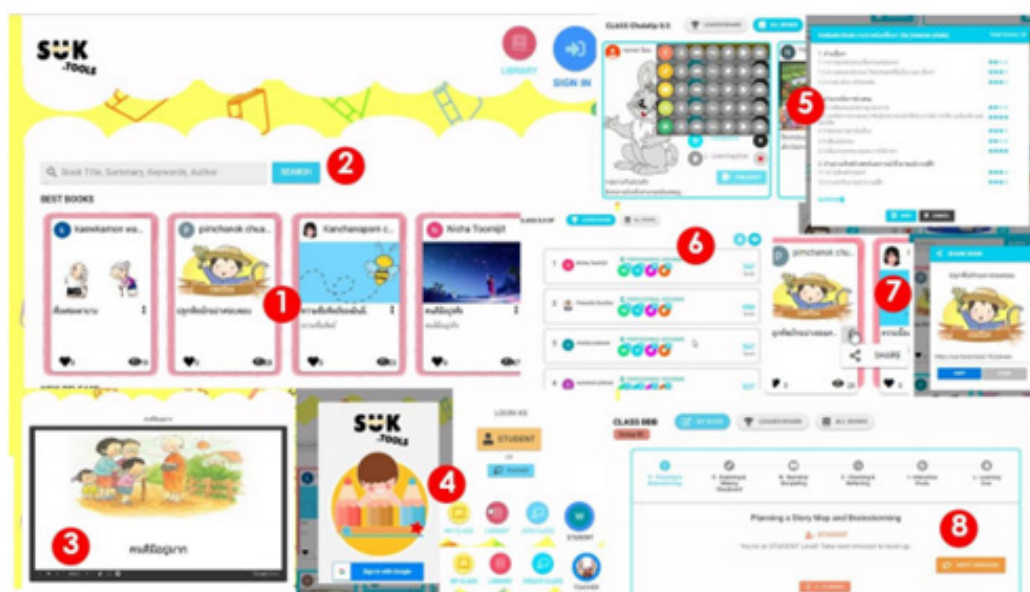The in-depth detail of above eight parts can be shown in figure 2:

Figure 2 The qualifications of fairy tales electronic book as part 1–8

Besides, the teacher can also manage the class by separating the course by "Create Class" by naming the classroom and description. The system will generate the PIN to be classroom code that can be created as an individual or group class as well as be able to edit the detail or member of the class. The teacher can check the work of every student, and the student also joins the course by filling in the PIN of the classroom as the teacher informed. The detail of this online classroom can be shown in figure 3.
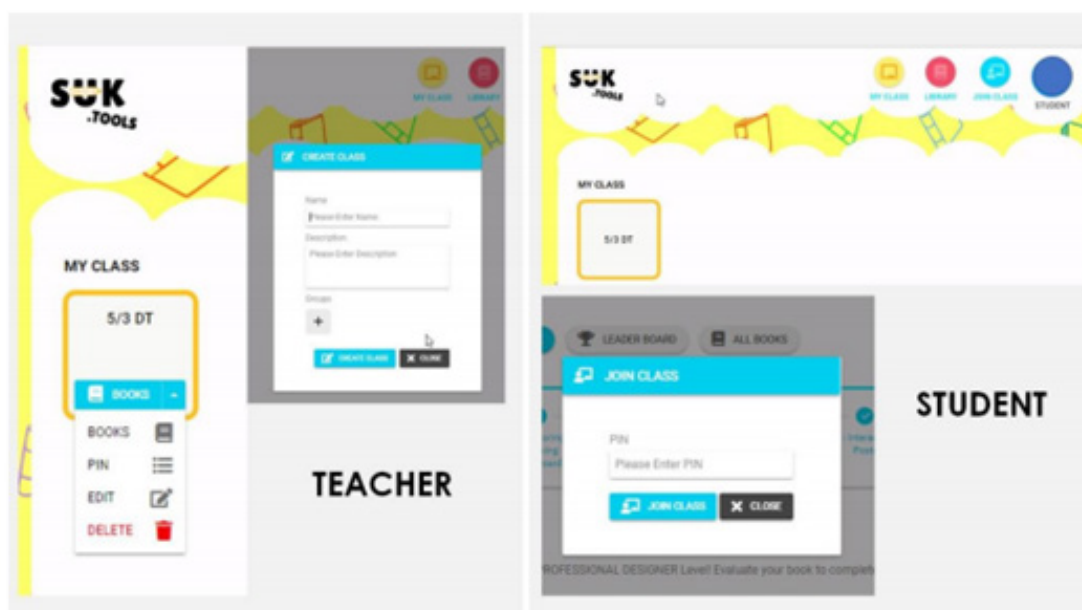
Figure 3 The characteristics of the classroom management system and class participation of teacher and student

Discussion

During the research, we found that the components of the learning model used in the study can be classified into five elements 1) digital storytelling, 2) gamification environment, 3) the role of learner and teacher, 4) learning resource, and 5) measurement and evaluation.

The experts' opinion confirms that the number of components is appropriate to model when relying on PENCIL Model which are 1) Planning a Story Map and Brainstorming, 2) Exploring Resources and Making Storyboard, 3) Narrative Storytelling, 4) Checking the Story and Reflecting 5) Interactive Social Media Posting and 6) Learning Evaluation) and suggest to adjust the name of each a process to be clear meaning and proper with student's age.

The research presents that digital storytelling is the development of technology for children in part of listening, thinking, understanding, interacting with the learning course, sharing the experience, changing people's belief, being the intelligent tools in term of creating, and exchanging the story to gain more experience and deeply understand. Additionally, this also encourages the student to develop the idea, express the emotion which affects technology integration of the course and aim to access the individual information and feedback the learning result (Elahi, Mahmood, Shazadi, & Jamshed, 2015; Tsiviltidou, 2015) as well as the creativity which occurs from knowledge exchange which leads to the various creativity and teamwork.

The writing and reading are related to each other and enhance the elaboration thinking which is the same as learning through fairy tales electronic books together with creative activities to increase the creative thinking (Kultida Kulkong, 2012; Lee, Lee, Seo, & Choi, 2015; Wang, 2012)

The suggestions are clear explanations that the role of student that they must play a position as an opened-heart and do not comment on the classmate's work in the wrong way. The reasons for these actions are students will be able to share the story naturally, bold to create the workpiece, and broadcast to other classmates. The teacher plays an essential role of learning that acts as a facilitator of carrying out the class activities, building the enjoyable atmosphere in the class, allowing learners to learn freely, motivating the learner to participate in the classroom activities. In the process of brainstorming and reflective thinking, the teacher will let student exchange ideas together as the group under criteria that everyone can give their opinion freely, and others group member must listen to speaker's opinion as well as sharing their opinion regarding the fact and reason. The process of searching for information leads the learner to be able to find out the digital information freely as well as select the data they need. The evaluation process does not consider from the beauty of art, or grammar, but pays attention to the expression about a point of view through the unique storytelling by the writing of the learner.

The suitability considering the subject description which conforms to the process of a learning model to get more effectively together with describing the gamification environment arrangement to motivate the class to be more exciting and enjoy. The competitive is only a part of activity but does not mean to the capability of learner. When we apply the learning model to real usage, we should deliberately consider the readiness of computer or smartphone, internet, place, teacher, and learner as well as technical skill usage, the ability of a learner in part of searching for information about computer usage which is an essential factor of the learning.

At the moment, the teacher and learner can apply www.suk.tools for doing an activity in the class since an upper primary student with every learning group and should use for learning in the school to build up the enjoyment, learning motivation, and practice to search for information from various sources. This tool can be used in everywhere and anytime if the internet available in that place.

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