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Development of Multimedia Cartoons based on Factors that Users Expected

Chawanrat Srinounpan[1] Walaiporn Sornkliang[1*] Rattayagon Thaiphan[1] Jeerawat Naksuwan[1] Auyporn Chukeaw[1] Kritaphat Songsri-in[1] Munlika Rattaphun[1] and Jureerat Chaykeeree[1]
[1]Science and Technology Faculty, Nakhon Si Thammarat Rajabhat University, Muang District, Nakhon Si Thammarat Province 80280
[*] Contact person: (Corresponding e-mail: walaiporn_sor@nstru.ac.th)

Abstract

The objectives of this study were 1) to study the expectation factors of multimedia cartoon users 2) to develop a multimedia cartoon titled "The journey of garbage" in accordance with the expectation factors, and 3) to assess satisfaction of developed multimedia cartoon users titled "The journey of garbage". There were 2 sample groups divided upon research method steps; 1) step of searching expectation factors, consisting of 252 teachers and primary school students and 2) step of assessment the satisfaction of developed media users; the sample group was consisting of 3 teachers and 60 students of grade 4-6 at Ban Khlong Din School, Nakhon Si Thammarat Province by using purposive sampling. This study has developed multimedia cartoons that met the users' expectations and were instructional media that helped students understand the proper waste separation methods. Media development was 3 steps, namely pre-production, production, and post-production. The statistics used in the study were percentage, mean, standard deviation, and confirmatory factor analysis.

The finding of this research revealed that the expectation factors of multimedia cartoon users were 21 factors that can be grouped into 3 aspects: content, display, and technical, each factor had factor loading greater than 0.40 in all factors. The satisfaction assessment of teachers and students towards developed media was at an excellent level.

Keywords: *Media Development, Multimedia Cartoons, Instructional Media, Waste Management, Expectation Factors*

Introduction

Thailand places importance on education at all levels because education is the basis for the country's development. The Ministry of Education has prepared Thailand Education Scheme B.E. 2560-2579 so that all Thai people receive quality education and lifelong learning, live life happily in line with Sufficiency Economy Philosophy and change of the world in the 21st century, with a strategy of people's potential development in all ages and create a learning society which aims to have a learning resource used in education, having textbooks, innovations and instructional media that are of quality and standard (Office of the Education Council, 2017).

Based on the goals mentioned above, an intermediary, channel, or instrument for transferring knowledge from a learning source to learners, will help learners to better understand the lesson is instructional media, which good instructional media should use technology to stimulate memory, making an interesting to attract learners to focus on instructional media. Multimedia cartoons are a display of stories mixed between text, graphics, animation, and sound, being a media that stimulate the learner's interest, and creates a visualization that makes learners develop their thinking continually resulting in learners can easily understand the lesson and memorize lessons quickly, Therefore, adopting of

multimedia cartoons in instructional will make learners impressed (Pansila & Tiamtan, 2021), therefore, learners more often use instructional media resulting in learners have a higher academic achievement (Weerapan & Anupong, 2017).

The development of Multimedia cartoons to have quality and meet the interests of media users should be based on the ideas, needs, or predictions of what learners will receive from instructional media and feel satisfied with what they have received, these characteristics are called the expectation factors toward media (Lumpongnua, 2008). Therefore, for the development of multimedia cartoons to have quality and meet users' needs, it is necessary to study the expectation factors of users toward media in various aspects first, in order to bring the above expectation factors as a basis for designing and developing quality media that truly meets users' needs.

Researchers have developed a multimedia cartoon titled "The journey of garbage" for learners to learn how to manage waste properly through 3R; Reduce, Reuse, and Recycle. But due to the Covid-19 situation, causing the amount of waste from food delivery increased by 300%, resulting in a large increase in the amount of plastic waste, such as plastic bags, plastic boxes, plastic glasses for drinks, plastic spoons and forks, etc. (Simachaya, 2020). Therefore, a multimedia cartoon titled "The journey of garbage" has taken users' expectation factors towards media as a basis for designing and developing media to make the learners feel satisfied because the media will be fun, entertaining, interesting, attracting the attention of learners well, making the lesson easier to understand and when the learners have knowledge and understanding, they will make the learners conscious and participate in waste management, be able to transfer knowledge to other people and help reduce the problem of waste.

Objectives

1. **To study the expectation factors of multimedia cartoon users**

2. **To develop a multimedia cartoon titled "The journey of garbage" according to the expectation factors**

3. **To assess the satisfaction of developed multimedia cartoon users titled "The journey of garbage"**.

Research Hypothesis

The development of multimedia cartoons using the expectation factors as the basis for designing and developing will make users have satisfaction towards media at the excellent level.

Literature Review

Multimedia Cartoons

Multimedia cartoons refer to cartoons that can be animated, also known as cartoon animation by creating movement from slides sorting and showing results continuously, allowing the eyes to see the movement in the form of afterimages (Kanchanasuwan, 2009). The development of multimedia cartoons is combining knowledge, experience in both science and art together, being able to attract learners' attention because motion images can be seen in instructional media more clearly than text or still images (Chajernsuk, Rodcheng, Kekaououtoat, & Saenboonsong, 2020). The display uses appropriate fonts size, having narrated audio and sound effects (Binnapee, Savani, Chareon, & Intasorn, 2021; Thongthep & Ploysuayngam, 2017). Multimedia cartoons can be learned as many times as learners want, which results in better learning of learners or can abide by the content that appears in the media (Saenboonsong, Emrat, & Jantrasi, 2018).

Expectation Factors

Expectancy Theory also known as V. I. E.; V (Valence) refers to satisfaction, I (Instrumentality) refers to instructional media or methods that lead to satisfaction and E (Expectancy) refers to the expectations within the person, therefore, a person must try to act in a certain way to satisfy the need, when receiving a response as hope or expect, that

person will have a positive impression of media or that thing (Vroom, 1964).

After performing literature reviews, academic papers, academic articles, results of research, and thesis that related to the expectation factors in media design to create user satisfaction (Sanmun, Chimplee, & Arayachai, 2018; Maneechuay & Prasittisuk, 2017; Thongthep & Ploysuayngam, 2017; Salem, 2017; Weerapan & Anupong, 2017; Suksanguan, 2016; Khutngern, 2012; Khlaisang, 2011; Sapthanadon, 2011; Hansacharunrot, Chantana, Onmanee, & Rattanatherawong, 2010; Payngulume & Tengkiattrakul, 2009; Lumpongnua, 2008), it can be grouped into 3 aspects as follows:

1. Content comprises objectives, quantity, age, relationship, interesting and understand.

2. Display comprises clear, meaning, color, background, character, animation, sound, sound effects, emotional and text.

3. Technical comprises interpretation, screen size, interactive, modern and balance.

Conceptual Framework

From the research hypothesis, the conceptual framework can be shown as in Figure 1.

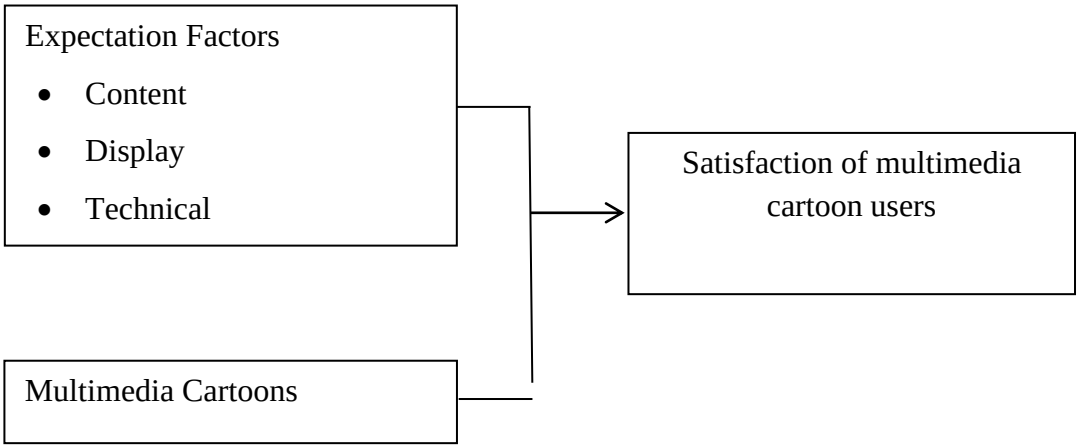


Figure 1; Conceptual Framework

Research Methods

This study is research and development with research method steps as follows:

1. The population and sample group consist of 2 groups divided upon research method steps as follows:

1. 1 Step of searching expectation factors; the sample group was 252 teachers and primary school students in Nakhon Si Thammarat Province (Hair, Blak, Barbin, Anderson, & Tatham, 2010) by using 12 times the number of factors extracted.

1.2 Step of assessment the satisfaction of developed media users; the sample group was consisting of 3 teachers and 60 students of grade 4-6 at Ban Khlong Din School, Nakhon Si Thammarat Province by using purposive sampling.

2. Research Instrument are as follows:

2. 1 Expectation survey form of multimedia cartoons users was rating scale, reliability value = 0.964.

2. 2 Satisfaction questionnaire was rating scale, reliability value = 0.956.

3. Research method steps were as follows:

3. 1 Researchers have studied the expectation factors of multimedia cartoon users by collecting data from books, academic articles, and research results then analyzed to be the expectation factors of multimedia cartoon

users, it was found that 21 factors were divided into 3 aspects: content; display, and technical.

3. 2 Developed factor measurement model affecting the expectation of multimedia cartoon users from expectation survey form by researchers have performed confirmatory factor analysis and second order confirmatory factor analysis of the expectation factor indicators of multimedia cartoon users.

3. 3 Designed and developed multimedia cartoons titled "The Journey of Garbage" which have been designed and developed based on user's expectations factors. The study and analysis consist of 3 steps as follows:

3.3.1 Pre-production; was a step of preparing to create multimedia work, starting from story preparation, topic setting, content setting, scriptwriting, character design, cartoon drawing, and creating storyboard.

3.3.2 Production; was a step of developing multimedia from finished storyboards, defining layout, computer drawing, multimedia creation then editing, decorating, adding sound effects and music.

3. 3. 3 Post-production; was a step for testing the quality and integrity of multimedia cartoons by 5 experts in technology and environment.

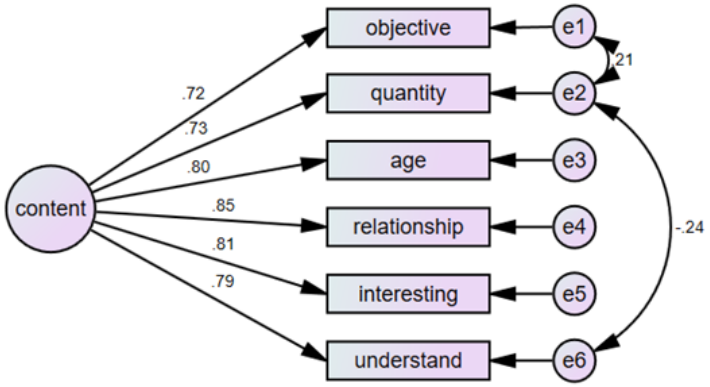
3. 4 Assessing the satisfaction of multimedia cartoon users titled “The journey of garbage".

4. Statistics used in this research were percentage, mean, and standard deviation (for assessing the satisfaction of multimedia cartoon users that has developed) correlation analysis, and second order confirmatory factor analysis (for testing the factor model that affects the expectations of multimedia cartoon users).

Results

The results of this research are as follows:

1. A study of the expectation factors of multimedia cartoon users from literature review, it was found that 2 1 factors were divided into 3 aspects; content, display, and technical. When applying data from a questionnaire of 2 5 2 teachers and primary school students in Nakhon Si Thammarat Province to test the goodness of fit of factors within the group with confirmatory factor analysis, found that all models were consistent with the empirical data by considering from chi-square (χ^2) / df was less 2 , P-value was greater than 0 . 0 5 , GFI and TLI P-were approach 1, RMSEA and SRMR were approach 0 in all model as shown in Figure 2.



χ^2/df = 1.529 P-Value = 0.152
RMSEA = 0.049 SRMR = 0.008
GFI = 0.984 TLI = 0.990

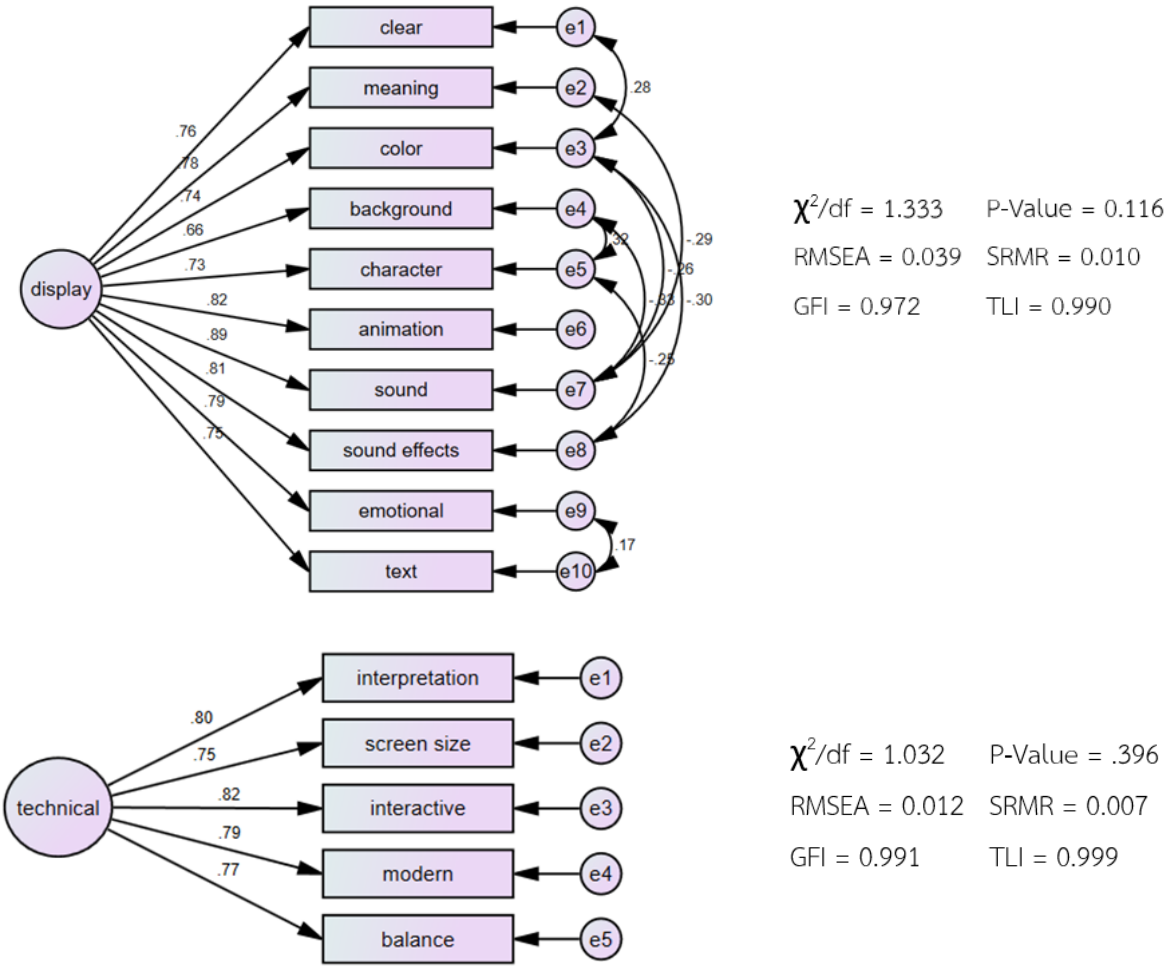


Figure 2: Confirmatory factor analysis model in each aspect.

From Figure 2 , when considering factor loading in the standardized observed variables model, it was found that all factors loading were positive between 0.67 to 89, and statistically significant = 0.001 in all factors by 1) content; the most factor loading was the factor of relationship = 0.83 , 2) display; the most factor loading was sound = 0.89 and 3) technical; the most factor loading was the interactive = 0.80.

When taking factors in each aspect to create a two-level relationship by using second order confirmatory factor analysis to test the goodness of fit of factor within and between group. The analysis results can be shown in Table 1 and Figure 3.

Table 1: Results of second order confirmatory factor analysis of expectation factor model.

Expectations with factors in each aspect	Factor Loading (b)	Sig.
Expectation -> Content	0.84	0.000
Expectation -> Display	0.93	0.000
Expectation -> Technical	0.99	0.000
Content		
1.1 Objective	0.73	0.000

1.2 Quantity	0.78	0.000
1.3 Age	0.71	0.000
1.4 Relationship	0.82	0.000
1.5 Interesting	0.77	0.000
1.6 Understand	0.80	0.000
Display		
2.1 Clear	0.76	0.000
2.2 Meaning	0.76	0.000
2.3 Color	0.73	0.000
2.4 Background	0.68	0.000
2.5 Character	0.74	0.000
2.6 Animation	0.83	0.000
2.7 Sound	0.86	0.000
2.8 Sound Effects	0.78	0.000
2.9 Emotional	0.83	0.000
2.10 Text	0.78	0.000
Technical		
3.1 Interpretation	0.80	0.000
3.2 Screen Size	0.78	0.000
3.3 Interactive	0.79	0.000
3.4 Modern	0.81	0.000
3.5 Balance	0.76	0.000
χ^2/df = 1.202, P-Value = 0.054, RMSEA = 0.013, SRMR = 0.007, GFI = 0.945, TLI = 0.990		

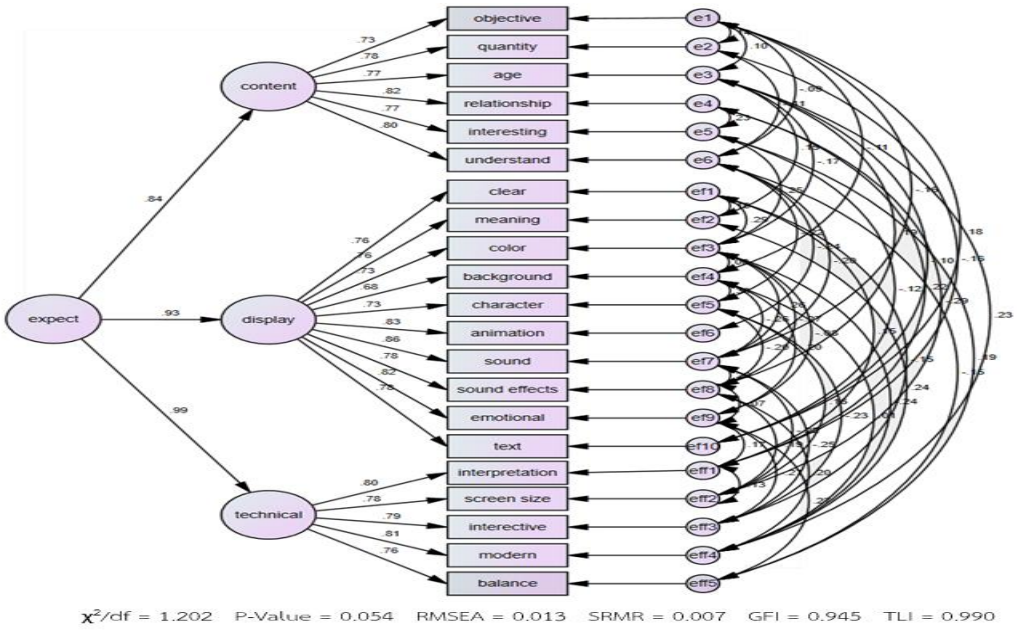


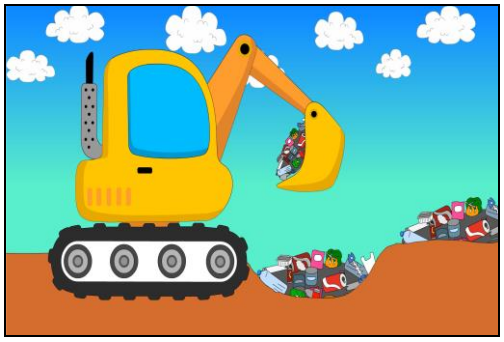
Figure 3: Second order confirmatory factor analysis model of expectation factors.

From Table 1 and Figure 3 , when considering factor loading in the standardized observed variables model, it was found that all factors loading were positive as before for all 21 factors, with a size of 0.67 to 0.86 and statistically significant = 0.001 for all factors and factor loading in 3 standardized latent variables were positive, with a size of 0.84 to 0.99 . When considering each aspect, it was found that the user's expectation on technical was the highest at 0.99, followed by the user's expectation on display was 0.93, and the user's expectation on content was 0.84 , that shows these factors are harmonious with data and can be used together.

2. Development of multimedia cartoons titled "The Journey of Garbage" based on the expectation factors, researchers have developed media according to planned steps by using the expectation factors that found from objective 1 as base of development were 1) content; researchers have analyzed the content in order to be consistent with objective that emphasized on building knowledge and understanding in content for learners to create awareness and participation in waste management, analyzed quantity that suitable to age, used relationship to make it easier to understand, and used interesting through multimedia cartoons to create interest; 2) display; researchers have designed and developed media by using meaning, clear, color, featuring female and male characters in various ages, and appropriate animation, used sound and sound effects to convey emotional, and having text to describe content clearly and beautifully; 3) technical; researchers have designed and developed media to be able to interpretation, designed screen size, used interactive, used multimedia, animation in presentations that are interesting, modern, exotic, virtual to attract learners' attention, made it easier for learners to understand content. The results of developed multimedia cartoon titled "The journey of garbage" shown in Figure 4.

1) Scene of garbage in the river

2) Scene of source of garbage



3) Scene of garbage disposal by landfill

4) Scene of making compost from garbage

Figure 4: sample of multimedia cartoons titled "The journey of garbage"

3. Satisfaction; assessment of satisfaction of users towards developed multimedia cartoons titled "The journey of garbage" according to objective 2, by a sample group was 3 teachers and 60 students in grade 4-6 from Ban Khlong Din School, Nakhon Si Thammarat Province. The satisfaction results on multimedia cartoons titled "The journey of garbage", total mean from both target groups was excellent level at 4.63, and the standard deviation was 0.42. The details are shown in Table 2.

Table 2: Satisfaction results of users of multimedia cartoons titled "The journey of garbage"

Satisfaction assessment issues	Assessed by Teachers			Assessed by Students		
	$\bar{x}$	S.D.	Meaning	$\bar{x}$	S.D.	Meaning
1. Content						
1.1 Objective	4.67	0.47	Excellent	4.57	0.50	Excellent
1.2 Quantity	4.67	0.47	Excellent	4.48	0.50	Good
1.3 Age	4.67	0.47	Excellent	4.65	0.48	Excellent
1.4 Relationship	5.00	0.00	Excellent	4.72	0.45	Excellent
1.5 Interesting	5.00	0.00	Excellent	4.65	0.48	Excellent
1.6 Understand	5.00	0.00	Excellent	4.60	0.49	Excellent
Total of Content	**4.83**	**0.24**	**Excellent**	**4.61**	**0.48**	**Excellent**
2. Display						
2.1 Clear	4.33	0.47	Good	4.57	0.50	Excellent
2.2 Meaning	4.33	0.47	Good	4.48	0.50	Good
2.3 Color	4.67	0.47	Excellent	4.63	0.48	Excellent
2.4 Background	5.00	0.00	Excellent	4.67	0.47	Excellent
2.5 Character	4.67	0.47	Excellent	4.65	0.48	Excellent
2.6 Animation	4.33	0.47	Good	4.58	0.49	Excellent
2.7 Sound	4.67	0.47	Excellent	4.67	0.47	Excellent
2.8 Sound effects	4.33	0.47	Good	4.48	0.50	Good
2.9 Emotional	4.33	0.47	Good	4.57	0.50	Excellent
2.10 Text	4.67	0.47	Excellent	4.60	0.49	Excellent
Total of Display	**4.53**	**0.42**	**Excellent**	**4.59**	**0.49**	**Excellent**
3. Technical						
3.1 Interpretation	4.67	0.47	Excellent	4.58	0.49	Excellent
3.2 Screen Size	4.67	0.47	Excellent	4.65	0.48	Excellent
3.3 Interactive	4.67	0.47	Excellent	4.50	0.50	Excellent
3.4 Modern	5.00	0.00	Excellent	4.67	0.47	Excellent
3.5 Balance	4.67	0.47	Excellent	4.60	0.49	Excellent
Total of Technical	**4.73**	**0.38**	**Excellent**	**4.60**	**0.49**	**Excellent**
Total Mean	**4.67**	**0.36**	**Excellent**	**4.60**	**0.49**	**Excellent**
Total mean from both target groups	**$\bar{x}$ = 4.63, S.D. = 0.42 meaning Excellent**					

Conclusion and Discussion

This research has developed multimedia cartoons titled "The Journey of Garbage" according to users' expectations which has been analyzed and tested the goodness of fit of expectation in each aspect with confirmatory factor analysis which results were in accordance with specified criteria,

namely Chi-square (χ^2)/df was less 2, P-value was greater than 0.05, GFI and TLI P-were approach 1, RMSEA and SRMR were approach 0 in all model which can summarize and discuss each objective as follows:

1. The expectation factors of multimedia cartoon users; the results showed that all 21 expectation factors had factor loading greater than 0.40 at all factors, which met the specified criteria when sample group size was greater than 200 sets (Singchangchai, 2006) and the model test results can describe the goodness of fit of expectation factors in each aspect reasonably, consistent with the empirical data and in accordance with criteria (Schumacker & Lomax, 2010), researchers, therefore, used the expectation factors of multimedia cartoon users, and factor loading to be base for the development of multimedia cartoons titled "The journey of garbage"

2. Development of multimedia cartoons titled "The journey of garbage" by taking the expectation factors derived from objective 1, amount of 21 factors from 3 aspects were 1) content, 2) display and 3) technical to be base for the development of 2D multimedia cartoons, making both height and width visible, storytelling through cartoons were realistic, with explanations that highlight the main points in a clear, easy to understand and followable manner, also having the character's sound, emotional, sound effects, used interactive and relationship, etc. which consistent with the research of Binnapee et al. (2021), Chajernsuk et al. (2020), Saenboonsong et al. (2018), and Thongthep and Ploysuayngam (2017).

3. Assessing the satisfaction of multimedia cartoon users titled "The journey of garbage" which was media that developed to help students to have knowledge of how to separate waste properly and campaigns to raise awareness of waste separation in each category to solve the problem of waste increasing and help solve the problem of school waste management in another way. The target groups were 3 teachers and 60 students in grade 4-6 at Ban Khlong Din School, Nakhon Si Thammarat Province. The results of the efficiency assessment from using multimedia cartoons titled "The journey of garbage"; the satisfaction survey respondents were divided into 2 groups as follows: 1) Teacher; by satisfaction on content was excellent level, mean = 4.83, satisfaction on this sub-section was a relationship at excellent level, having interesting and understandable. The display was excellent level, mean = 4.53, satisfaction on this sub-section was background, color, character, sound, sound effects, text. The technical was excellent level, mean = 4.73, satisfaction on this aspect was modern, and 2) students; by satisfaction on content was excellent level, mean = 4.61, satisfaction on this sub-clause was a relationship. The display was excellent level, mean = 4.59, satisfaction on this sub-section was background and sound. The technical was excellent level, mean = 4.60, satisfaction on this sub-section was modern. When determining the total mean satisfaction of teachers and students, it was found that the satisfaction on multimedia cartoons titled "The journey of garbage" was excellent level which the research hypothesis was true. The development of multimedia cartoons using the expectation factors as a base for design and development to make users' satisfaction was excellent level and was consistent with research by Pansila and Tiamtan (2021), Thongthep and Ploysuayngam (2017), Suksanguan (2016), and Sanmun et al. (2018).

It can be concluded that the expectation factors of multimedia cartoon users that the researcher has studied and analyzed all 21 factors divided into 3 aspects: content, display, and technical, can be used as a base for media design and development resulting in users were satisfied with multimedia cartoon usage at a very good level.

Recommendation

Recommendation in this Research

After studying all 21 expectation factors of multimedia cartoon users, it was found that all 21 factors can be used as a base for designing multimedia cartoons which will result in users having satisfied with media, therefore, researchers or people who are interested in developing multimedia cartoons

can use their knowledge as a guideline for designing multimedia cartoons by sorting importance in design, namely technical, display and content.

Recommendation for Future Research

ข้อเสนอแนะในการวิจัยในโอกาสต่อไป ควรมีการประเมินเปรียบเทียบผลสัมฤทธิ์ของสื่อการ์ตูนมัลติมีเดียหลังจากการนำไปใช้งาน เพื่อเป็นการวัดประสิทธิภาพหรือผลสัมฤทธิ์ของสื่อการ์ตูนมัลติมีเดีย

References

Binnapee, R., Savani, H., Chareon, K., & Intasorn, Y. (2021, February 19). 2D animation moralistic cartoon (Fasting). In *The 11th National Conference in Topic "Community-led Social Innovation in the Era of Global Changes amidst Covid-19 Crisis"*. Southern College of Technology, Nakhon Si Thammarat. **[in Thai]**

Chajernsuk, N., Rodcheng, P., Kekaououtoat, C., & Saenboonsong, S. (2020). The a comparison of grade 3 students learning achievement using animation media in adventures in the technology world at Wat Inkanlaya School. *Journal of Applied Informatics and Technology*, *2*(2), 104-115. **[in Thai]**

Hair, J., Blak, W. C., Barbin, B. J., Anderson, R. E., & Tatham, R. L. (2010). *Multivariate data analysis*. Upper Sandle River, NJ: Prentice Hall.

Hansacharunrot, C., Chantana, K., Onmanee, K., & Rattanatherawong, W. (2010). Student's satisfaction in learning media primavera 5.0 in RMUTR. *Modern Management Journal*, *8*(2), 81-94. **[in Thai]**

Kanchanasuwan, T. (2009). *Multimedia technology*. Bangkok: KTP Comp & Consult. **[in Thai]**

Khlaisang, J. (2011). *Principles of educational website design: Theory to practice.* Bangkok: Thailand Cyber University Project, Office of the Higher Education Commission, Ministry of Education. **[in Thai]**

Khutngern, S. (2012). *The self-learning multimedia on data and information for Mathayomsuksa 1 students* (Master's thesis). Rajamangala University of Technology Thanyaburi, Bangkok. **[in Thai]**

Lumpongnua, N. (2008). The assessment of users' expectation for further development in designing and developing the multimedia computer assisted instruction for auto mechanics field: water temperature sensor servicing. *The Journal of King Mongkut's University of Technology North Bangkok*, *18*(2), 43-51. **[in Thai]**

Maneechuay, K., & Prasittisuk, S. (2017). *The factors that affect satisfaction in online e-Learning of the Government Savings Bank (GSB) employees in Surat Thani Province*. Retrieved from http://www.utccmbaonline.com/ijbr/doc/(Edit)Id603-10-05-2017_15:59:08.pdf **[in Thai]**

Office of the Education Council. (2017). *National education plans 2017-2036*. Bangkok: Prigwhan Graphic. **[in Thai]**

Pansila A., & Tiamtan, P. (2021). The development of multimedia lessons titled animation creation for Matthayomsuksa three students. *Journal of Graduate Studies in Northern Rajabhat Universities*, *11*(1), 165-180. **[in Thai]**

Payngulume, K., & Tengkiattrakul, S. (2009). The effect of using multimedia on expectation and satisfaction with the teaching-learning approach in operating rooms among nursing students. *Rama Nurse Journal*, *15*(3), 417-430. **[in Thai]**

Saenboonsong, S., Emrat, N., & Jantrasi, S. (2018). The development of multimedia for learning on search engine of seventh grade students at Wat Phrakhao School, Phranakhon Si Ayutthaya. *Journal of*

Learning Innovations Walailak University, *4*(2), 1-15. **[in Thai]**

Salem, A. (2017). *Apply of e-Learning in the teaching process Minburi Bangkok Business Administration Technological College* (Master's thesis). Mahanakorn University of Technology, Bangkok. **[in Thai]**

Sanmun, D., Chimplee, N., & Arayachai, W. (2018). The development of instructional media using application on smartphone: Hematology course. *Silpakorn University Journal*, *38*(3), 73-89. **[in Thai]**

Sapthanadon, T. (2011). Factors affecting the teaching and learning management of online lessons at Nakhon Ratchasima Rajabhat University. *Veridian E-Journal SU*, *4*(1), 652-666. **[in Thai]**

Schumacker, R. E., & Lomax, R. G. (2010). *A beginner's guide to structural equation modeling* (3rd ed.). New Jersey: Lawrence Erlbaum Associates.

Singchangchai, P. (2006). *Principles and using multivariate statistics analysis for nursing* research (3rd ed.). Songkla: Chan Muang Publishing. **[in Thai]**

Simachaya, W. (2020). *Plastic waste surges by 60% during COVID-19*. Retrieved from http://www.tei.or.th/th/blog_detail.php?blog_id=51 **[in Thai]**

Suksanguan, W. (2016). The development instruction media of comic e-Book on principle of accounting with Chadok history. *Academic Services Journal, Prince of Songkla University*, *27*(1), 81-90. **[in Thai]**

Thongthep, K., & Ploysuayngam, W. (2017, December 7-8). The development of 2D animation on "Campaign to solve drug problems" for drug addicts in Aoluek District, Krabi Province. In *The 14th KU-KPS Conference*. Kamphaengsaen Campus, Kasetsart University, Nakhon Pathom. **[in Thai]**

Vroom, V. H. (1964). *Work and motivation*. New York: John Wiley & Sons.

Weerapan, D., & Anupong, N. (2017). The development of 2D animated multimedia learning materials about sufficient life via internet. *Valaya Alongkorn Review (Humanities and Social Science)*, *7*(3), 61-72. **[in Thai]**