

An approach in creating positive emotion for children's e-learning based on user interface design

Magrizef Gasah¹, Nurul Hidayah Mat Zain², Aslina Baharum³

^{1,3}Faculty of Computing and Informatics, Universiti Malaysia Sabah, Sabah, Malaysia

²Faculty Computer and Mathematical Sciences, UiTM Cawangan Melaka, Kampus Jasin, Melaka

Article Info

Article history:

Received Sep 30, 2018

Revised Dec 22, 2018

Accepted Jan 2, 2019

Keywords:

E-learning

Methodology

Positive emotion

User interface design

ABSTRACT

This paper presents an approach in creating positive emotion for children's e-learning using user interface design. The problems that this research aims to solve are the lack of children interest in school and early childhood school dropout. This research consists of three phases where each phase has its own research method. In this paper, the proposed research method aims to identify the user interface design that could trigger positive emotion and achieved using a qualitative method and quantitative method. The result shows a guideline for creating e-learning application that could help designer and developer to develop the application. Hopefully, the guideline of the positive emotion and the e-learning application could help the children more interested in school and learning in the future.

Copyright © 2019 Institute of Advanced Engineering and Science.
All rights reserved.

Corresponding Author:

Magrizef Gasah,
Faculty of Computing and Informatics,
Universiti Malaysia Sabah,
88400 Kota Kinabalu, Sabah, Malaysia.
Email: magrizef_zone@yahoo.com

1. INTRODUCTION

Children between the age of six and ten years old are in the consolidation phase that concerns with the learnings acquired in first childhood, preparing for adolescence. Around this age children begin to understand the world around them such as finding new solutions, gaining skills to resolve problems, judge, learning to reflect, and understand that others have a different point of view and that it can bring consequences to them and to the interaction between them [1]. As this earlier age, children tend to feel bored in school when the material and the teaching method are not interesting. If this problem was not handled sooner, the children will not go to school and probably will drop out at an early age. Children between that age should be given exposure to a lot of activities in school that could encourage them and having an interest in the school. Subsequent studies have shown that to create the effective associations is through raising positive emotions in learning such as enthusiasm, enjoyment in the present moment and contentment [2].

In academic, the positive emotions could be linked to the achievement of various skills that helps in academic success. By nurturing happiness in the class it helps students to sustain a sense of mindfulness, physical health and resilience [3]-[4]. Besides, the positive emotion experienced by the students could help them in encountering the academic challenges with determination and acceptance. This positive experience could be applied or implemented in e-learning and online training programs to spark emotional engagement [5]. Other than that, in order to trigger an emotion to users, the designer has a very important role to give the user positive experience, which could also create a positive emotion (e.g. trust) and the negative experience could create negative emotion (e.g. anxiety) [6]. The positive experience and the positive emotion are closely related to each other where both it is very significant in encouraging the interest of the children. It was possible to design products that target specific types of emotions by measuring the emotional responses felt

by users [7].

This support that, it is possible to create a product that targets a specific emotion by measuring the emotional response that could be applied in the children's learning material and make them interested in learning. Numerous researcher and consumer have argued that products that could excite customers will be more successful than those that do not [8]. This proves that by creating a learning material that could excite the children will be more successful to create interest in learning because exciting things induce interest to children. Exploration of other senses or emotional connection, associations and experience is important for the product to compete [9]. The link between attachment and emotional design is important in order for the user to use the product [10]. Therefore, exploring more user interface design that could make the children excited in learning is important because making an emotional connection with the children through the learning material will make them feel less boring and more to the excitement.

Identifying the emotional response only is not enough to create an interest to the children. Since emotion could not be defined easily because one emotion could be good for children to create an interest and some are not, depending on the children personal experience and perspective. To categorize the emotion, it is important to identify the basic level of emotion [11]. According to [12], humans experience emotion through evidence that could influence action, thoughts and behaviour. These emotions could be categorized into various effects, which correspond to the current situation of the human. Therefore, by identifying the most basic level of human emotion it's could be categorized according to the aim of our research which is implementing the positive emotion to children. The identification of this positive and negative emotion is necessary so that only the positive emotion will be implemented in the e-learning application.

2. RESEARCH METHOD

The approach used for this research was adapted from the emotional interface methodology by Tzvetanova in 2007. Originally, the emotional interface methodology research is a research method for modelling an emotional appraisal in User Interface. As early approach, it has identified some user interface with emotional content and being verified by the expert [13].

Figure 1 shows the research method. The approach consists of the flow of the research and each flow contain its own research method that answers the research question. The phase 1 will be focusing on the creation of the guideline for the emotional interface design. Phase 2 is the demonstration of the emotional interface where the interface is being shown in form of e-learning application. Finally, phase 3 is the emotional interface evaluation where the developed application is evaluated using the quantitative and qualitative method. The quantitative method is executed using the EEG device while the qualitative is conducted using an adapted Kort Emotional scale [14].

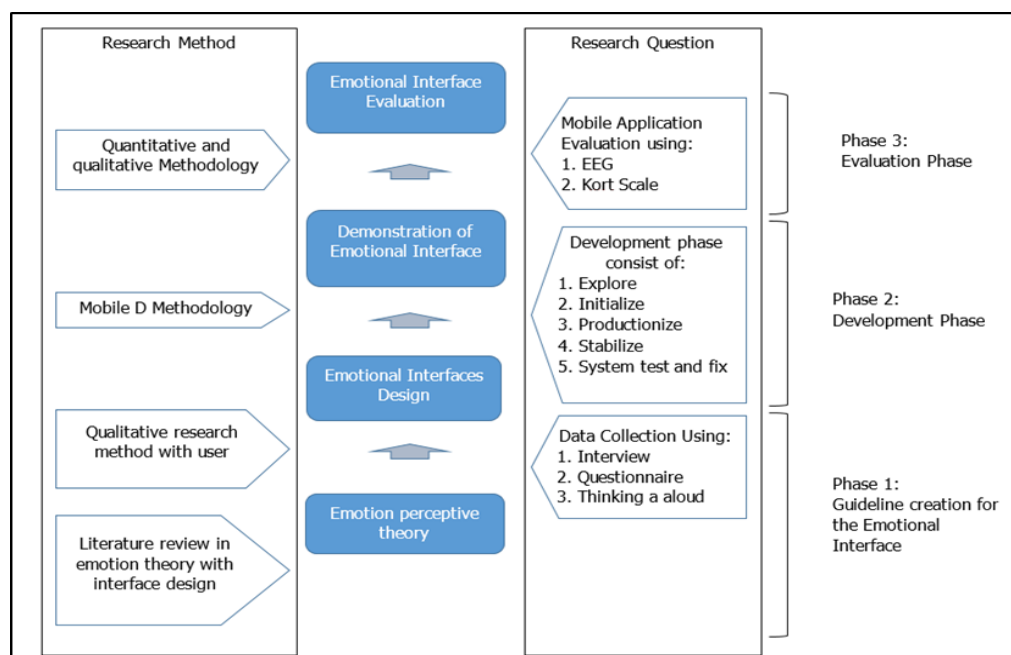


Figure 1. Research Method

2.1. Modeling Basic Emotion

Before the execution of the approach (Figure 1) in creating the positive emotion in children's e-learning user interface application, the identification of the basic emotion is necessary to create a template for the classification of the emotion into positive emotion and negative emotion. The procedure to create a template to classify the negative emotion and positive emotion are as shown in Figure 2. Firstly, the modelling of the basic emotion required the result of experiments, research and theory from the previous study. The list of the accumulated basic emotion will then be classified into positive and negative emotion to produce a template to identify a particular emotion whether it is a positive or negative emotion.

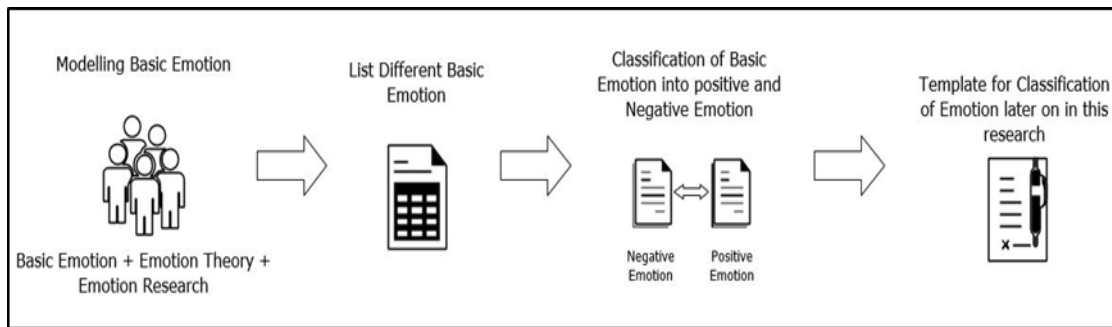


Figure 2. Procedure to Identify the Ppositive and Negative Emotion

According to Edelman (2007) and Barret (2006) [11]-[12], it is necessary to identify the most basic emotion of the human. Table 1 shows the adapted basic emotion from three researchers according to their findings and a total of 40 basic emotion will be used.

Table 1. 40 Adapted Basic Emotion

Source, Year	List of Distinct Emotions		Basic Emotion
Plutchik (2001) [15], 8 Emotion	<ul style="list-style-type: none"> • Anger, Disgust; Fear; Sadness 	<ul style="list-style-type: none"> • Anticipation; Joy; Surprise; Trust 	1. Admiration, 2. Adoration, 3. Aesthetic, Appreciation, 4. Amusement, 5. Anger, 6. Anticipation, 7. Anxiety, 8. Appreciation, 9. Awe, 10. Awkwardness, 11. Boredom, 12. Contempt, 13. Calmness, 14. Confusion, 15. Craving, 16. Disgust, 17. Entrancement, 18. Empathetic, Pain, 19. Envy, 20. Excitement, 21. Fear, 22. Guilt, 23. Horror, 24. Interest, 25. Joy, 26. Nostalgia, 27. Pride, 28. Pleasure, 29. Pity, 30. Relief, 31. Romance, 32. Sadness, 33. Satisfaction, 34. Shame, 35. Sexual desire, 36. Surprise, 37. Sympathy, 38. Tenderness, 39. Triumph, 40. Trust
Sacharin (2012) [16], 20 Emotion	<ul style="list-style-type: none"> • Anger; Interest; Amusement; Pride; Joy; Pleasure; Tenderness; Awe; Relief; Surprise 	<ul style="list-style-type: none"> • Nostalgia; Pity; Sadness; Fear; Shame; Guilt; Regret; Envy; Disgust; Contempt 	
Cowen (2017) [17], 27 Emotion	<ul style="list-style-type: none"> • Admiration; Adoration; Aesthetic, Appreciation; Amusement; Anxiety; Awe; Awkwardness; Boredom; Calmness; Confusion; Craving; Disgust; Empathetic, Pain 	<ul style="list-style-type: none"> • Entrancement; Envy; Excitement; Fear; Horror; Interest; Joy; Nostalgia; Romance; Sadness; Satisfaction; Sexual desire; Sympathy; Triumph 	

Next, after the basic emotion have been identified, the emotions need to be classified so that it is possible to distinguish between the positive emotion and the negative emotion. Since the user interface design both could make the user feel a positive emotion and negative emotions, classifying these emotions are the priority before proceeding to the next step. The classification of the basic emotions into positive emotion and negative emotion in Table 1 is possible by applying the template created by Robinson (2008) [18]. Table 2 shows the classification of the basic emotion into positive emotion and negative emotion. Table 2 will be used as the template to classify the emotion from the user interface design after the data have been collected.

Table 2 shows the basic emotion in Table 1 being classified into positive emotion and negative emotion. The basic emotion was classified by understanding the type of emotion and classified it into positive or negative emotion. For example, the emotion that related to object properties could show a positive emotion to students when they interested in learning new things in school, while a negative emotion could be the boredom that the students experiencing during the class. Other types of emotions that included are the future appraisal, event-related, self-appraisal, social, and cathected.

Table 2. Classification of Basic Emotion (Positive vs Negative Emotions)

Kind of Emotion	Positive Emotion	Negative Emotion
Related to object properties	1. Admiration, 2. Adoration, 3. Aesthetic Appreciation, 9. Awe, 4. Craving, 24. Interest	16. Disgust, 11. Boredom, 23. Horror
Future Appraisal	4. Amusement, 36. Surprise, 20. Excitement, 30. Relief, 6. Anticipation	21. Fear, 7. Anxiety, 22. Guilt, 14. Confusion, 10. Awkwardness
Event-Related	25. Joy, 39. Triumph, 28. Pleasure, 33. Satisfaction, 17. Entrancement	5. Anger, 32. Sadness, 26. Nostalgia, 27. Pride
Self-Appraisal	13. Calmness	34. Shame, 35. Sexual Desire, 19. Envy
Social	37. Sympathy, 29. Pity, 38. Tenderness, 18. Empathetic Pain, 8. Appreciation	12. Contempt
Cathected	31. Romance, 40. Trust	

2.2. Guideline Creation for Emotional Interface

The guideline for the Emotional Interface is actually the User Interface Design that significant with the human emotion. In other words, the emotional interface is the user interface design that has emotional value in it where it could influence users to feel some emotion. The construction of the guideline required some literature review from the existing theory to understand the nature of emotional connection and emotional design. The identification of emotion-eliciting conditions is necessary for the theoretical foundation of the research. For the construction of an emotional user interface, it is appropriate to borrow a suitably large, agreed upon theory, which can be adapted for design purposes [13]. The execution and procedure of phase 1 are shown as in Figure 3.

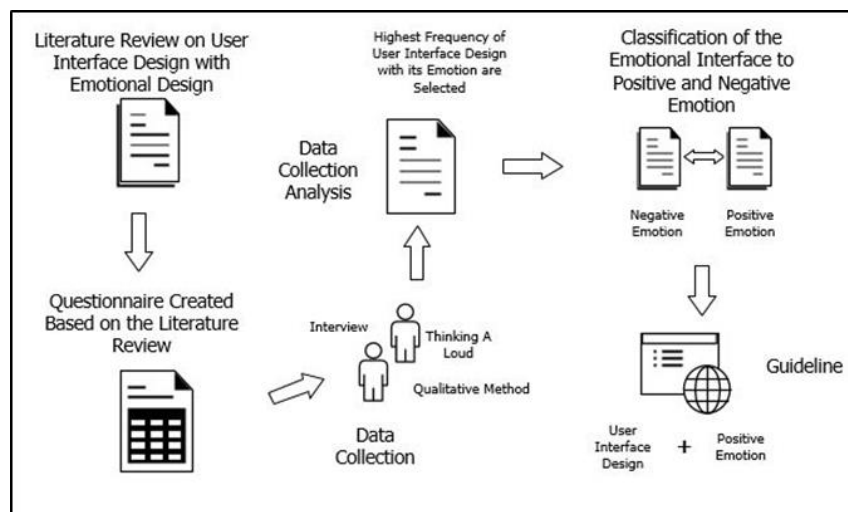


Figure 3. Procedure of Data Collection

The procedure starts with an Intensive literature review on user interface design and its expected emotion appraisal. Next, the questionnaire was created based on the literature review adapted from [13]. Then, the questionnaires will be used to executed the data collection. Once the data have been gathered, it was analysed and classified into positive and negative emotion according to the template in Table 2. Lastly, the guideline was produced where it consists of user interface design that could produce positive emotion appraisal. The collection of this theory will be used as the questionnaire question and the expected user will rate it according to what they felt when they see the design where some data need to be collected. This to ensure that the theory only focusing on single emotion only. After the data collection is done, the emotion is then being classified into positive and negative emotion. Lastly, the result of the positive emotion is taken to create the guideline where it is free from negative emotion.

3. RESULTS AND ANALYSIS

The data collection was executed in two different locations within Sabah; 1. Kota Marudu, and 2. Kota Kinabalu. These locations were selected because most of the children here already exposed to the latest technology such as iPad and Android Tab and they could respond and understand most of the question asked. Other than that, two mobile applications were used during the data collection were “Autimo” and “Kids Preschool Learning Games”. These two mobile applications were used because it could help the teachers and the students to understand the user interface design. Besides, the application also consists of features and learning material that may help the teachers about what subject that could help the children understand more in their studies.

3.1. Participants

A total of 113 respondents were involved in the interview for the guideline creation of the emotional interface design according to theory and questionnaire adapted. The respondents involved were children and the teachers. 13 of the respondents were teachers and 100 of the rest were children between the age of 4 to 5 years old. The gender of the respondent was 58 female and 55 male. This includes the 12 female teachers and 1 male teacher and the rest is the kindergarten children. Next, the respondents' race consists about 80 Dusun Ethnic, 10 Malay, 5 Kadazan Ethnic, 5 Rungus Ethnic, 4 Bajau, 3 Bugis, 2 Brunei, 2 Iban, 1 Sino and 1 Timor.

3.2. Emotional Interface Guideline

The result of the User Interface and the emotion that it could trigger is shown as in Table 3. The frequency percentage was the result of the emotional response that has been selected by the respondents during the interview and the questionnaire. The highest frequency percentage was chosen because a lot of the respondents choose that particular emotion with the respective user interface design. The emotional response result with the respective user interface design then will be classified into negative and positive emotion. The negative emotional response has to be avoided in order to make the children interested in learning because children do not interested in things that confusing and hard for them to understand. This could cause their focus and interest gone. The positive emotion will be selected to create the guideline. This positive emotion was chosen because the aim in this research is to produce the emotional connection (the positive emotion could make it possible) among the children and to make they are interested in learning after they use the application.

Table 3. Result of the user interface design with the emotional response

User Interface Design	Design
1) Layout	a) Follow Standard Layout - Excitement (65.5%); b) Use Grid - Interest (60.2%); c) More Whitespace - Boredom (47.8%); d) Potrait - Admiration (53.1%); e) Landscape - Calmness (50.4%); f) Complex Layout - Confusion (69.9%)
2) Colour	a) Red - Energy (36.3%); b) Orange - Excitement (27.4%); c) Yellow - Happy (59.3%); d) Green - Natural (70.8%); e) Purple - Wisdom (31.0%); f) Blue - Cold (46.9%); g) Pink - Feminine (47.8%); h) Brown - Earthy (50.4%); i) Black - Evil (50.4%); j) White - Clean (72.6%); k) Grey - Neutral (50.4%)
3) Typeface	a) Palatino - Interest (59.3%); b) Helvetica - Stimulated (39.8%); c) PAP - Interest (50.4%); d) Tahoma - Joy (51.3%); e) Arial Narrow - Relief (45.1%); f) Comic Sans Ms - Excited (54.0%); g) Chiller - Fear (55.8%); h) Felix Titling - Admiration (44.2%)

Table 4 shows the classification of positive and negative emotion based on the result of the data collection. The 25 types of user interfaces design was grouped according to the same or nearest emotional response that has the same meaning. This is an important process before the emotion could be clearly classified. The result of the classification shows that there are 19 distinct emotional responses. Four of the emotion are considered as a negative emotion and should be rejected from the list in the guideline. The emotion includes boredom, confusion, Evil, and fear. The other 15 emotions considered as the positive emotion. The classification of this emotion into positive and negative are based on Table 2.

Table 4. Classification of the Emotion (Positive vs Negative Emotion)

Category of Emotion	
Negative	Positive
Boredom; Confusion; Evil; Fear	Excitement, Excited; Interest; Admiration; Calmness; Energy; Happy, Joy; Natural; Wisdom; Cold; Feminine; Earthy; Clean; Neutral; Stimulated; Relief

The guideline for the emotional interface design was created based on the result of the questionnaire and the classification of the emotion into positive emotion and negative emotion. The emotion then filtered based on the emotional response and the type of interfaces design. The guideline created as shown in Table 5.

Table 5 shows the guideline that consists of emotions, layout, colour and typeface. The emotions in this guideline act as the basic emotion that the designers want the children to feel. So, they could apply it according to what type of interface design that available. For example, to elicit excitement emotional response in children emotion, the interface design that could be implemented in the user interface are follow the standard layout, using orange colour or use Comic Sans Ms as its typeface. The guideline could be applied based on the designer intention and the type of emotion designers want to elicit especially children emotion.

Table 5. Guideline for the Emotional Interface Design

No	Emotions	Interface Design		
		Layout	Colour	Typeface
1	Excitement, Excited	Follow Standard Layout	Orange	Comic Sans Ms
2	Interest	Use Grid	-	Palatino, PAP
3	Admiration	Portrait	-	Felix Titling
4	Calmness	Landscape	-	-
5	Energy	-	Red	-
6	Happy, Joy	-	Yellow	Tahoma
7	Natural	-	Green	-
8	Wisdom	-	Purple	-
9	Cold	-	Blue	-
10	Feminine	-	Pink	-
11	Earthy	-	Brown	-
12	Clean	-	White	-
13	Neutral	-	Grey	-
14	Stimulated	-	-	Helvetica
15	Relief	-	-	Arial Narrow

3.3. Adaptable Features

The adaptable features that have been suggested by the teachers and children are important to set the characteristic of the e-learning application. The features that suggested by the teachers are audio able task, Tahoma typeface or Century Gothic, bilinguals (Malay and English), few learning contents and type of graphical design. The teacher suggested audio able task because most of the children within that age do not know how to read. The children barely know how to talk and the only thing that can make them understand is by giving them the task with real voice or audio. The voice should be a real human voice and not robotic like voice as the teachers mention because the children may not understand the task given. Next, the font style that the teacher recommended is either Tahoma or Century Gothic, because that font is clear and easier to be read by the children. In addition, the teacher also stresses that use font that easies for the children to read and the “a” should be used instead of ”a”. The bilinguals language feature also included because not all of the children understand English because their native language is Malay. The learning content should include the current syllabus for kindergartens with 4-5 years old such as remembering Alphabet, Number, Shape and Colour. Finally, the background or the picture of the application should be a cartoon drawing and not a real human image because this could attract the children attention. During the interview, the teachers press that too much learning for the children will make them lose focus in learning. This because the duration of children focus is very short only between 3-5 minute only. If the teaching method is interesting the children will listen more, if not the children will get bored and play with whatever they want.

3.4. Next Development Phase

The content of the mobile application will be developed according to the requirements from the respondents during the data collection. Other than that, some of the results from the guideline and the development method will be applied in the development. Norman (2002) [19], stated that the user interface was the design of the system on its interface level on showing how the interface interacts according to the process and the functionality of the system. According to the module of the application, it consists of a few requirements that need to be full filled. The user interface design based on the requirements of the system followed by the use case description. Finally, the storyboard will explain how the application works. The e-learning application will consist of 10 chapters where each chapter had its own learning material and quizzes. For example, from the “Home Page”, they can be directed to a chapter such as chapter one, Unit 1 that had its own sub-topic that children need to master such as the smell, sound and taste. After the children learn some

of the objects, next they will be then directed to a quiz interface and when it did, it will show the result and back to "Home Page". The e-learning subject was early science for kindergarten or in Malay *Sains Awal PraSekolah*. This subject was selected because it could implement all the learning features and materials according to the requirements including Alphabets, Numbers, Colours, Shapes, and Drawing. Each of the learning features consist of its own tasks and quizzes, practice and game. This to ensure that the children could master and remember the subject when they use the e-learning application.

4. CONCLUSION AND FUTURE WORKS

This paper has presented an approach in creating positive emotion for children's e-learning using user interface design. Without a proper method or approach in creating a user interface that could elicit a positive emotion to children, it will be a very challenging task. This paper has achieved the aim, where the guideline created could be used as guidance or template for the developer to design an application with the positive emotion of user interface design. Since the scope of this research only focusing on children between the age of 4-5 years old and creating an e-learning application that could create a positive emotion towards the children, the expected outcomes of this research are the e-learning application could make the children more interested in school and see learning as fun and easy things. Besides, researcher and designer could use this approach to identify the intended emotion to be included in their studies or development. For future works, the development of the e-learning application will be synchronised with the emotional interface guideline as mention in the phase two. This could be done by including the design in the prototype of the e-learning application and the emotion that focuses on children only. After the prototype has been developed, it will be evaluated using two methods, as mention in the third phase of the research approach. The first method is using Electroencephalography (EEG) device and Kort Scale Rating. This to ensure whether the guideline really could create positive emotions to the user or not.

REFERENCES

- [1] C. R. S. D. Figueiredo and F. V. Dias, "Families: Influences in Children's Development and Behaviour, From Parents and Teachers' Point of View," *Psychology Research*, vol/issue: 2(12), pp. 693-705, 2012.
- [2] Seligman M., "Flourish: A visionary new understanding of happiness and well-being," Free Press, New York, 2011.
- [3] B. L. Fredrickson, *et al.*, "Open hearts build lives: Positive emotions, induced through loving-kindness meditation, build consequential personal resources," *Journal of Personality and Social Psychology*, vol/issue: 95(5), pp. 10-45, 2008.
- [4] K. J. Johnson, *et al.*, "Smiling Predicts broadened attention," Unpublished manuscript, 2006.
- [5] C. Wroten, "Emotional Engagement: How Positive and Negative Emotions Affect eLearning," 2015.
- [6] D. A. Norman, "Emotional Design: Why we love (or hate) Everyday Things," Basic Book, New York, 2004.
- [7] P. M. A. Desmet, *et al.*, "Emotional Design; Application of a Research-Based Design Approach," Springer Netherlands, 2007.
- [8] N. Millard, "Learning from the 'wow' factor – how to engage customers through the design of effective affective customer experiences," *BT Technology Journal*, vol/issue: 24(1), pp. 11–16, 2006.
- [9] M. F. Ashby and K. Johnson, "Materials and design: the art and science of material selection in product design," Butterworth-Heinemann, 2013.
- [10] P. Smith, "Design for Collaborative Consumption – What can emotional Design Teach us about attachment and value in a Sharing Economy?" Department of Product Design, Norwegian Unersivity of Science and Technology, 2008.
- [11] R. S. Edelstein and P. R. Shaver, "A Cross-Cultural Examination of Lexical Studies of Self-Conscious Emotions," *The self-conscious emotions: Theory and research*, pp. 194-208, 2007.
- [12] L. F. Barrett, "Are Emotions Natural Kinds?" *Sage Journal*, vol/issue: 1(1), pp. 28-58, 2006.
- [13] S. Tzvetanova, "Emotional Interface Methodology," International association of societies of design research, The Hong Kong Polytechnic University, 2007.
- [14] B. Kort and R. Reilly, "Analytical Models of Emotions, Learning and Relationships: Towards an Affect-sensitive Cognitive Machine," M.I.T, 2001.
- [15] R. Plutchik, "The Nature of Emotion," University Of South Florida, 2001.
- [16] V. Sacharin, *et al.*, "Geneva Emotion Wheel Rating Study," Geneva, Switzerland: University of Geneva, Swiss Center for Affective Sciences, 2012.
- [17] A. S. Cowen and D. Keltne, "Self-report captures 27 distinct categories of emotion bridged by continuous gradients," National Academy of Sciences, 2017.
- [18] D. L. Robinson, "Brain function, emotional experience and personality," *Netherlands Journal of Psychology*, vol. 64, pp. 152-167, 2008.
- [19] D. A. Norman, "Emotion and design: Attractive things work better," *Interactions Magazine*, vol/issue: 9(4), pp. 36-42, 2002.