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## Evaluation of Lifestyle Change Based on Ontology Engineering

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### I. Introduction

It is generally acknowledged that sustainable lifestyle is related to the sustainable environment, in terms of reducing waste and other pro-environmental behavior. The increased volume of wastes is results from the mass-consumption, which raised a certain concern towards the environment, and lifestyle is a strategy introduced to be able to reduce natural resource consumption (Japan's Ministry of the Environment, 2014). Evaluation of the lifestyle change can help to have better understanding of the designed activities which support pro-environmental behavior.

On the other hand, wood education workshop is the social platform and activities with the purpose of introducing a pro-environmental lifestyle and paradigm of using a product for a longer time. As value of coexisting with nature deteriorate in current society, especially because of mass-production and mass-consumption, so does the value of self-producing, self-repairing, and remake something slowly disappear as well in today's convenient-oriented society (Ishida and Furukawa, 2013). With the shortages of energy sources, individuals and communities will have to reengage with lost practices of sustainable living that reconnect us with nature (Kunstler, 2005). Thus the wood education workshop should be dedicated to teach those values and connecting with nature, while at the same time letting the participants to notice the improvement and happiness inside the workshop for the experiences of new lifestyles to the younger generation.

Happiness is known as a factor which could lead to success in many outcomes, with happiness itself related with desirable attitudes of sociability and pro-social behavior, thus leads to evidence of happy people shows more frequent positive affect (Lyubomirsky et al., 2005). The relation of happiness with sustainability is interesting aspect which might affect the positive outcome for the lifestyle changes.

One innovative method to represent the knowledge of interest and address the problem concerning of data is through ontology engineering. Systematically developed ontology could create an effective roadmap, which becomes a good framework to discover the potential of a system and integrating the results (Cameron et al., 2017). The methodology to clarify the concept of lifestyles has been developed for specifying the structure of lifestyles, using a method from ontology engineering which has been used for the functional decomposition of artifacts (Kishikami et al., 2015). These methods may clear how to evaluate lifestyle changes and how to find the better way to change the younger generation's lifestyles sustainable.

This study aims to evaluate the process of introducing a sustainable lifestyle by using the ontology method through social platform activities, analyzing the connection between several sustainable lifestyle activities based on self-report and smile detection, which related with lifestyle evaluation oriented with happiness.

### II. Method

#### *Wood Education Workshop*

The wood education workshop is divided into 3 phases, each with its own specific theme, and done in various locations in Japan as presented in Table 1. In this report, the focus will be on Kitakami, Toyonaka, Ikeda, and Sendai city, for the first workshop of wood

education. Participant of the workshop itself are consists of the student from elementary schools of the area, accompanied by their parents, with 11 participants in Kitakami, 8 participants in Toyonaka, 15 participants in Ikeda, and 14 participants in Sendai. Inside the first workshop, there are various activities as illustrated in the Figure 1 which is the action decomposition tree based on the ontology engineering, with the orientation of creating a cutting board. The research will be focused on observing the happiness of the participant based on each of the activities, from questionnaire and video analysis.

Table 1. Wood Education Workshop Program

| Workshop Phase  | Environmental Learning  | Wood Education Workshop  |
|-----------------|---|--|
| First Workshop  | Environmental Issues, Changing Lifestyle, Relation between Forest and Lifestyle | <b>I. Produce Board</b> (Sanding the Board, Trimming, Burning Pen, Oil Finish) |
| Second Workshop | Nature Technology   | <b>II. Repair Board</b> (Choosing and Using Oil)                               |
| Third Workshop  | Value of Attached Object in Different Forms                                     | <b>III. Remake</b> (Redesign to something else)                                |

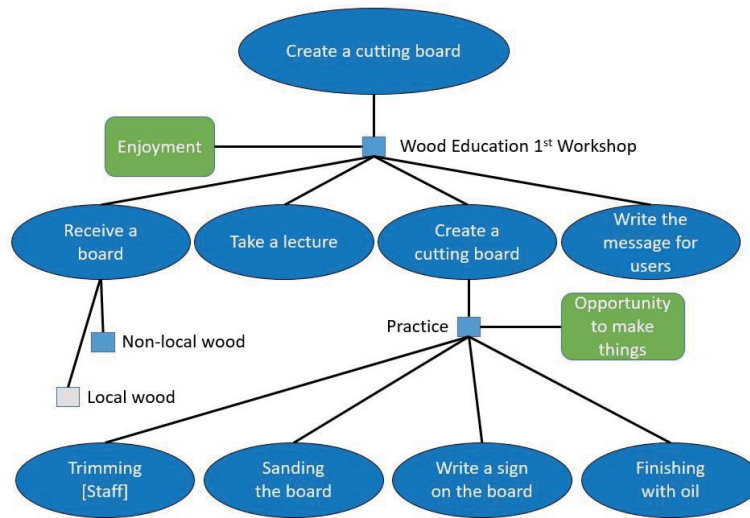


Figure 1. Wood Education First Workshop Ontology Decomposition Tree

### Tools

The data for this research are gathered through two different sources, the first one is from conducting a questionnaire for the children inside the workshop. The questionnaire itself consists of various question related to specific activities of the workshop, and five different answers based on the emotion of the participant, with score 1 as very unsatisfying (unhappy), and 5 as very enjoyable (happy).

The second sources of the data analysis came from the video recording of the workshop participants. The reaction of the participant was recorded by video camera and analyzed through the concept of Facial Action Coding System (FACS), which is a standardized method of measuring and describing facial behavioral expressions (Andelin and Rusu, 2015). For this research purpose, the focus will be on happiness expression which is distinguishable by identifying the movement from the certain muscle of *orbicularis oculi* and *zygomaticus major* to identify the Duchenne smile. The Duchenne smile is a smile which related to enjoyment during the pleasant moment (Ekman, 1990).

### III. Data Results

#### Workshop Questionnaire

Based on the results from the questionnaire of happiness rating for several activities

inside the workshop, various answers from the first workshop participants were gathered. The questionnaire results range from 1 (very unhappy) to 5 (very happy). Five main activities from the first workshop with the theme of creating wooden board including activities of (a) lecture, (b) trimming, (c) sanding the board, (d) using the burning pen, and (e) oil finish. Activities of lecture and finishing with oil are perceived as the most enjoyable for the workshop participants.

Table 2. Relationship between overall happiness and happiness in each activity of the first wood education workshop

| Parameter  |               | Activities |          |                   |             |            |                  |
|--|---------------|------------|----------|-------------------|-------------|------------|------------------|
|  |               | Lecture    | Trimming | Sanding the board | Burning pen | Oil finish | Overall workshop |
| Happiness rating (Questionnaire)                                     | Kitakami      | 4.73       | 4.73     | 4.82              | 4.73        | 4.82       | 5.00             |
|  | Toyonaka      | 4.25       | 4.25     | 4.00              | 4.00        | 4.25       | 4.75             |
|  | Ikeda         | 4.00       | 3.87     | 4.07              | 4.47        | 4.67       | 4.40             |
|  | Sendai        | 4.93       | 4.43     | 4.79              | 4.64        | 4.57       | 5.00             |
|  | Average       | 4.48       | 4.32     | 4.42              | 4.46        | 4.58       | 4.79             |
| Correlation (R) to overall happiness                                 |               | 0.603      | 0.236    | 0.609             | 0.308       | 0.259      | 1                |
| Total number of smiles in each activities/total number of smiles (%) |               | 20.5%      | 13.7%    | -                 | 40.4%       | 25.4%      | -                |
| The source of the happiness  | Learning      | Yes        | -        | -                 | -           | Yes        | Yes              |
|  | Creativity    | -          | -        | -                 | Yes         | -          | Yes              |
|  | Communication | Yes        | -        | Yes               | Yes         | Yes        | Yes              |

Analyzing the correlation between happiness rating from each of the workshop activity with the happiness rating for the workshop in general from the questionnaire, the lecture and sanding the board activity have a high positive correlation, while the trimming activity has the least positive correlation.

#### *Video Analysis*

Observation of the video analysis was done through four different main activities inside the first workshop, they are (a) lecture, (b) trimming, (c) burning pen, and (d) oil finish. The activity of sanding the board is not included due to the longer duration which resulted in more smiles displayed compared with other activities. The percentage of the smiles indicate the comparison of total smiles displayed by the workshop participants. Based on the observation of the video recording of the workshop, the activities of using burning pen triggered most of the smiles displayed by the participant with 40.4% of the total smiles occurred during this activity phase. On the opposite side, the trimming process is categorized as an activity which does not trigger many smiles compared with other activities.

#### **IV. Discussion and Future Works**

Based on the results of the questionnaire, most of the participants perceived finishing and lecture are the happiest activities, with average rating of 4.58 and 4.48 respectively. Comparing with both of the activities, there is a similarity that both of them categorized as an activity with learning and communication process. The learning process means that there is the process of learning by the participant designed in the activities, while creative process indicate that the participant has the chance to express their idea and imagination designed in the activities. The communication process is determined through the possibility of participant to have social interaction with others people designed in the activities. Several key behaviors of positive affect inside an activity is related with experimentation, involvement, and learning opportunity (Chu et al., 2016). Lecture, burning pen, and finishing are the activities with high happiness rating, with the three of it have

combination value of learning, creativity, and communication. Meanwhile trimming activity, with 4.32 rating, was perceived as the least happiness activity, as the activity itself does not contain any of the key values.

Looking at the result of the correlation, lecture and sanding the board have the highest correlation to the overall happiness of the workshop, with value of 0.603 and 0.609 respectively. Lecture, as explained above, contributed to their overall happiness of the workshop in about 20 minutes, while the sanding board activity gives contribution to it of the workshop in about 1 hour. Because the sanding board activity is simple but it makes the participants to confirm the result of their effort after feeling the smooth surface of the board.

Moving towards the result of video analysis for the total smiles displayed, the burning pen activities triggered most of the total smiles inside the workshop. Most of the smiles situations displayed when the participants were taking part in social activities, for example in lecture, where the participants displayed smile expression during the time the teacher having two-way communication with the participants. Social interaction is the best predictor for smiling according to the Behavioral Ecology Theory (BET), which emphasizes that social interaction is a necessary cause of Duchenne smiles (Crivelli, 2014).

The method of ontology which is able to break down the action might serve as a new knowledge to identify the happiness and enjoyment inside a workshop which introduces a new lifestyle. The existence of learning, creativity, and communication process might influence to high happiness rating, although the mechanism of the happiness itself might be more complex. Through using the ontology engineering method each happiness from specific action might be analyzed separately. The research will continue on gathering the data from the workshop, and by visualization from ontology engineering method, identifying the effective way to introduce a new lifestyle with the value of happiness.

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