

# Training Designers of Real-World Products: Scenario Approach in Industrial Design Curriculum

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**Abstract.** This paper aims to explore the use of scenario approach in training curriculum for industrial design students. Over-reliance on internet and ignorance of user's need are critical issues to be addressed among design students. It is of interest to incorporate Scenario Approach to education content to overcome students' failure to grasp the key points of a design. We investigated differences in views on scuba lighting equipment between design students and expert users. Two groups of 23 participants respectively from the Professional Association of Diving Instructors (PADI) and an industrial design department were recruited. Questionnaire was used for collection of data in this study. Narrative statistical analysis and independent variable t-tests were used to interpret the raw data. The findings indicate that design students and expert divers place their primary focuses on completely different factors. Overall, the students put a great deal more emphasis on appearance of lighting equipment than did the expert divers. Divers rated multiple functionality and weight among the most important factors in design. The students sampled largely overlooked these two key points. Results of this study are critical to industrial design instructors. It is suggested that students must come to understand usage patterns and cognitions of users prior to preparing a design project. Students can gain such understanding through application of Scenario Approach combined with real-life experience of the equipment. In addition, due to the wide range of materials available on the Internet, and their unregulated nature, the quality of information that design students access online varies wildly. Furthermore, because the Internet is convenient, online information may be overused and misapplied by design students.

**Keywords:** scuba lighting equipment, PADI, Scenario Approach, Internet.

## 1 Preface

Design students receive massive information on internet as assistance or stimuli for their design. It is recognised that students simultaneously over-rely on and manipulate other's ideas from the Internet. It is of interest to transform this phenomenon in the final assignment required by the curriculum of design methodology, and then, more importantly, reshape their existing positioning in design.

Initially, scuba lighting equipment was chosen as a topic for this curriculum, which was appropriate for differentiating user's experience, and facilitating the subsequent evaluation. Participating students were introduced with scenario approach that effectively help ideation of students and allow student to visualize the potential problems that a user would encounter. Moreover, such approaches avoid improper information assumption and product cognition.

The aim of this paper is to help students recognize that design is an interactive creation process between perception and experience, and that the validity of an idea may reveal designer's information approach in his/her long-term memory. And thus, once one's design experience meets a certain degree, he/she will be able to decipher the information of user's experience, and in the meantime, transform the elements in design creation (Hsu1996). Questionnaires were designed after reviewing relevant literatures and internet tests were then prepared. Students were guided for the steps of scenario approach and the assessment list.. The researcher formally conducts the questionnaire of the Internet, after the pretest is re-modified by Mr. Hwang. The data—after collecting, analyzing and recording—will be compared and discussed. Finally, the paper attempts to proffer a research conclusion and suggestions for future researchers.

## 2 Literature Review

Scuba lighting equipment is main lighting equipment for the scuba divers along with one or two smaller lighting equipments, in terms of its lighting and capacity. The smaller one will replace the main one, when the main light equipment is out of power or broken. In addition, regarding conventional battery, user has to install a new battery before doing exercise whereas rechargeable battery is charged before diving (Lin, 1994).

Beyer and Holtzblatt (1998) divide user's experience into fives models: 1) flow models; 2) sequence models; 3) cultural models; 4) artifact models; and 5) physical modes. The five models will, through user's possible problems and messages encountered in the five modes, reveal user's experience model.

Flow model: we can discern the relationship involved in this activity, including the intertwining interaction among people, things, and objects.

Sequence models: the framework of the model aims to achieve its goal. From beginning to end, the sequence of steps—encompassing the contingent events, which are demonstrated as “trigger,” “steps,” and “order breakdowns”—aims to achieve one goal of things.

Cultural models: this reveals the impact of different organization or roles upon the whole culture. The individual organization or role may achieve the whole structure of a certain event or one small minor impact. From the cultural impact on the events, we can understand how it affects one's values of notion.

Artifact models: we can analyze the actual object and then detect the use frequency and location of the object from the framework of the models. Then, their relationship can be discerned via the succession of time.

Physical models: the arrangement of the objects reveals the interrelating relationship between object and humans. This relationship may help clarify the issues of environmental arrangement.

The scenario approach was early applied to human-computer interaction (HCI). One typical example of it is Richardson Smith, who was in the ID TWO design company in England and America, applied scenario approach to develop the panel design of the printer. At the very beginning, one has to observe the scenario of the product, and then guide him/her into the human-computer panel design. Then, this approach was more and more applied to the design of the product (Kelley, 2001). The sequence of scenario approach, as IDEO (1992) proposed, can be divided into five steps:

1. Understand
2. Observe
3. Visualize
4. Evaluate and refine
5. Implement

Scenarios approach suggests that one, in the development of the product, simulates a using situation through imagination, including user's characteristics, events, and the relationship between the product and the environment. This approach aims to analyze the relationship between humans and product via the using situation. By the visual and actual experience, this approach guides and participants in the product development. More importantly, it aims to invent any new product idea, judges whether the idea goes with the design theme, and evaluates whether the idea of the product reaches user's potential need. This is, so to speak, the user centric design (UCD) (Tu, 2005).

### 3 Methodology

#### 3.1 Procedures

The researcher attempts to connect scenario approach to user's experience model, as Fig.1 demonstrates. Thus, we can apply this model to the relationship among people (students and experts), things (scuba diving), and objects (scuba lighting equipment). Moreover, the observational sphere—steps, procedures, stimulation, and decomposition—can be approached to strengthen the depth and width of observation. We can make the model of the product visually vivid by use frequency, use position and duration of time. After the three steps, the assessment and refinement will be made to the Internet questionnaire and expert's evaluation; the questions of the Internet questionnaire are, of course, what the researcher aims to inquire and investigate. Then, the differences between the production and cognition will be evaluated by the experts.

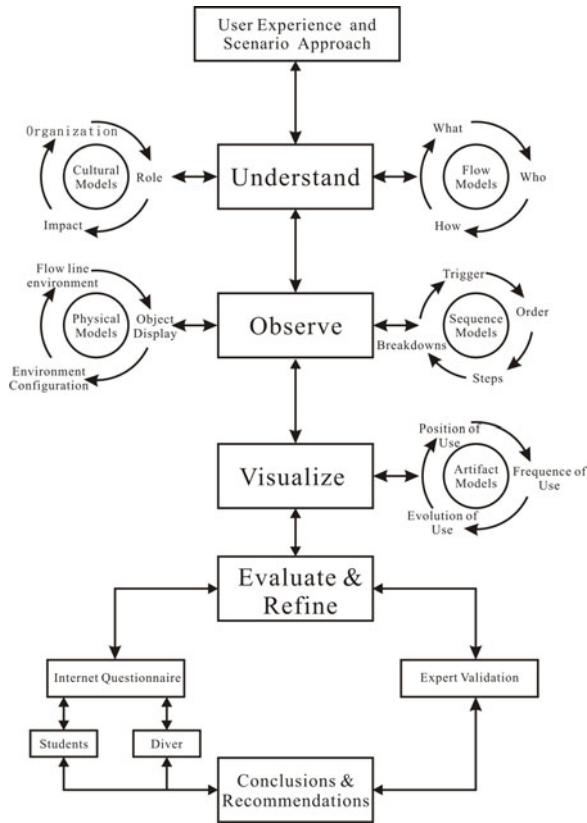


Fig. 1. Research Process

### 3.2 Design of the Questionnaire Content

After the topic of the research is ensured, the researcher begins to design the content of questionnaires, in which, as the research wishes, the interviewees may offer valid and beneficial information for the research. The content of the questionnaire includes the scuba diver’s information, gender, age, address, email, education background, job, frequent regions of scuba diving, frequency of scuba diving, scuba diving system and the levels of scuba diving license. The above information will facilitate the researcher to carry on the further tracing and feedback. Meanwhile, the students of design fill in the above information. This will be used to do t-test analysis between the two groups for their differences.

### 3.3 Limit of Participants

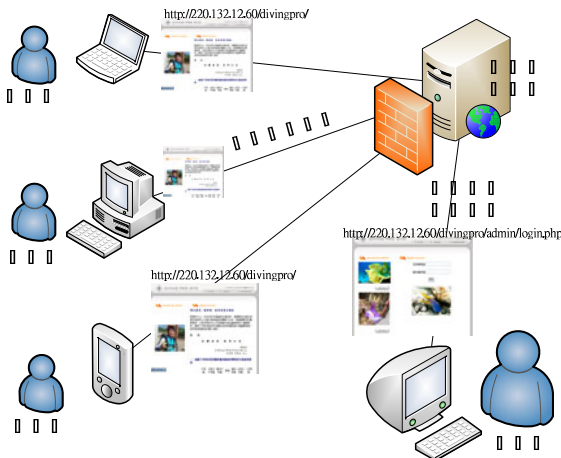
There are two groups for the research: one is the group of 23 students of design, and the other is the group of scuba diver. The limited numbers of participants will be the

characteristics for the research due to the fact that the number of professional scuba divers may reach the real group subject.

## 4 Design of Internet Questionnaire

### 4.1 Design of the Databank Program

The design of questionnaires has to go beyond the traditional questionnaire, because the group is very unique (Chu, 2002). The researcher is able to receive the information via Internet, instead of the written form of questionnaire. First, the questionnaire content is made with a refined and beautiful webpage. Through the inscription of MYSQL (Matthew and Stones, 2003), each item clicked by the testee will be transmitted to the server of researcher's computer, and then stored in the databank (Fig. 2).



**Fig. 2.** Design internet questionnaire and indicate data links with databank

The strength of the Internet questionnaire is that the taste is able to fill in the questionnaires beyond the limit of time and space. This is very convenient for the statistical investigation since scuba divers' diving regions are sometimes different.

Then, after the information of the databank is established, the statistical data will be operated via the computer, instead of the traditional manual collection. This is not only time-saving, but also ecological friendly.

The webpage can be accessed at < <http://220.132.12.60/divingpro/> >, which provides the expert instructors' discussion and scuba divers' revised questionnaires. In this webpage, the head instructor gave a prologue for this webpage in hope that this website provides a convenient and sustaining site for the discussion and pretest of the design of scuba diver's equipment (Fig. 3).

**【基本資料】**

居住地區： 台北市

性別： 男  女

年齡： 10歲以下

電子郵件：

教育： 大專以上  高中職  國中  小學及以下

職業： 自由業  軍公教  公司主管  受雇職員

勞務工作電氣承裝業  農林漁牧

學生

家管  醫生  其它

常潛水地區： 台灣

潛水次數： 0次  1-3次  4-6次  7-9次

10次以上

潛水系統： PADI  SSI  NAUI  其他

證照等級： 初級潛水員

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Fig. 3. Questionnaire content and webpage design

### 4.2 A Site of Data Collection

The items clicked or sought by the tastes on the webpage can be explicitly seen and meanwhile, the results of taste’s feedback can also be demonstrated. In addition, the interaction between the MYSQL and the webpage can also reach the need of function.

**DIVING PRO SITE**

all contact via. at javan1188@gmail.com

HOME DESIGN PINKTENTACLE

**WHAT'S NEW?**

**QUESTIONARY**

系統管理員

資料庫密碼

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Fig. 4. The permitted ID number and password

The website of administrators' log-in is at:  
 <<http://220.132.12.60/divingpro/admin/login.php>>.

The tastes who have the permitted ID number and password (See Fig 4) are able to fill in the questionnaire and see the results of their questionnaire in the databank (See Fig. 5). The administrator can, through the convenient and advanced technique of Internet, be informed by any on-going information received.

表單號碼08012017

請就下列項目對您購買備用燈的影響程度勾選重要程度

價格	3
重量	1
知名度	3
亮度(瓦)	4
功能多寡	1
舒適性	4
量身定做	1
教練推薦	4
大小尺寸	1
耗電量	4
耐壓深度	1
外觀	4
顏色	4

請問您最常用的品牌為何?

DenniPrincOTHER

居住地區： 台北市

性別： F

年齡： 41歲-50歲

電子郵件：

教育程度： 高中職

職業： 軍公教

常潛水地區： 馬來西亞

潛水次數： 10次以上

潛水系統： SSI

證照等級 潛水長

**Fig. 5.** The questionnaire and see the results

## 5 Analysis

### 5.1 Result

The 23 (college) sophomore testees are given with the paper questionnaire, while the expert scuba divers are with Internet questionnaire. The Internet questionnaires received are 23. The result of each variable of the questionnaire is in detail demonstrated as follows:

**Table 1.** Sigma of each variation

	Student's group	Scuba diver's group
<b>Price</b>	5.13 (1.632)	5.52 (1.928)
<b>Weight</b>	5.70 (1.02)	4.61 (1.994)
<b>Appearance</b>	5.43 (1.037)	3.87 (1.890)
<b>Multifunction</b>	5.13 (1.014)	4.83 (4.370)
<b>Comfort</b>	5.91 (0.848)	5.70 (1.063)
<b>Lighting</b>	6.04 (0.825)	6.48 (0.593)

## 5.2 The Analysis of Independent Variable T-test

The ANOVA statistic analysis of SPSS is conducted in this research; the significant standard P value is 0.05; t-test is adopted to analyze the six variations (which are, price, weight, appearance, multifunction, comfort, and lighting) between the college students and expert scuba-divers while purchasing the lighting equipment of scuba diving. The results of the analysis are mirrored as in Table 2.

**Table 2.** Result of Independent sampling t-test

	Levene test		T-test
	F-test	significance	Significance (two-tailed)
1_price	0.312	0.579	0.461
2_weight	13.347	0.001	0.026*
3_appearance	3.272	0.007	0.001*
4_multifunction	1.535	0.222	0.396
5_comfort	3.510	0.068	0.447
6_lighting	0.089	0.766	0.046*

Note \* suggests there is significant difference,  $P < 0.05$

From this, we are able to discover that the values of the variations such as price, appearance, multifunction, comfort, and lighting are more than 0.05, suggesting that the variance in the five variations is equal; the values of variation such as weight is 0.01, which is less than 0.05, suggesting that the variance of the variation is not equal.

From significance (two-tailed), we can discover that the P value of the three variations in price, multifunction, and comfort don't have significant difference with one another. However, for their P value is less than 0.05, the two variations of appearance and lighting have significant difference. Moreover, because its P value is less than 0.05 (which is 0.026), the variation of weight have significant difference with the invariant variance.

The analysis of t-test reveals that the three variations—which are weight, appearance, and lighting—have significant difference.



### 5.3 Result Analysis

The mean of weight in the college student's group is 5.7, while that in the scuba diver's group is 4.61. This difference may primarily derive from their difference of experience. Most of the college students did not have any experience of scuba diving, and they failed to know the fact that the scuba diving light doesn't almost have weight in water. In contrast, the expert scuba divers, with their lived experiences, may less likely take the weight into consideration. Moreover, because the light is not usually big, it doesn't cause any difficult for those who want to carry with it.

The mean of appearance of the student's group is 5.43, while the mean of the scuba diver's group is 3.87. The differences between the two groups may primarily account for the fact that the students, whose educational background is in design, may be much more susceptible to the appearance or the design of the object. They, of course, may greatly take the appearance into consideration. However, the professional scuba divers deeply know that it will be very dark in the depth of 20 meters of the underwater; one can hardly see in that depth. Thus, their primary concern for buying the scuba diving equipment is multifunction. It'll be very convenient and safe once the equipment is combined with multiple functions, especially if they encounter any urgent or dangerous situations. Moreover, they don't have to carry much equipment with themselves under the water. This difference may proffer an important indicator for the future designers.

The mean of lighting in student's group is 6.04; that in scuba diver's group is 6.48. The difference may, due to the medium of water, explain the fact that lighting will be more reduced in water rather than in land. Thus, generally speaking, the two groups will consider the lighting of the scuba diving equipment. But more specifically, the scuba diver's group will consider lighting more than the student's group. Moreover, the other reason to account for this difference may primarily rely on the fact that lighting is a keenly and desperately desired in the dark and deep underwater (Richardson, 1995). This can hardly be discerned or comprehended by the student's group. People are phototoxic oriented; they will feel the sense of secure whenever there is light. The place with light is, after all, more sought and desired than the place with darkness. That lighting has significant difference between the two groups can be another indicator or variation for the design of function.

## 6 Conclusion

We discover that the two groups have, as regards user's experience on the lighting aid of scuba diving, significant difference in terms of weight, appearance, and lighting.

Most design students have been trained with simulations and interviews of scenario; however, most of them, without real experience of diving and other group's situation and cognition, have missed the focal point of the product designed in the final stage.

Most students are accustomed to searching for information via Internet and use it without further consideration or evaluation. This phenomenon is explicitly reflected on the overlapping of student's design works. Worse, some works, though made by different groups, are completely the same. Then, at the beginning of the idea, we can clearly see students' misjudgment on the information, though some will be pinpointed by the experts. However, the differences of the experience will ensue and develop.

The result of the Internet questionnaires is simultaneously done with the data of the server. This is, beyond doubt, an interdisciplinary integration among design, computer science, mechanical engineering, and scuba diving; this offers a helpful and convenient site for the data collection, discussion, and cooperation for each field.

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