The KeyGraph Perspective in ARCS motivation model

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Abstract

This study examines the learning motivation by means of the traditional ARCS questionnaire and the new technology KeyGraph method. The purposes of the study are to provide pictures of the ARCS model in scenario map format, to supple information in facts and in possible chances, to identify the important elements of each factor in the ARCS model in four scenario maps, and to suggest the possible chances. This collects the data by ARCS questionnaire and analyses the data with the KeyGraph method. The six scenario maps provide the research results. The six scenario maps reveal the learner motivation information and the possible chance to teachers or the instructional designers. The significances of this study are not only in theory, enriching the ARCS motivation model theory and extending the application of the KeyGraph method, but also in practical education system, indicating the feedback and providing the suggestions.

1. Introduction

Learning motivation is an essential element in education instruction. One of the motivation models is the ARCS model, which is commonly implemented to evaluate the course motivation design. Some of the ARCS model studies evaluate the courses design and provide the finding of the difference between before and after the class.[1] Some researches compare different kinds of course designs and figure out which one is better.[2] Some articles were interested in comparing the difference in using different kinds of media in a course.[3][4] Those aspects of the studies are very significant studies in motivation for instructional designers to design a practice course. However, little literature provided little information for teachers or instructors to reflect their own teaching.

The purpose of this study is to examine the learner motivation by the questionnaire of the ARCS model developed by John Kelley.[5] That is, would the ARCS questionnaire be analyzed in the scenario maps format which would provide other interpretation to teachers or instructional designers? Therefore, the purposes of this study are as below:

- To provide a whole picture of the ARCS model in a scenario map format.
- To identify the four parts of the ARCS model in four scenario maps formats.
- To suggest the possible chances in the scenario map

format.

In general, this study examines the motivation of the learners in a pre-service course, a web based blended e-learning course. In the hope of gaining useful suggestions and possible chances the teachers and instructional designers would improve their instruction.

2. Related Literature

This study focuses on examining the motivation ARCS model in a pre-service computing education course using the KeyGraph technology. There are some related literature in motivation theory, ARCS model, and KeyGraph technology.

2.1 John Kelley ARCS model

Keller proposed the ARCS motivation theory in a systemic method. There are two main issues facing on the ARCS model: one is attitude, and the other is evaluation. The evaluation for the motivation is not to evaluate the learning efficiency but to evaluate the motivation characteristic in learning motivation theory. That is to evaluate whether the learners desire to learn not how much the learners learn (Hsu and Chang, 2003[6]).

The ARCS Model identifies four essential components for motivating instruction:[7][8]

- Attention. strategies for arousing and sustaining curiosity and interest
- Relevance. strategies that link to learners' needs, interests and motives
- Confidence. strategies that help students develop a positive expectation for successful achievement
- Satisfaction. strategies that provide extrinsic and intrinsic reinforcement for effort.

2.2 KeyGraph model

Since Ohsawa at 1998 addressed the KeyGrpah as a kind of data visualization to discover chance, the KeyGraph technology brought the text mining research into a new age.[9] Montero and Araki (2005) showed that a text might be divided into some different subgroup.[10] At the same time, Sakakithara, and Ohsaww (2005) sorted different group into KeyGraph technology. They also defined the high frequency element as a "black node", and the number of baskets which contain the two elements and the high frequency co –occurrence as a "black link".[11] As Oshawa (2002) himself pointed out that the value of KeyGraph technology as an extractor of causalities from an event-sequence, and as a words abstractor from a document.[12] Moreover, the main point of the KeyGraph technology provided some chances which would reverse the bad situation into a better one especially in a feeble industry.[13]

3. Method

This study analyzes the learners' motivation in a computer education course. Although the traditional ARCS questionnaire was applied, this study implements a new technology, KeyGraph approach, and hopes to understand more information in learners' motivation. The subjects, ARCS instrument, and research procedure are expressed as below.

3.1 Subjects and Instrument

A computing education course in teacher education program for the pre-service students was the target class. Sixty students were enrolled in class. At the end of the class, all the subjects were asked to fill out the ARCS questionnaire about this course and the activity of using web in the class. Six missing data were eliminated, so the total subjects were fifty-four.

The ARCS questionnaire contains 34 items. The Attention factor contains item 1,4*, 10, 15, 21, 24, 26*, and 29. The items marked with * mean the inverse items. The Relevance factor contains item 2, 5, 8, 13, 20, 22, 23, 25, and 28. The Confidence factor contains item 3, 6*, 9, 11*, 17*, 27, 30, and 34. The Satisfaction factor contains

item 7, 12, 14, 16, 18, 19, 31*, 32, and 33. The score is calculated for each item by 5 scale points, from non-agree to very agree.

3.2 Procedure

First, this study produced the scenario map for the ARCS model to examine if there were more information in the scenario map(Fig. 1 The scenario map of the ARCS model). Taking all the answer of the subjects without analyzing the factors, the total score of the ARCS for the whole class is calculated for each item and each subject. The scenario map revealed an interesting relationship among the ARCS four factors.

Then, this study went deep into examining the relationship in these four factors. According to the ARCS questionnaire design, four total scores are calculated for each item in the attention, relevance, confidence, and satisfaction categories for all the subjects. As the result, four scenario maps are produced for each category.

Finally, this study proposed suggestions and possible chance to teachers and instructional designers.

3.3 Scoring

The scoring system in this study translated the subjects, items, and scores into KeyGraph model. Each subject was represented as one sentence in KeyGraph scoring system. So, this study collected 54 sentences in total. The ARCS questionnaire contained 34 items as 34 words in KeyGraph model, that is, each item was a word. The score of each item was 1 to 5, and was considered as how many times of each item appear. So, in this study the score was the frequency. For example, if item x was 5 points, this would be considered this item x would appear 5 times. In KeyGraph wording, the frequency of Word x was 5. The frequency for each item is on table 1.

Table 1. The frequency of each word: The total score of each item.

Word (item)	Frequency (totalscore)	Word (item)	Frequency (totalscore)	Word (item)	Frequency (totalscore)
1	212	13	201	25	109
2	228	14	205	26	220
3	216	15	198	27	238
4	228	16	220	28	237
5	212	17	146	29	225
6	164	18	207	30	216
7	128	19	218	31	232
8	212	20	212	32	223
9	235	21	207	33	231
10	222	22	195	34	219
11	202	23	218		
12	206	24	225		

In order to produce a scenario map, the support degree in this study is set on 78% which means the 78% of the maximum of the frequency, 5* 54 * 78% = 210.6. Each word frequency, greater or equal to 210.6 would appear as the high frequency key word. This study selected 65% as the threshold to link the two high frequency words. In another word, the link existed when the associated value within any two words is greater or equal to the threshold. For example, Subject A answers item 10, 20, and 30 with the score 4, 5 and 1. The scoring system will be subject (sentence) A : "…10101010….2020202020…30…". The word 10 and word 20 is evaluated as 4* 54 = 216 which is greater than the threshold (5*54*65% = 175.5). So, the word 10 and word 20 is linked.

With the same technology, this study set the number of low frequency words as 3. In order to reducing the complicated linkage, this study increases the sensitive degree to 110%. So, the KeyGraph will produce 3 low frequency words in a scenario map, and automatically calculates the value of the low frequency word with each high frequency word in each factor. If the value is

greater or equal to the value (the average of each factor * 110%), these two words are linked. The average of each factor is automatically produced by the KeyGraph model. Because the complication of each factor was different, the average of each factor was different too. As the result, it causes the link between the low frequency and the high frequency word in each different factor.

4. Result

The purposes of this study are to provide a whole picture of the ARCS model in a scenario map format, to supple information with the facts and the possible chances, to identify the four parts of the ARCS model in four scenario maps formats, and to suggest the important information with the facts and the possible chances. Three parts of results are below.

4. 1 The scenario map of the ARCS model

The results of the KeyGraph technology is a scenario map (Fig. 1 The scenario map of the ARCS model, which displays the relationships among the four factors. Four colors to represent are below: Blue represents the Attention, purple represents the Relevance, yellow represents the Confidence, and green represents the Satisfaction.

Fig. 1 The scenario map of the ARCS model.

This scenario map is hard to explain. It is better to decompose the scenario map into four separated groups.

4. 2 The scenario map of the four factor

There are four scenario maps of attention, relevance, confidence, and satisfaction(Fig. 2, 3, 4, 5).

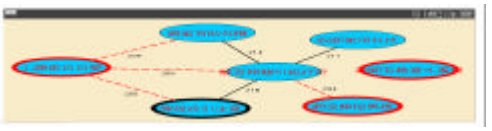

Fig. 2 The scenario map of attention

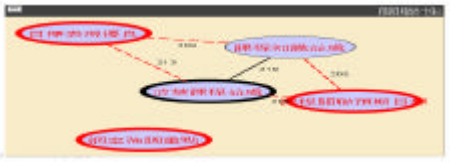

Fig. 3 The scenario map of relevance

Fig. 4 The scenario map of confidence

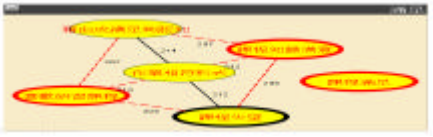

Fig. 5 The scenario map of satisfaction

These four figures show the internal relationships and a main important item for each category. All connect to each other within their own category. In the attention, relevance and satisfaction categories, one element is isolated. The results indicate that each category in ARCS model shows a strong internal connection.

4.3 The scenario map of the factors - interaction

The scenario map of the ARCS model in figure 1, 2, 3, 4, and 5 shows the facts whose items are more important in this computer education course. The scenario map of the four-factors-interaction (Fig. 6) is important to show an obvious interaction between the four factors.

Fig. 6 The scenario map of the four-factors-interaction

Three distinct items are notable as possible chances. There are three possible chances in the figure 6, two possible chances come from the confidence category, and one comes from the relevance category.

5. Conclusion

The purposes of this study are to provide information that is the students' impressions in the course and any possible chance for improving the instruction to teachers or instructional designers. The ARCS motivation model is the instrument to examine the learners' perspectives, and the result will be the feedback to the teacher or instructional designer for reflecting the teaching strategies.

The result indicates that the internal connections in Attention and in Satisfaction are more influence than the internal connections in Relevance and in Confidence. The possible chances link to the another three different parts, which means it will stimulate the learners' motivation if these two elements in Relevance and one element in Confidence categories are improved.

The future study will focus on the effects of the possible chances, the scaffold.

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