A validity and reliability study for Major and Non-major Students' Attitude Scales of Green Literacy

Ming-Rong Tsai

Abstract—The purpose of this study focused on developing consumer applications of college students' attitude scales for green literacy. It described students' literacy cognition as green consumers. All 450 samples in this study included college students of hospitality management majors and non-majors enrolled in the 2015 academic year. The whole validity ranges of questionnaire included green consumer cognition, behavior intentions, consumer arbitrary decision, control of perception behavior, and behavior attitude. The content validities were set up by scientists, food consultants, and dieticians. To detect the specialized validation, this study examined students' pilot results of attitude scales in factor analyses. It also measured the reliability of attitude scales, internal consistency and retest precision. Applications of college students' attitude scales were evaluated on their gender, specialization field, and education levels. All students' attitude scales were adjusted to be a five-point scale with 25 items of 5 aspects. This study clearly provided authentic validities and reliabilities for approaching students' attitude scales toward green consumer literacy. Statistical results indicated that major college students acquired better behavior intentions and positive consumer attitude in green literacy cognition than those of non-major college students.

Index Terms—attitude scales, green foods, green literacy cognition, green consumers

I. INTRODUCTION

Recently, green literacy recognition has become a global consumer issue which appeals to many scholars' attention in series of academic studies. Green literacy will enrich consumers' green recognition, life quality, and achieve positive green attitude for food production (Spaargaren & Mol, 2008; Zhu, Li, Geng & Qi, 2013). Four types of modern consumption can be classified in their literacy cognition of production for green consumers; they are green activity supporters, green thinkers, basic green consumers, and green issue followers. First of all, green activity supporters will give strong adherence to environmental protections. Then green thinkers will find their products in brainstorm of green choices and service types. As for basic green consumers, they will get active behavior cognition in their green priority action. Lastly, green issue followers will stick to their concerned issues of the green literacy cognition. For the above four types of green consumers, green production involves both clean and renewable characteristics in two parts including a body of knowledge about the natural world and a process of

enquiry to generate such problem- solving knowledge (Young et all, 2002). It is clear that most consumers' attitudes will play the dominant role of creating better green cognition and acquisition in their consumer literacy. To fulfill more green consumption, clean food and renewable production should be in favor of sustainable developments for green consumers (Clark, 2007; Narayanaswamy & Stone, 2007). There are seven fundamental principles of green literacy cognition (4R and 3E) for us to follow, such as reduce, reuse, recycle, refuse, economic, ecology, and equity. General speaking, sustainable green consumption has turned out to be an urgent issue which prevented harmful practices of environmental manufacturers in modern world (Mont & Plepys, 2008). Green consumer literacy gives us a renewable presentation and sustainable conception in response to quality information (Escamilla-Santana & MacFie, 1993), sensory judgments (Cardello & Sawyer, 1992; Deliza *et al.,* 1993) and consumption behavior (Hellemann *et* al., 1993).

The ultimate goal of green literacy depends upon developing full-scale learning attitudes in consumers' positive recognition. To cultivate green literacy will be more challengeable than just to know about and use green food materials and other products. We all live in the same green global world in which more green literacy will be accepted by the public. In fact, all green foods can be integrated into the new recognition of two parts --to be both clean and renewable substances. This green recognition has a dynamic literacy because green technology will play an ever-increasing role in our home, work, and community. Students have to be capable users of green technology, but certainly they also have to be able to seek, evaluate and solve related problems of green consumption as their contribution of modern citizens (Saskatchewan Education, 2001). Just as green technology comprises more than knowing computer information; green literacy involves more than using and solving technological products of green consumption. Not only using technological products ensures being green literacy, but also students must know what consumption attitudes should be best operated in their daily lives, which serve technological problems of green food materials.

Developing green applications of consumers' attitude scales were collected with advice of experts to provide better green literacy and sustainable development. There were many green factors, such as green foods, food miles, carbon footprint, water footprint, vegetarian, green restaurants and hotels, and sustainable food materials, all of which could be elucidated and integrated into green consumption in the questionnaire. The conceptions of both green consumption and sustainable developments could be acquired through consumers' literacy construction. We need a thorough

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recognition to promote green consumption and consumers' behavior intentions. A complete perspective would be in need for students' measurements of attitude scales, such as behavior intentions of green consumption, and green literacy of all student levels in this study.

Purposes

The purpose of this research aims at developing applications and validation of attitude scales in green literacy questionnaire (ASGLQ). Four basic learning performances would be indicated as the following way:
(1) To compare students' specialization fields of hospitality management in green literacy
(2) To explore students' different genders (males or females) of green literacy
(3) To analyze students' different educational levels of green literacy
(4) To dissect students' different studying schools of green literacy

II. METHODOLOGY

A. Research design

In order to evaluate students' green literacy validation, the ASGLQ attitude survey was used and interpreted by quantitative analyses. The main design of this study was based on college students' attitude scales for consumers' green literacy. It was developed by the expert team involved in a multidisciplinary project, which is composed of scientists, food consultants, and dieticians. The revised questionnaire contained 25 test items for assessing students' green consumers' attitude scales. The five-point scales of Likert-type were measured in 5 point responsive categories, from point 1 (strongly disagree) to point 5 (strongly agree).

B. Participants

All survey participants in this study were college students from the researcher's classes. In this study, 450 students from both junior college and senior college were interviewed to conduct the item groundwork of questionnaire. All test items had been revised by the author's draft design (Su, 2008a, 2008b, 2011, 2013). The stratified procedure was adopted to eliminate sampling voids. Students' learning backgrounds included specialization fields, students' gender, educational levels, and school enrolments would be constructed to do the sampling frames and made potential blocking variables more clearly in data analyses.

C. Instrument

This study developed ASGLQ as an effective instrument of validation. The attitude scales of questionnaire were distributed into five aspects with relation to green consumers' recognition (5 items), behavior intentions (5 items), arbitrary decisions (5 items), controls of perception behavior (5 items) and behavior attitudes (5 items). As suggested in previous questionnaire developments (DeVellis, 2003; Jensen, 2003; Su, 2008a, 2008b, 2011, 2013), feasibility, repeatability and internal validity were estimated and confirmed by the statistical approach of the exploratory factor analyses (Jover, Montes, & Fuentes, 2004).

D. Procedure

The whole research procedure started with the program of questionnaire items. The initial groundwork comprised of literature review, students' comments, and advice panels of experts, from which the content and validity of attitude scales were developed. Next, the pilot form of attitude scales was subjected to construct validation analyses. Constructive validity of attitude scales was supported with factor analyses techniques to verify the inter-correlated variables during early stages of this study (Sad, 2012). The decisive process of factor analyses, however, was to test a hypothesis or theory frame obtained from interrelationships of variables. The reliability study of questionnaire would set up in the following sequence order. First of all, an overall scrutiny of reliability analyses sorted out Cronbach's α internal consistency. Secondly, for analytical convenience it was necessary to collect the composite reliabilities. Finally, the revised ASGLQ was subjected to confirm validity and reliability analyses of questionnaire.

E. Validity and Reliability

To get the more reliable context validity, ASGLQ was reviewed and amplified by several dieticians and scientists to act as advisors for the pilot questionnaire. The pilot test, including 166 participants, was conducted to inspect relevant test items. In terms of constructive validity, 166 copies of pretests were taken into consideration for factor analyses. The results of first factor analyses indicated the KMO data (0.905) and χ^2 data (2447.644) of Bartlett spherical investigation (the degree of freedom 300) proved to be significant ($p < 0.001$); therefore, these results were deemed suitable for factor analyses.

Five aspects of students' attitude scales were observed for influential effects in main component analyses. The initial Eigenvalue obtained was above 1.0 with a cumulative total variance of 64%. The total Cronbach's α value could be 0.93 as shown in the internal consistency. According to Gay (1992), any supposed coefficient reliability over 0.90 indicated to be a preferable scale reliability. DeVellis (1991) regarded the 0.70 reliability as the minimum acceptable reliability. The more correlative a coefficient became; the higher the consistency of each test item presented amid its initial relations with others. This preliminary questionnaire divided into 25 test items during the whole process. The total 25 test items could be classified into five questionnaire dominated aspects: Q_1, Q_2, Q_3, Q_4, and Q_5.

● (Q_1) Consumer literacy of green cognition

● (Q_2) Consumer literacy of behavior cognition

● (Q_3) Consumer literacy of arbitrary decision

● (Q_4) Consumer literacy of perception behavior control

● (Q_5) Consumer literacy of behavior attitude

All five questionnaire dominated aspects would be classified from students' questionnaire survey as the results of factor analyses. Factor loadings of all test items were indicated in Appendix 1. All mean values, standard deviations, and Cronbach's α value were tabulated in Table 1. According to Table 1, the internal consistency of five questionnaire dominated aspects and the total scale reached a satisfactory degree (Kraterina & Tzougraki, 2004).

Table 1 Mean Scores (M), Standard Deviations (SD), and Cronbach's α for ASGLQ

Subscale of Questionnaire	M	SD	Cronbach's α
Q1	3.88	0.60	0.707
Q2	3.68	0.59	0.718
Q3	3.63	0.75	0.895
Q4	3.95	0.65	0.872
Q5	3.67	0.67	0.886
TA (total scale)	3.76	0.52	0.931

F. Data Analyses

All final test results of the questionnaire were validated with specific statistical classifications. Four variant blockings were formed to compare differential statistics: gender (male, female), specialization field (major, non-major), education levels (4–year senior college, 2–year senior college, 2–year junior college, 5–year junior college), and enrolment schools (School A, School B, and School C). All statistical analyses were acquired by SPSS 12.0 Windows Software. Descriptive statistics were calculated in survey analyses, and one-way ANOVA set at 0.05 with significant levels was examined to test main effects. In cases of three covariant categories with p-values less than or equal to 0.05, Scheffé's post hoc comparisons were conducted to be significant major effects. All result analyses were explored and identified differential main effects within covariant categories for green consumer literacy and attitudes.

The ultimate goal of green literacy recognition took some urgent steps of considerations for cultivating students' consumer attitudes in their daily lives. To cultivate green literacy recognition would be much more than just to know about and use green food materials. All modern men live in the technology world in which they have to cultivate sustainable consumption and green production. Today it is for a dynamic green literacy recognition that college students would play an ever-increasing role in their home, work, and community. Students should be capable users of technology certainly, but they also should be able to seek, evaluate and solve related problems of green consumption sustainment as their contribution to citizens of modern world (Saskatchewan Education, 2001). Just as green technology contains more than knowing computer information; green literacy gets more involvements in using and working out technological products of green consumption sustainment. Using technological products not only ensures green literacy, but also requires students know what consumption attitudes should be best operated in their daily lives, which serve technological problems of green food materials.

III. RESULTS AND FINDINGS

The main purposes of this study were to develop and validate students' attitude scales in green literacy through the questionnaire survey and students' characteristics (blocking variables for data analyses). The questionnaire was filled by the participants (n=450), with collecting rates 74% (n=332).

A stratified procedure was used to eliminate voids in sampling frames. All characteristics – such as students' gender(male, 44.6%; female, 55.4%), specialization field (major, 52.6%; non-major, 47.4%), education levels (4–year senior college 65.7%, 2–year senior college11.7%, 2–year junior college7.8%, 5–year junior college14.8%), and studying schools (A, 71.0%; B, 8.1%; C, 20.9%) — were constructed in sampling frames and made blocking variables analyses more effectively potential. The test items of questionnaire were to examine and evaluate major effects of 332 majors and non-majors students' green literacy recognition of hospitality management. Students' attitudes were documented and analyzed to find means and standard deviations of test items and learning differences. Surveys of five subscales indicated positive attitudes toward green consumer literacy with the mean response >3.50 for all attitudes. The descriptive statistics means (standard deviations) for students' attitudes of the five subscales and overall survey were: Q1 3.86 (0.57), Q2 3.65 (0.45), Q3 3.60 (0.24), Q4 3.89 (0.15), Q5 3.60 (0.40), and overall 3.72 (0.74). The overall total Cronbach's α was 0.930, supporting the internal consistency of reliability scales reached a satisfactory degree.

Table 2 Summary of F-ratios, p-values, and effect sizes (f) for each of ANCOVAs

Blocking variable	Analyses of variants	Attitude		measure		
		Q1	Q2	Q3	Q4	Q5
Gender (male. female)	F-ratio	0.163	0.932	1.459	1.000	0.888
	p-value	0.687	0.335	0.228	0.318	0.347
	f	0.045	0.055	0.063	0.045	0.045
Specialization field	F-ratio	1.979	5.223	2.157	0.371	1.373
(major, non-major)	p-value	0.160	0.023*	0.143	0.543	0.242
	f	0.078	0.400	0.078	0.045	0.083
education levels	F-ratio	1.189	1.959	1.289	1.339	1.531
(4–year senior college,	p-value	0.314	0.120	0.285	0.261	0.206
2–year senior college,	f	0.101	0.128	0.105	0.105	0.115
2–year junior college, 5–year junior college) studying schools	F-ratio	0.947	3.593	2.919	3.257	5.703
(Schools A, B, and C)	p-value	0.389	0.029*	0.055	0.040*	0.031*
	f	0.071	0.143	0.128	0.135	0.179
	Scheffé		3>1		3>1	3>1

Major differential effects of green literacy were explored from the variety of students' attitudes toward green consumer. Main effects of five subscales shown in green literacy were tested for four blocking variables by a series of ANOVAs in combined samples since all students had to complete the same attitude survey. Table 2 provided a brief summary of the F-ratios, p-values, and Cohen's effect sizes (f) together with 20 ANOVAs for gender, specialization field, education levels, and studying schools. The effect sizes were major factors or indexes to determine differential variants for students' green behavior intention. The effect sizes (f -index) were calculated to examine possible differences of five subscales. With guidelines for interpretations of the f-index, it was generally taken that $f = 0.1$ was a small effect, $f = 0.25$ was a moderate effect, and $f = 0.4$ was a large effect (Cohen, 1988, 1994). Inspections of five subscales indicated reliable factors and positive attitudes toward green consumer. ANOVAs revealed that one of the significant main effects was attributed for studying schools in green consumer of behavior intention (QDA2), perception of the behavior control (QDA4), and

behavior attitude (QDA5). The effect sizes between 0.135 and 0.179 showed small and medium effects, and Scheffe's post hoc comparison revealed favorable sizes to School C more than to School A in three subscales. Students' independent variants of specialization field didn't reach significant differences except in QDA2 subscale, with $f = 0.40$, indicating medium to large effect sizes. Students' major hospitality management was superior to that of non-majors in consumer literacy of behavior intention; therefore, behavior intention attributed to be a dominate variant for students' specialization field. There were not any significant differential variants in five subscales of gender to show effect sizes as $f < 0.130$, indicating under medium effect sizes.

IV. Major discussions and conclusions

The statistical results of this study elucidated a high AQGL survey of validity and reliability to approach students' consumer attitudes of green literacy. All results from major discussions indicated that green cognition helped students acquire a sound understanding of targeted consumption and promoted a positive attitude toward behavior intention. Parts of students' characteristics of green literacy, such as specialization field and studying schools had significant influences on their green consumers' attitudes, with higher effects than other variants discussed. Developments of green cognition would help students to advance meaningful consumer concepts, as well as to fulfill consumer principles in their learning process of green literacy. Such green literacy learning enabled advanced-level students to gain professional cognition more effectively and gave different level students the opportunity to understand the basics of green literacy through repeated practices. Green concept provided a powerful means for fostering green literacy learning because it could present students behavior intention. The statistical results explored different students' background by consumer concept to help students improve their cognition of consumer attitudes toward green literacy.

It was concluded that these statistical results of this study made a significant contribution toward participants' consumer literacy of green food. The results also supported previous consumer concept of this research for green cognition and a better conception of sustainable developments which would correspond to positive efforts of researchers (Wheland, Donovan, Dukes, Qammar, Smith, and Williams, 2013). Teaching applications of AQGL for green food offered unique benefits, especially when students had to learn new and complex conceptions, as also noted by Zhu, Li, Geng, and Qi (2013) who utilized the cognition framework of green learning for behavior intention representations. These results indicated that major college students acquired better behavior intentions and positive consumer attitude in green literacy cognition than those of non-major college students.

Despite the statistical significances of the results, readers were reminded that the samples in this case study were based on learning convenience and that these results could not be generalized beyond the context of this study. Continuing efforts would be also needed to confirm further extended approaches to fulfill future benefits of questionnaire designs.

Other individual students' characteristics, such as age and social backgrounds would be needed to explore in the near future.

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APPENDIX

Appendix 1 Five subscales of Likert items for green food consumer literacy attitude

Sub	Items	Loading Factor	Cron-bach's α
QA1	1. Consumer products are non-added food materials.	0.781	0.707
	2. Consumer products are recycled foods.	0.7	
	3. Consumer products should stick environmental labeling.	0.651	
	4. Consumer products should avoid throw-up materials after use.	0.68	
	5. Consumer products should adopt high biodecomposed environmental materials.	0.391	
QA2	6. I will buy green products as the priority purchase.	0.709	0.718
	7. I will buy cheaper products, not in case of green consumption.	0.907	
	8. I will buy green merchandise made from green materials.	0.545	
	9. I will buy local in-season products.	0.764	
	10. I will actively recommend other people to buy green products.	0.747	
QA3	11. Families would be the factor to influence my choice of green products.	0.686	0.895
	12. Friends would be the factor to influence my choice of green products.	0.876	
	13. Classmates would be the factor to influence my choice of green products.	0.846	
	14. Teachers would be the factor to influence my choice of green products.	0.759	
	15. Retailers would be the factor to influence my choice of green products.	0.636	
QA4	16. I think to stick environmental labels will be in fashion and in the trend for consumers' products	0.687	0.872
	17. I think green products should emphasize the concept of 4 R design.	0.743	
	18. I think the more recycling systems we endeavor, the more my intention to buy.	0.803	
	19. I think green products should integrate the philosophy of life cycle.	0.821	
	20. I think environmental protection and ecology engaged in green products should upgrade a splendid image of producers.	0.839	
QA5	21. To buy green products would make me feel pleasant.	0.796	0.886
	22. To buy green products would be my responsibility to share.	0.81	
	23. I would choose green products, with no regard of more expensive prices..	0.488	
	24. I would be proud of eating at green restaurants knowledge.	0.73	
	25. I would change my consumer behavior for the harmony of environmental protection and ecology.	0.81	