การพัฒนาและประเมินผลโปรแกรมการรู้เท่าทันสื่อเรื่องผลิตภัณฑ์สุขภาพ: กรณีศึกษาผลิตภัณฑ์เสริมอาหาร ในเด็กนักเรียนชั้นมัธยมศึกษาตอนปลาย
Development and Evaluation of Media Literacy Program on Health Products: A Case Study of Dietary Supplements in High School Students

นิพนธ์ต้นฉบับ

Original Article

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บทคัดย่อ

วัตถุประสงค์: เพื่อพัฒนาและประเมินผลของโปรแกรมการรู้เท่าทันสื่อ เรื่องผลิตภัณฑ์สุขภาพที่เน้นผลิตภัณฑ์เสริมอาหาร ในเด็กนักเรียนชั้นมัธยมศึกษาตอนปลาย **วิธีการศึกษา:** ระยะที่ 1 การพัฒนาโปรแกรมการรู้เท่าทันสื่อฯ ใช้แนวคิดการรู้เท่าทันสื่อร่วมกับหลักการไตรยางค์การศึกษา พัฒนาโดยการสนทนากลุ่มครูและสอบถามความเห็นนักเรียน เพื่อจัดทำแผนการจัดกิจกรรมการเรียนรู้ 4 แผนกิจกรรม จัดทำลงในโปรแกรมแฟลช® ดำเนินกิจกรรมสัปดาห์ละ 1 คาบเรียน รวม 4 คาบเรียน ระยะที่ 2 ประเมินผลโปรแกรมการรู้เท่าทันสื่อฯ เป็นการศึกษากึ่งทดลอง โดยมีนักเรียนกลุ่มควบคุม 37 คน และกลุ่มทดลอง 32 คน เป็นนักเรียนชั้นมัธยม 5 จากสองโรงเรียน ทำแบบประเมินการรู้เท่าทันสื่อฯ (ก่อนทดลอง) หลังจากนั้น 1 สัปดาห์ นักเรียนกลุ่มทดลองใช้โปรแกรมการรู้เท่าทันสื่อฯ และให้นักเรียนทั้งสองกลุ่มทำแบบประเมินการรู้เท่าทันสื่อฯ (หลังทดลอง) อีกครั้ง วิเคราะห์ข้อมูลด้วยสถิติ paired t-test เพื่อเปรียบเทียบการเปลี่ยนแปลงในแต่ละกลุ่ม และสถิติถดถอยเชิงเส้นแบบพหุเพื่อเปรียบเทียบคะแนนหลังการทดลองระหว่างสองกลุ่มโดยควบคุมตัวแปรแปรเพศ คะแนน GPA สะสมเฉลี่ย และคะแนนการรู้เท่าทันสื่อก่อนได้รับโปรแกรม **ผลการศึกษา:** คะแนนทักษะการรู้เท่าทันสื่อที่หลังการทดลองในนักเรียนกลุ่มทดลองสูงขึ้นจากก่อนทดลองอย่างมีนัยสำคัญทางสถิติ (10.56 ± 1.58 และ 8.06 ± 1.52 คะแนน, ตามลำดับ, P-value < 0.001) ในขณะที่ในกลุ่มควบคุมนั้นคะแนนไม่ต่างจากกก่อนเริ่มการทดลอง พบว่าคะแนนการรู้เท่าทันสื่อของกลุ่มทดลองกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ (10.56 ± 1.58 และ 6.54 ± 2.39 คะแนน ตามลำดับ, P-value < 0.001) **สรุป:** โปรแกรมการรู้เท่าทันสื่อต่อผลิตภัณฑ์เสริมอาหารมีผลทำให้นักเรียนมัธยมมีทักษะการรู้เท่าทันสื่อเพิ่มขึ้นกว่าการไม่ได้รับโปรแกรมการรู้เท่าทันสื่อฯ

คำสำคัญ: การรู้เท่าทันสื่อ, โปรแกรมการรู้เท่าทันสื่อ, ผลิตภัณฑ์เสริมอาหาร, นักเรียนชั้นมัธยมศึกษาตอนปลาย

Editorial note

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Abstract

Objective: To develop and test a media literacy program on health products emphasizing dietary supplements in high school students. **Methods:** The 1st phase was the media literacy program development based on the concept of media literacy and educational trilogy. Learning activities plans were developed as guided by the information obtained from focus group of the teachers and students. Four learning plans were developed and placed on Flash® program. Learning was conducted with 4 weekly sessons. The 2nd phase evalued the efficiency of the program. A total of 37 and 32 5th grade high school students from 2 schools participated in the experimental and control groups, respectively. Students from both groups complete the test of media literacy before the program. One week later, students in the experimental group took the program. After the program completion, students in both groups complete the test. Data were analyzed using paired test for within-group comparisons, and multiple linear regression controlling for gender, cumulative GPA, and pre-test scores. **Results:** Mean score of media literacy of students in the experimental group after the program increased significantly from that before the program (10.56 ± 1.58 and 8.06 ± 1.52 points, respectively, P-value < 0.001); while scores in the control group did not. After the program, mean score of the experimental group was significantly higher than that of the control group (10.56 ± 1.58 and 6.54 ± 2.39 points, respectively, P-value < 0.001). **Conclusion:** Media literacy program on dietary supplements improved media lieracy scores for high school students when compared with no program.

Keywords: media literacy, media literacy program, dietary supplements, high school students

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Introduction

In 2019, Thais spent an average of 10 hours and 22 minutes a day on the Internet, accounting for an increase of 17 minutes from 2018. The most active Internet users were Gen Y, i.e., individuals aged 19 – 38 years old, with an average of 10 hours and 36 minutes a day spent on the Internet. This was followed by Gen Z or those under 19 years old with an average of 10 hours and 35 minutes of the Internet use. Students had the highest Internet use and the region with the highest use was the north of Thailand. In addition, it was found that the most crucial problem for Internet users was the lack of confidence in the reliability of information available online.[1]

Since 2014 to date, there have been no fewer than 15 deaths nationwide due to the exposure of sibutramine in adulterated dietary supplements advertised as the weight loss product. Sibutramine caused side effects such as acute

myocardial infarction, heart attack, irregular heartbeat, and hallucinations.[2] These adverse effects have been reported not only in Thai adults, but individuals as young as 16 years old. Most of them reported that they bought the product through social media including Facebook and Instagram, often based on product reviews. This showed that these young individuals were still lacking media literacy skills and subject to serious drug adverse events.

According to literature review, it was found that many organizations have been trying to carry out activities to promote the development of media literacy skills in health among adolescents and students. For example, the Ministry of Education and the Ministry of Public Health of Thailand jointly set up the Health Literacy School program as guided by the Department of Health to educate students more about health. Unfortunately, the program failed to achieve its goal. This was because only certain individual student's behaviors such as healthy food consumption were subject to modification; while most of the activities focused on modifications of environments and health measures such as regular student health check-ups.

Media literacy has been recognized as one of the major core competencies for students by the Ministry of Education. Therefore, in the current 2008 core curriculum of the basic education policy, there were indicators related to health and media literacy. Based on such policy, health education and physical education were mandatory for 5th grade primary school level and all grades of high school levels.[3] However, media literacy skills were probably not be included in all school's' learning plan if the national indicators were not considered necessary by the school. Therefore, a certain number of students were not taught and trained for media literacy skill.

Therefore, the researcher would like to provide teaching programs to help students acquire media literacy skills to handle health products especially dietary supplements. The researcher developed a media literacy program on health products focusing on dietary supplements in high school students. Specifically, this study aimed to examine the benefits of the media literacy program on media literacy among high school students. The findings could be useful in further improving the program to better the media literacy skills among high school students to handle the information and advertisement of dietary supplements more efficiently.

Methods

In this quasi-experimental study, the instruments consisted of the media literacy program and the questionnaire on media literacy. First, the media literacy program was developed as followed. This program was the media literacy program on health products: a case study of dietary supplement in high school students. The program was based on the concept of media literacy which was defined as a ready-made program for teachers to teach their students.

The program consisted of 2 parts namely an activity handbook for teachers and a 4-activities learning plan which was developed according to the Educational Trilogy (OLE) principle.[4] The principle helped define learning objectives and evaluate learning outcomes from Miller's theory[5] together with Bloom's Revised Taxonomy[6], the theory of learning of Skinner[7], and supplemented with the concept of media literacy to enable learners to learn better. Details of the 4-activities learning plan were as follows: In the first activity plan (information access), participants were guided to information access. Participants were guided to find information from a wide variety of reliable sources and be familiar with the source of the information. In the second plan (information analysis), participants were guided to interpret the content presented in the media in accordance with the purpose for which it is presented. In the third plan (information evaluation), the participants were guided to be able to tell which word or message made them believe/ not believe, and to propose opinions and issues presented by the media in various aspects. In the last plan (creation), the participants were guided to the develop the media creatively which meant that the content in the media must not distort the facts, and in a format that corresponds to the audience.

In this developing state, personnel and their responsibilities in the program were as follows. First, the selected four teachers responsible for guiding participating students were selected and trained. These four teachers were among many teachers in Chiangmai province who had been involved in the Thai Food and Drug Administration (FDA) program called Aoryornoi or the junior FDA volunteers to guide the local student volunteers. These four teachers were provided with the information of our media literacy program. To be eligible for our media literacy program, these teachers had to 1) have been trained on the use of food consumption behavior development model of junior high school students to

reduce risk factors for non-communicable diseases (NCDs) under the Food and Drug Administration's Aoryornoi project, 2) be a vocal teacher for at least 3 years, and 3) be able to consistently carry out Aoryornoi activities with unexpired Aoryornoi certificate.

In this developing state of the program, five students from arts and sciences classes of the upper secondary level were purposively selected. Only female students were selected because they were more likely to use health products than male counterparts.

Input from the ten students was crucial for program content and activity development. The researcher asked the students for their opinions with 6 open-ended questions. The questions were divided into two main areas, specifically the repetition of the content being taught, and the format of the teaching materials to be supplemented by the students. The information obtained from the students were the input for the focus group. In the focus group, the researcher used a semi-structured interview to guide the teachers to draft the learning activity plan based on the media literacy theory and related literature.[4] The program consisted of setting objectives, organizing learning experiences, and evaluating results by applying Miller's theory[5] to evaluate learning outcomes. The improvement of Bloom's Revised Taxonomy[6] was used as a conceptual basis for determining the learning objectives and evaluating the outcomes corresponding to the objectives of each learning activity plan. For the learning management process, Skinner's learning theory[7] was applied to complement the concept of media literacy to make the learning activities plan interesting and stimulating for the learners. All the learning activity plans were put into the Flash™ program to present to teachers. These teachers were asked for their opinions to revise the program before the actual use. The information obtained from these teachers was analyzed using the content analysis method.

The sample for this evaluation phase was grade 5 high school students with moderate academic performance from two schools located in the semi-urban, semi-rural areas of Chiangmai using a purposive sampling technique. With one year of grade 4 class, these grade 5 high school students had been well adjusted to high school learning, and they were not in the intense preparation for the national university entrance examination like grade 6 students. These grade 5 students were ready for learning new things in the program. The selection of students with a moderate grade point average and adequate academic performance and behavior by the teachers could allow for smooth learning.

The sample size was calculated using G power 3.1.9.2 for mean difference between two independent means (two groups). With a mean difference from a study determining the effect of a media literacy program in high school students at Sansai Wittayakom School, Chiang Mai province[8], a type I error of 5%, and a power of 90%, a same size of 26 participants in each group was needed. However, at the end of the recruitment, a total of 37 and 32 students were selected for control and experimental groups, respectively.

The evaluation of the media literacy program

Based on the information obtained from the teachers previously, 4 learning activity plans were refined.[9] For the first plan of Access, the activities aimed at enriching the ability of a person to search for information on dietary supplements using appropriate keywords and reliable sources of information. In Analysis, the activities were designed to strengthen the ability of a person to understand the content presented in the media for the commercial purpose. In the third activity plan, Evaluation, the activities were set to enhance the ability of individuals to evaluate the quality and credibility of the content contained in the media to make an appropriate selection or purchase decision. In the last activity plan, Creativity, the activities helped the person to be able to produce reliable new media according to the specified objectives and the characteristics of the target audience. These four activities were prepared as four media cases of four products including weight loss supplements, skincare supplements, acne supplements, and memory enhancing supplements. With four questions for each case product, 16 questions or were prepared.

These 16 questions of the 4 case products were evaluated for content validity by three experts, specifically two instructors of the Faculty of Pharmacy, Chiang Mai University, and the chairman of the Aoryornoi project of Chiang Mai province. Content validity for each activity was tested using the Item Objective Congruence (IOC) Index. It was found that each of the 16 questions was with IOC index of 1.00 indicating perfect content validity.

The implementation of the media literacy program

One week before the implementation of the media literacy program, students in the two groups were evaluated for media

literacy level. Students in the experimental group were then asked to participate in the 4 weekly 50-minute lessons. The researcher acted as an observer. One week after the experimental media literacy program, students in both groups were asked to complete the media literacy assessment.

Participant protection

This study was approved by the Ethics Committee of Faculty of Pharmacy, Chiang Mai University (approval number: 37/2019).

Data analysis

Demographic statistics including mean with standard deviation (S.D.) and frequency with percentage were used to present demographic characteristics of participants and study variables. Paired t-test was used to compare media literacy mean scores at pre-test and post-test in the experimental and control groups. Multiple linear regression was used to compare post-test media literacy mean scores between the two groups controlling for gender, cumulative GPA score, and pre-test media literacy score. Statistical significance was set at a type I error of 5%. All statistical analyses were conducted using STATA data analysis statistical software version 14.0.

Results

Student's opinions for the development of the media literacy program were as follows. Students never seen the advertising content of health products or dietary supplements presented in the cases. Students knew how to search before program participation and could tell how to do the search. For the teaching materials, students agreed that there should be supplemental instruction on media literacy, dietary supplements, and a compelling teaching style specifically video media. Results from the focu group were used to improve the program.

Of the 32 and 37 students in the experimental and control groups, respectively, more female students were significantly found in the experimental group (87.50%) than in the control group (51.35%) (*P*-value = 0.002) (Table 1). Most students in the experimental group had GPA of 3.51 – 4.00(43.75%); while those in the control group had GPA of 3.01 – 3.50 (32.43%) (*P*-value = 0.021). Other characteristics including students' income/week, average internet use time, experience purchasing health products, and experience of adverse effects or harms from the use of health products in the experimental and control groups were comparable (Table 1).

Table 1 Demographic characteristics of the students.

Characteristics	N (%)		*P*-value*
	Experimental group (n = 32)	Control group (n = 37)	
Gender			
Male	4 (12.5)	18 (48.65)	0.002
Female	28 (87.5)	19 (51.35)	
Cumulative GPA			
2.00 - 2.50	0 (0)	5 (13.51)	0.021
2.51 - 3.00	4 (12.50)	11 (29.73)	
3.01 - 3.50	13 (40.63)	12 (32.43)	
3.51 - 4.00	14 (43.75)	7 (18.92)	
Income/week (Baht)			
≤ 400	14 (43.75)	15 (40.54)	0.950
401 - 600	15 (46.88)	16 (43.24)	
601 – 800	2 (6.25)	4 (10.81)	
≥ 801	0 (0.00)	1 (2.70)	
Average time using the Internet (hours/day)			
< 5	3 (9.38)	6 (16.22)	0.241
5 – 7	10 (31.25)	16 (43.24)	
7 – 9	8 (25.00)	3 (8.11)	
> 9	10 (31.25)	12 (32.43)	
Having ordered health products			
Yes	16 (50.00)	12 (32.43)	0.138
No	16 (50.00)	25 (67.57)	

* Chi-square test or Fisher's exact test, as appropriate.

In the control group, score of each of all media literacy skills and overall skill before the start of the program was slightly increased from that after the program with no statistical significance (Table 2). Among those in the experimental group, their scores of access, evaluation and overall media literacy skills after the program (3.94, 2.00 and 10.56 points, respectively) were significantly higher than those before the program (2.84, 0.94 and 8.06 points, respectively) (*P*-value < 0.001 for all). On the other hand, even though scores of analysis and creativity after the program were higher than those before the program, such increases were not statistically significant (Table 2).

After the program, scores of overall media, and individual skills including access, evaluation, and creativity skills, in the experimental group (10.56, 3.94, 2.00 and 2.91 points, respectively) were significantly higher than those in the control group (6.54, 2.03, 1.22 and 2.11 points, respectively) (*P*-value < 0.001, < 0.001, < 0.001, and 0.001, respectively). The score of analysis skill in the experimental group was also higher than that in the control but with no statistical significance (1.68 and 1.14 points, respectively, *P*-value = 0.063) (Table 3).

Table 2 Scores of media literacy skills of students in the two groups before and after the program (N = 69).

Media literacy skills	Mean score ± standard deviation							
	Control group (n = 37)				Experimental group (n = 32)			
	Before	After	Mean difference†	*P*-value*	Before	After	Mean difference†	*P*-value*
Access (full score=5)	2.00 ± 1.13	2.03 ± 1.04	0.03 (-0.46, 0.41)	0.900	2.84 ± 0.95	3.94 ± 0.80	1.09 ± 1.15 (-1.51, -0.68)	< 0.001
Analysis (full score = 4)	1.05 ± 0.91	1.14 ± 0.86	0.08 (-0.52, 0.36)	0.710	1.50 ± 0.95	1.68 ± 0.86	0.19 ± 1.23 (-0.63, 0.26)	0.395
Evaluation (full score = 4)	1.05 ± 0.91	1.22 ± 1.03	0.16 (-0.67, 0.35)	0.530	0.94 ± 0.76	2.00 ± 0.80	1.06 ± 1.08 (-1.45, -0.67)	< 0.001
Creativity (full score = 4)	1.97 ± 0.73	2.11 ± 1.05	0.14 (-0.55, 0.28)	0.520	2.81 ± 0.53	2.91 ± 0.77	0.09 ± 1.03 (-0.46, 0.27)	0.609
Overall media literacy (full score = 17)	6.08 ± 2.64	6.54 ± 2.39	0.46 (-0.73, 1.65)	0.440	8.06 ± 1.52	10.56 ± 1.58	2.50 ± 2.06 (1.75, 3.24)	< 0.001

* Paired t-test comparing scores before and after the media literacy program within each group.

† Mean difference with 95% confidence interval.

Table 3 Comparison of scores of media literacy skills between the two groups after the program (N = 69).

Media literacy skills	Mean score ± standard deviation			*P*-value*
	Control group (n = 37)	Experimental group (n = 32)	Mean difference (95% CI)	
Access	2.03 ± 1.04	3.94 ± 0.80	1.91 (-2.18, -1.16)	< 0.001
Analysis	1.14 ± 0.86	1.68 ± 0.86	0.54 (-0.94, 0.02)	0.063
Evaluation	1.22 ± 1.03	2.00 ± 0.80	0.78 (-1.50, -0.52)	< 0.001
Creativity	2.11 ± 1.05	2.91 ± 0.77	0.80 (-1.46, -0.32)	0.001
Overall media literacy	6.54 ± 2.39	10.56 ± 1.58	4.02 (-5.20, -2.80)	< 0.001

* Multiple linear regression adjusted for GPA score and media literacy scores before the program.

Discussions and Conclusion

The developed media literacy program consisted of four learning activity plans to align with the four elements of media literacy namely access, analysis, evaluation, and creativity. Each learning activity plan consisted of setting learning objectives (O), the process of organizing learning activities (L), and evaluating the results (E) according to the educational principles or OLE. Objectives and evaluation of learning outcomes were based on Bloom's Revised Taxonomy theory and Miller learning outcomes theory, a theory that focused on the hierarchical learning process from memorization to behavior change. Learning activity plan 1 focused on providing students with access skills, knowing how to search for information and which sources were reliable. It was the process of learning at the highest level based on Miller ideas. The 2nd learning activity plan focused on providing students with media analytical skills, namely, being able to distinguish how the media were intended to communicate. This learning process is at the analytical level according to Bloom's taxonomy. Learning activity plan 3 focused on providing students with media evaluation skills, namely, being able to choose to believe or not believe what the media offer. Learning activity plan 4 focused on giving students the ability to create media that were being able to communicate and make the right decision to purchase health products. This step is an advanced learning process of creative thinking. The researcher adopted Skinner's Theory of Learning Concept to strengthen the organization of the learning process. It was evidenced by the satisfaction of the experimental group of students with this kind of learning process that made them fun, with activities, games, role plays, and videos, allowing students to understand and remember the content even easier.

The names of the four learning activity plans of the media literacy program were called “Smart Search, Media Access Channels," “Easy Media Analysis," “Sure or Not, Think Before Sharing,” and "Media Creativity," respectively. Each plan took 50 minutes to complete. The program was put on Flash™ program, an offline program that made it easy to use and provide guidance for teachers. The materials included information about learning, learning objectives, learning processes, worksheets, pre and post-tests, media videos, introductory media literacy series, health products for teachers and students.

The media literacy program, when compared with the control measures, was found to offer higher scores of overall and individual media literacy skills, except the analysis skill.

Our findings are consistent with previous research on the effectiveness of media literacy toward Internet advertisement of health products for high school students.[11], Their 4 weekly 50-minute learning sessions resulted in higher knowledge and awareness of media literacy advertising, but not the practical skills.[11]

In our study, when individual skills were considered, the arguments for the findings could be as follows. For access skill, score after the program in the experimental group was significantly higher than that in the control group. From the group interviews, students had previously studied in Thai language how to access the information on the Internet and they still knew how to do it. However, the media literacy program could enhance such skill even further.

For the analysis skill, it was the only media literacy skill that the score in the experimental group was not statistically higher than that in the control group. This may be because media analysis skill requires knowledge of advertising, definition of health products, and knowledge of legal fundamentals. It was worth noting that when students took a training lesson, certain discrepancies were found. When certain media such as live clothes selling, news programs in the royal court, and eating behaviors were viewed by the students, about 70% of the students correctly identified the purposes of these media. However, once real case studies on social media were presented to them, they could not identify purposes of these cases. The difference could be because these actual advertisements in the social media today are sophisticate in presentations. Some are disguised as passive, educational campaign materials, not direct sale- or marketing-focused ones. However, with these subtle marketing and sale strategies, students' ability to analyze the media strategies could be limited and the students could be successfully persuaded by the media. In the future studies, more subtle sales and marketing strategies should be added in the training materials to enhance analysis skill.

Regarding evaluation skill, it could be significantly enhanced by the media literacy training program when compared with no program. It was observed during the training session that the students revealed that before participating the program they perceived the advertisements on the actual social media were true and trustable, not deceiving. Our finding is consistent with the results of a 2015 survey of Internet use problems in 2019. The Electronic Transactions Development Agency found that 29.7% of Gen Z individuals (i.e., those under 19 years old) were unsure that information displayed on the Internet was reliable.[1] A survey in 2018 also revealed that 65.71% of respondents believed that if famous people were used to advertise the products, they would make the products reliable.[12] In our study, however, being trained by teachers, students could be able to identify deceiving advertisement from the videos. Among students in the experimental group, their scores of analysis skill after the program were higher than those before the program even though with no statistical significance. Like skills other than media literacy, it could also be that analysis skill, among all individual skills of media literacy, was more difficult to acquire within a relatively short period of training. It was worth noting that training with actual video media could draw more attention than the simple lectures.

For the creativity skill, score after the program in the experimental group was significantly higher than that before program (P-value < 0.001). Creativity skill was a collection of knowledge and skills the students had acquired after the completion of the program. When students had the knowledge and understanding ranging from access, analysis, and evaluate skills, eventually students were able to impart or pass on information appropriately and accurately. This was consistent with the learning level theory of Bloom's Revised Taxonomy, which was based on memorization as a basis before going up to the level of understanding, applying, analyzing, evaluating, and thinking creatively, respectively.[6]

The method of organizing the learning process according to the media literacy program allowed the experimental group to have media literacy skills by making the ultimate change in the learning process. The changes were being able to tell and choose to believe/not believe the proper advertising of dietary supplements. Unlike the previous study with comparable participants, our study successfully made certain cognitive improvement on media literacy. With the 5 main activities based on media literacy organized in one day, it could be difficult to change the behavior.[8]

Our study had certain limitations. Higher scores of media literacy skills in the experimental group could have been related to possible biases. In our experiment, there were more female students in the experimental group (87.50%) than those in the control group (51.35%). With the proposed 37 participants in the experimental groups, 5 prospective male participants had to join military training camp during the experiment leaving only 32 participants for the experiment with

a large proportion of female students (87.50%). Such disproportions of gender between the two group could have had affected the scores of media literacy. Female individuals are more likely to be more interested in physiology and health care than male counterparts.[10] In our study, a large proportion of female participants in the experimental group could have resulted in the higher chance of acquiring knowledge and skills in the media literacy when compared with those in the control group.

In addition to gender differences, academic performance could have had effects on media literacy scores. Higher scores in the experimental group could be related to their higher cumulative GPA, i.e., 84.38% with cumulative GPA of 3.00 or higher, and no students with cumulative GPA lower than 2.5. On the other hand, only 51.35% of students in the control group had cumulative GPA greater than 3.00, with 13.51% of them having cumulative GPA lower than 2.5. Cumulative GPA difference could have affected the differences in media literacy scores. With this concern, gender, cumulative GPA, and scores before the program were adjusted for in the multiple linear regression.

Differences in media literacy scores between the two groups could be because clusters of participants were randomly assigned to the interventions. The cluster random assignment was chosen to prevent information exchange and contamination. Specific schools were selected because the content of the training had to be implemented in regular school time. The teachers had to be well experienced in consumer protection and the administrators had to be concerned about the training of consumer protection for their students. As a result, differences regarding certain student characteristics such as cumulative GPA could confound the study results.

Our findings could be considered a short-term efficiency of the training. After 4 activity plans were implemented within a week, the media literacy outcomes were evaluated. To prove the intermediate- or long-term efficiency or sustainability of the program, a longer period, such as 1 to 3 or 6 months should be planned for evaluation.

Since the study was not blined, certain biases could be expected. In addition, even though the reseachers were not teachers in the schools, students were ware of the observation by the researchers. As a reslt, social desirability bias from the students could also be expected. These biases should be taken into account in future studies.

In terms of implications, this media literacy program could be applied in high schools well equipped with computers and related devices. The program could be implemented within one month in regular classes and supplementary tutoring in students' home room hours. The program should be promoted by the Ministry of Education for a nationwide implementation. The Ministry of Public Health could promote the program to schools with less intensive Aoryornoi activities.

In conclusion, media literacy program on dietary supplements improved media lieracy scores for high school students when compared with no program.

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