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Development and exploration of news media literacy scales in Taiwan

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Abstract

The purpose of the study is to explore how the promotion of news media literacy positively affects media criticism as well as the control and judgment of self-behavior. Potter developed the Chinese News Media Literacy Scale (NMLS), based on his theoretical framework of media literacy cognition. Potter is an outstanding scholar in media literacy. Senior high school students in Taiwan validated the NMLS for reliability and validity. The NMLS consists of 45 questions covering four topics: intellectual skills, personal locus, media knowledge structure, and news context reading. The Chinese version of the NMLS demonstrated good reliability, considerable validity, appropriate discrimination, and an appropriate level of difficulty, making it suitable for Taiwanese students. Female respondents exhibited higher news media literacy than their male counterparts. Public senior high school students showed higher news media literacy compared to those from private schools. The time spent reading news positively correlates with improvements in news media literacy. The findings indicate that news media literacy education significantly enhances students' critical understanding of news and media literacy skills, with varying effects across different genders and types of schools. The limitation of the study is that the sample mainly comes from Taiwan, which may not fully represent other cultural contexts. The findings can guide educational policy in schools, particularly in designing and implementing news media education curricula, taking into account the differences in gender and school types. This research expands the literature on news media literacy, especially in terms of scale development and its application to a specific cultural context like Taiwan, and introduces new insights into the impact of gender and school type on media literacy.

Keywords: Cognitive theory of media literacy, Cultural context, Educational policy, Media literacy, News media literacy scale, News media literacy.

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1. Introduction

Since the 1990s, media literacy research has entered an era of rapid development. Significant institutions, including UNESCO, the European Union, media literacy associations, and governmental bodies, undertook the research during this period. They have proposed many frameworks for news media literacy, mainly from the perspectives of analysis and evaluation, creation, reflection, and action. Potter has been published the cognitive theory of media literacy since 2001, laying a theoretical foundation for media literacy research [1-3]. His research shows that readers with media literacy will have an in-depth reflection on their media experience, believing that they can control media influence and have a basic knowledge of media content, media industries, and media effects. Therefore, it is necessary to develop tools to measure individual news media literacy and classify respondents. Maksl, et al. [4]. Maksl, et al. [4] evaluated the usefulness of the news media literacy measurement for the news literacy course 2017. Their research proposed a news media literacy scale based on Potter's theory. They used it to survey college students, finding that the news literacy course can effectively improve students' ability to understand and interpret the news. This highlights the importance for educators and policymakers to understand where our youths are in terms of their capabilities to participate in the new media ecology. We can conceptualize this capability as new media literacy (NML), which we have theorized into four quadrants with ten fine-tuned indicators [1].

On the other hand, Maksl, et al. [4] found that the lack of citizen consensus in society is detrimental to news literacy teaching methods and research effectiveness. The newly developed and verified news media literacy standards can aid in achieving shared objectives. Therefore, it highlights the importance of applying the news literacy scale.

This study mainly approaches media literacy in Chinese-speaking areas. Therefore, it developed a Chinese News Media Literacy Scale (NMLS) based on the news literacy compiled by Ashley, et al. [5]. The present research compiled the NMLS to assess news readers' intellectual skills, understanding of news media, and ways of interpreting the news. Therefore, it used the NMLS to explore Taiwan students' media literacy status and identify the fundamental factors influencing their media literacy. This study employed a qualitative approach to establish research protocols for subsequent data collection, thereby achieving its objectives. It also analyzed the cognitive theory about media literacy via literature review, laying the thesis statement's foundation. After analyzing the characteristics of Taiwan new dissemination, the study summarized four key topics: intellectual skills, personal locus, knowledge structure, and news context reading. Lastly, the study employed a quantitative approach, distributing a questionnaire to conduct the survey. Following this, they collected data for statistical analysis and comparison, which aided in the compilation of an MNLS relevant to Taiwan.

2. Literature Review

2.1. Cognitive Theory of Media Literacy

A credible media and information system constitutes the prerequisite for sustainable social development. In today's world, misinformation, factual distortions, and prejudice permeate news media, underscoring the critical role of media literacy in sustainable development [6]. Due to the increase in news releases and the acceleration of news dissemination, people find it challenging and even impossible to examine news sources when exposed to much media information [2, 3]. potter conducted the studies from the perspectives of media literacy and cognitive psychology, proposing two distinct viewpoints. First, suppose news readers' media literacy is to be improved. In that case, it is necessary to provide them with media literacy education first so that they understand the media content, the motivation of the media industry, and the potential negative impact of media.

Meanwhile, it is also essential to understand how news readers use media to achieve personal goals and avoid crises in their daily lives. Second, news readers alter their behaviors based on how they perceive the world. A deeper understanding of how news readers think can determine how media information amplifies what consumers mean to achieve. Potter also gathered various concepts from the research literature to construct a cognitive model of media literacy, which encompasses four key areas: knowledge structure, personal locus, competencies and skills, and information processing [7].

As shown in Figure 1, Potter [3] established a cognitive model of media literacy based on the following four ideas. Firstly, information processing is a natural response. Potter believes that news readers' processing a great deal of media messages is their automatic response in a state of automaticity. Secondly, the media constrains news readers, influencing people's cognitive processes by defining topics. The media makes the readers believe that some matters are essential while others are not. Thirdly, media literacy can help readers improve their drive and ability to analyze and use media messages. Fourth, media literacy can enable news readers to filter messages, match the meaning, and construct meaning. Therefore, Potter proposed three essential cognitive media literacy model aspects: intellectual skills, personal locus, and media knowledge structure. The personal locus in Figure 1 refers to what governs the information-processing tasks. The locus consists of goals and drives. The goals determine the filtering and ignoring of information processing tasks [2]. The more you know about the locus, the more conscious you are of shaping it, and the better you can control the process.

Potter posits that the personal locus provides the necessary tools to execute the plan, based on the competencies and skills depicted in Figure 1. Competencies and skills are the tools. Potter believes that the competencies and skills do not enable news readers to be media literate, but lacking them prevents people from becoming media literate.

Potter established a clear framework for the cognitive theory of media literacy to explain the four factors, i.e., knowledge structure, decision-making motivation, message processing tools, and the flow of information-processing tasks. From the perspective of knowledge structures, Potter emphasized the significance of media effects, media content, the media industry, the real world, and the self. He also stated the train of news readers' thinking. Potter also said that cultivating competencies and skills helps one effectively filter information, construct meaning, and judge the authenticity of news and information. In short, Potter's cognitive model of media literacy provides the present study with a framework. When news readers construct knowledge structures, the more they understand media effects, media content, and media industries, the more likely they will

have a good command of the motivation of news production. In his cognitive model of media literacy, Potter views media literacy as one's information-processing ability. In 2013, Ashley and her team developed a news media literacy scale to assess the level of news literacy among readers. The news media literacy scale focuses on analyzing readers' ability to interpret news knowledge or information, that is, the knowledge, technology, and ability readers need when analyzing and interpreting news media [5, 8].

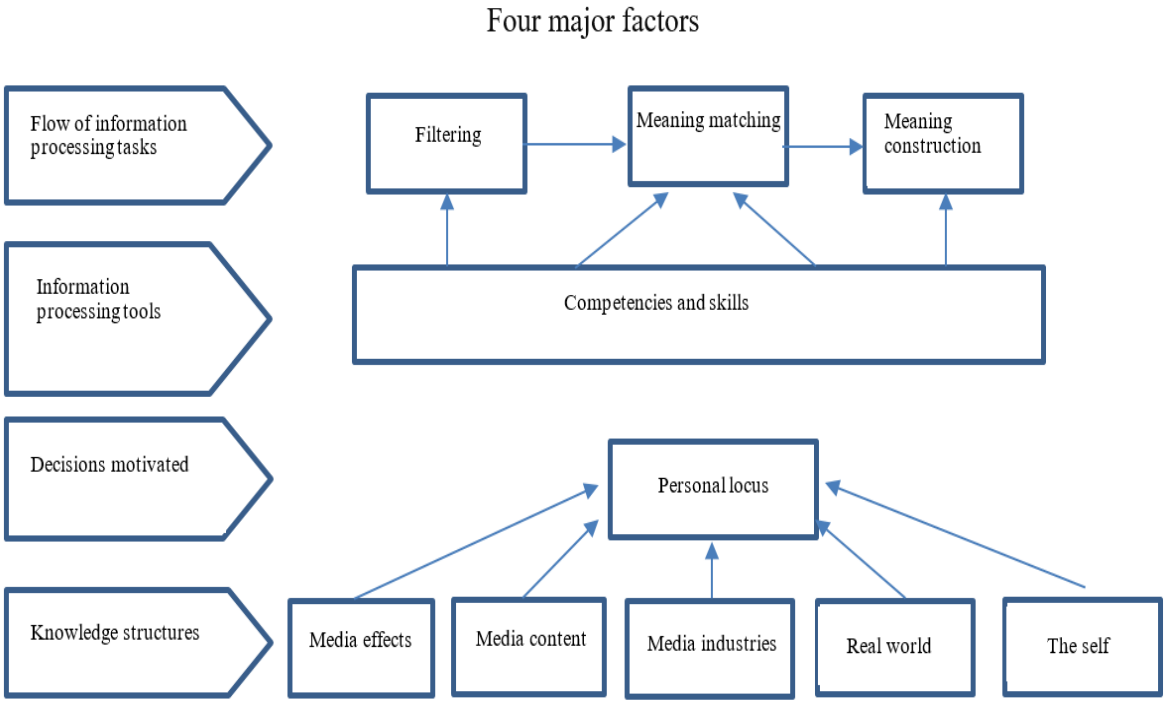

Figure 1.
Cognitive model of media literacy.
Note: Potter [2].

2.2. Foundation for Compiling News Media Literacy Scale

Based on the above discussion, the present study proposes a framework for a news media literacy scale applicable to people in Taiwan. It aims to evaluate students' news media literacy. The scale consists of four topics (see Figure 2 for details), which were set based on cognitive theories of news media, news media literacy, and Taiwan's journalistic environment.

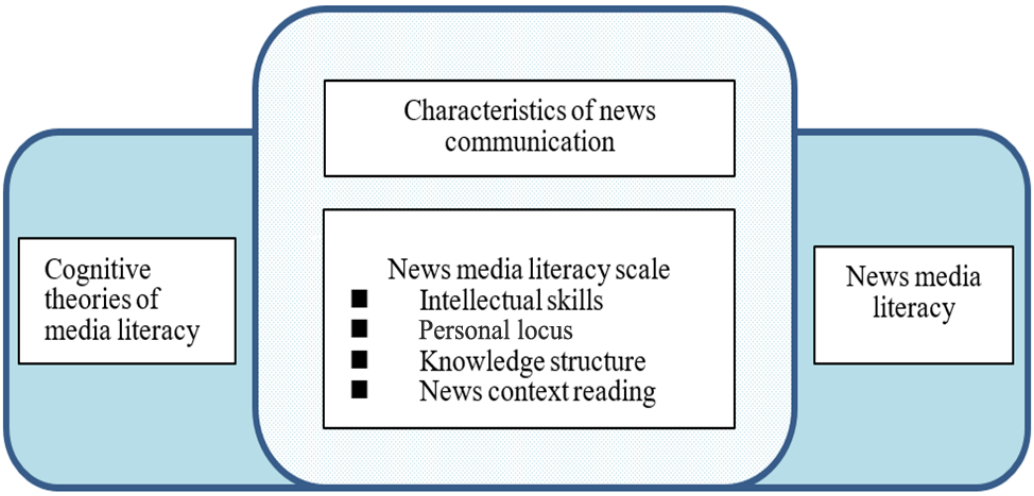

Figure 2.
Framework for news media literacy scale. This study uses the cognitive theory proposed by scholar Porter as the design framework of the "Chinese version of the media interpretation scale".

2.2.1. Intellectual Skills

This construct assesses an individuals' thinking. It explores news readers' reading and thinking habits, including their news reading habits. It consists of three factors, i.e., automatic information processing, mindful thought processing, and skill. Individuals can use concepts like their attitude toward themselves and their self-perception of news [3] to determine whether their thinking is an automatic response or a mindful and conscious process [4, 7, 9]. Automatic information processing demonstrates that one thinks in a way that responds automatically.

In contrast, mindful thought processing means that one thinks mindfully. The factor "skill" shows that one holds a skeptical attitude towards a matter and thinks mindfully while reading the news. We measured the above three aspects using three, two, and five question formats. Ten questions were presented to research participants, measured using a five-point Likert scale.

2.2.2. Personal Locus

This topic focuses on readers' responses to the news they receive, measuring their thinking while reading the news and subsequent behaviors. News media primarily bases its coverage of topic from a specific viewpoint. This way, news can be unauthentic and biased so that it can deviate from the truth. Therefore, readers are skeptical about news content. Instead, they analyze its value as information and interpret the information and knowledge in it while reading it, based on which they manage to understand the meaning of the information disseminated via news media [10-14]. The boundary between authentic information and that on other media is becoming blurred. Media should be deemed teaching aids or learning tools, and media education constitutes a prerequisite for media literacy measurement. Suppose teachers want to teach using the Internet, computer games, or other digital media. In that case, they are expected to enable students to understand and critique these media by providing them with methods and cultivating their digital literacy [15].

Furthermore, readers should be aware that reporter's viewpoints may influence the news they write. Therefore, they should filter information and construct the meaning based on it, examine its context and consistency, analyze its objectiveness, accuracy, and neutrality, and learn to check facts [5].

The cognitive theory of news literacy points out the process readers go through when receiving information, i.e., message filtering, meaning matching, and meaning construction. The news value can also be guaranteed using the following seven standards, i.e., timeliness, significance, proximity, prominence, conflict, human interest, and uniqueness. The process of meaning construction involves measuring personal locus and related outcome variables, specifically the degree of readers' perceived control over their analysis of news media, including the correaltion between news use and knowledge of current events [3, 4, 7]. This construct mainly focuses on the understanding and judgment of news content, the analysis of news report contexts, and the awareness of the standpoint and values of news media. The personal locus includes three factors, i.e., motivation, analysis, and skepticism. Motivation comes from a personal desire for news. Analysis involves evaluating one's acceptance of new information, its value, its topics, and its casual contexts. It also involves verifying the accuracy of news information and discerning the viewpoint and intention of news media. Skepticism refers to the state of alertness that one places oneself concerning the possibility of fake news and disinformation. The three aspects were measured using three, eight, and four items. A total of 15 questions were presented to participants, who were asked to respond to the statements using a five-point Likert scale.

2.2.3. Knowledge Structure

The media disseminates news. In this context, the promotion of media literacy hinges on reader's comprehension of its content, and their awareness of the motivations and potential negative effects of media industries. Moreover, readers should understand the current status and industrial structure of the media, including media's participation in and contribution to a given topic, their news style, their way of news dissemination, and commonly cited news sources, which helps them examine and evaluate the credibility of the news [13, 16, 17]. Media education does not aim to cultivate technical skills or promote "self-expression," but to help readers gain a more systematic understanding of the media and how it works. Readers will reflect on their use of media [15]. In terms of the characteristics of news communication, an ethnic group may hold a given position on a particular topic. Therefore, readers need to understand media operators' perspectives and identity, the relationship between media and news, and the journalistic environment, based on which they make proper responses [18, 19]. In addition, Potter [2] proposed a five-dimensional cognitive knowledge structure, which provides readers with contextual assistance when they manage to understand newly emerged media information. This way, readers can make better decisions about the information. This specifically pertains to the knowledge structure of news media. Maksl, et al. [7] believe that media knowledge structures originate from three areas: the institution that produces news, the way news content is generated, and the awareness of the potential impact the content has on people.

The focus of this topic is on readers' comprehension of news media and the presentation of information. It comprises three aspects, i.e., media industry, content, and effects. Media industries refer to the type of media and their industrial environment. The production of news content encompasses the style, communication, and sources of news. The term "media effects" refers to the responsibilities of reporters and the characteristics of unauthentic news. The above three aspects are evaluated using five, five, and three questions, i.e., 13 items.

2.2.4. News Context Reading

Self-reports and scenario analysis can examine news literacy based on practical training and educational investigation. Appropriate reading materials from media were selected per research needs for readers to read, think, and analyze. Also, options were offered to measure their media literacy based on their responses. This construct concentrates on assessing the "analysis" of the subject "personal locus." Two news texts, which consist of 5 and 2 items, respectively, were provided for readers to read and respond to, and seven questions were used for measurement. Table 1.displays the framework for the news media literacy scale specific to Taiwan.

Table 1.
Dimensions for news literacy scale.

Topic	Factor	Topic analysis	Potter [9]	Ashley, et al. [5]	Number of items
Intellectual skills	Automatic thought processing	Personal preference	Media literacy audience	Questions about automatic vs. Mindful thought processing	3
	Mindful thought processing	Personal preference	No	No	2
	Skill	Important component	Media literacy fake news	News media skepticism	5
Personal locus	Motivation	Personal preference	Media literacy approach	Questions about personal locus	3
	Locus of control	Causal context	No	Questions about automatic vs. Mindful thought processing	8
	Skepticism	Standpoint and values	No	News media use、current events knowledge	4
Knowledge structure	Media industry	No	Media industry	Institutions that produce news	5
	Media content	No	Media content	The way news content is produced	5
	Media effects	Causal context	Media reader	Impact of news content on people	3
News context reading	News information evaluation: Analysis	Important component, causal context	No	Questions about automatic vs. Mindful thought processing	7

3. Methodology

3.1. Question Type and Filling of the News Media Literacy Scale

Teach topic on this scale comprises one to four factors. Below, we explain the types of questions and the responses required from research participants. It took participants approximately 25 questions to complete the scale.

Firstly, the self-reported topic “Intellectual Skills” evaluates readers' thinking habits and viewpoints on the news. We evaluate it using a five-point Likert scale (strongly agree, agree, neutral, disagree, and strongly disagree). Participants were asked to choose one that best reflects their feelings from the five options. Subsequently, we converted their responses into corresponding points, assigning 5 points for strong agreement and 1 point for strong disagreement.

Secondly, the self-reported topic “Evaluation of news connotations" measures readers' news literacy. We also evaluate it using a five-point Likert scale (strongly agree, agree, neutral, disagree, and strongly disagree), converting the responses into corresponding points.

Thirdly, the topic "Knowledge Structure," which was tested, assesses readers' knowledge about and understanding of Taiwan's news and media environments. A series of quotes about Taiwan media and news production and dissemination were adopted. Multiple-choice questions were designed for respondents to choose the best answer. If their response was correct, they were awarded 1 point. Otherwise, they were given 0 points.

Lastly, a "News Context Reading" test evaluates readers' analysis performance when they read the news. The test includes two pieces of news, one with incomplete questions with exaggerated descriptions, whereas the other is a complete news report. Multiple-choice questions were designed to ask respondents whether the news was credible and the reason why they believed it was credible or not. Respondents were required to choose the best answer to the questions. Likewise, they were awarded 1 point for each correct answer and 0 for each wrong response.

Research methods consist of two parts, i.e., examining the reliability and validity of the scale and preliminary exploration of senior high students' media literacy in Taiwan.

3.2. Validity And Reliability of the Scale

This research employed a sampling survey to establish a scale rather than a census, so purposive sampling was adopted. One thousand students from six senior high schools were selected as research participants who completed the scale online using mobile devices. They were not required to fill out the scale at the same time. Instead, they had one month to finish it, i.e., from March 1, 2021, to March 31, 2021. They gathered a total of 708 valid copies during that period. The collected raw data were examined in terms of validity and reliability and analyzed from the perspectives of the four topics: intellectual skills, personal locus, knowledge structure, and news context reading. In terms of validity, the World Change and Media Literacy Promotion in Context of Fake News forum converted twice during the scale compilation process, where ten experts, including communication experts, media operators, and educators, scrutinized the items, topics, and wordings. In this respect, the scale is of expert validity. As well, the wording of the scale was reviewed and modified by five senior high school teachers (from Saint Francis High School, Kaohsiung Municipal Kaohsiung Girls’ Senior High School, Middle School of Kaiping City, Taipei Municipal Song-Shan Senior High School, and Ying Hai High School, respectively) and three students (from Saint Francis High School, Kaohsiung Municipal Kaohsiung Girls’ Senior High School, and Taipei Municipal Song-Shan Senior High School, respectively), so this scale is of face validity. The data from senior high school students was obtained,

and exploratory factor analysis was conducted using the extraction method of principal component analysis and varimax with Kaiser normalization. This way, its construct validity is guaranteed.

We utilized Cronbach's alpha to assess the overall dependability of every topic, as well as the dependability of each topic and factor. Accordingly, the unsatisfactory items were removed. This way, reliability is ensured. Finally, the factors and items for each topic were modified based on the validity and reliability results.

3.3. Scale Difficulty and Discrimination

In this study, the third topic, Knowledge Structure, is a knowledge test, while the fourth topic, News Context Reading, is a reading test. The difficulty and discrimination of the two tests were analyzed. Participants with scores in the 73rd percentile and above were categorized into the high-score group, and those with scores in the 27th percentile and below were classified as the low-score group. Next we computed the percentage of correct answers for both groups question, setting the average percentage for each question as the test question's difficulty. The difference between the percentages of correct answers for the high- and low-score groups was used as the discrimination index.

4. Results and Discussion

4.1. Reliability and Validity

The factor analysis's resulting solution for the three topics was not orthogonal. To produce the final solution, we employed tilted rotation. Table 2 presents the eigenvalue of each factor for the three topics and the variance percentage and cumulative percent variance, while Table 3 lists the questions for each topic.

(1) Intellectual skills: This topic comprises three factors with eigenvalues greater than 1. Factor 1 had an eigenvalue of 3.62, accounting for 33% of the variance. The absolute value of its group factor loadings fell between 0.80 and 0.89, which is called "automatic message processing."

Factor 2 had an eigenvalue of 2.22, occupying 20% of the variance. The absolute value of its group factor loading fell between 0.81 and 0.86, which is called "mindful thought processing." Factor 3's eigenvalue was 3.62, taking up 16.5% of the variance. The absolute value of its group factor loading fell between 0.55 and 0.86, called "skill." In conclusion, the exploratory factor analysis (EFA) results show that the factors that were extracted are related to the topic, and the test question's absolute value of the factor loadings is greater than 0.55 (between 0.55 and 0.89). Moreover, the total variance explained by the three common factors after rotation reached 69.65%.

(2) Personal locus: It comprises three factors with an eigenvalue greater than 1. Factor 1 had an eigenvalue of 4.03, taking up 27% of the variance. The absolute value of its group factor loadings fell between 0.68 and 0.83, called "motivation." Factor 2 had an eigenvalue of 3.48, accounting for 23% of the variance. The absolute value of its group factor loadings fell between 0.55 and 0.78, which is called "analysis." Factor 3 had an eigenvalue of 2.00, accounting for 13% of the variance. The absolute value of its group factor loading fell between 0.77 and 0.91, indicating "skepticism." To sum up, the EFA results show that the extracted factors are in accord with the topic, and the absolute value of the factor loadings of the test questions is more significant than 0.55 (between 0.55 and 0.91). Moreover, the total variance explained by the three common factors after rotation reached 63.35%

Knowledge structure consists of three factors with an eigenvalue greater than 1. Factor 1 had an eigenvalue of 2.69, accounting for 21% of the variance. The absolute value of its group factor loadings fell between 0.38 and 0.62, indicating "media industry." Factor 2 had an eigenvalue of 2.11, taking up 16% of the variance. The absolute value of its group factor loadings fell between 0.48 and 0.79, referred to as "media content." Factor 3 had an eigenvalue of 1.56, occupying 12% of the variance.

The absolute value of its group factor loading fell between 0.61 and 0.83, which is called the "media effect." To sum up, the EFA results show that the extracted factors conform with the topic, and the absolute value of the factor loadings of the test questions is more significant than 0.38 (between 0.38 and 0.83). Moreover, the total variance explained by the three common factors after rotation reached 48.95%.

Table 4 shows the factor loadings of the three topics and each factor's name and questionnaire items. The first topic's three factors, Intellectual Skills, consists of 3, 2, and 6 questions, respectively. As for the second topic, personal locus, one of the questions had a factor loading of less than 5, so the question was removed. Its three factors include 3, 7, and 4 questions, respectively. The third factor, Understanding of News Media, has three factors, which consist of 2, 7, and 4 questions, respectively. The question items marked with * in front of each option mean the correct answer. As for news context reading, there were two reading questions, but only one factor was measured, i.e., the factor "analysis" of the topic "Personal Locus."

Afterward, Cronbach's alpha coefficients were computed to examine the reliability of the scale's internal consistency (see Table 4 for details). The α coefficients for the three factors of the topic of intellectual skills were all higher than the threshold value of reliability (≈ 0.70). The three factors of personal locus all had a coefficient higher than the threshold value. (3) The three factors of knowledge structure had a coefficient of 0.46, 0.76, and 0.69, respectively. The reliability of the first factor was low, but the question was of great importance to the test of Taiwan's media knowledge. Furthermore, the subject comprised a multiple-choice knowledge test, where the reliability served as a guide, and all the questions remained unchanged.

4.2. Difficulty and Discrimination

The difficulty for "understanding of news media" fell between 0.04 and 0.60, while the discrimination index fell between 0.06 and 0.71.

The overall difficulty index was 0.43, and the discrimination index was 0.51 (see Table 5 for details). Except for the first and second questions, the remaining had excellent discrimination indexes (i.e., greater than 0.4). The first question was designed to test students' understanding of the nature of Taiwan media, and the second was about how Taiwan journalists collect evidence. The knowledge they were designed to collect is significant, so they were retained.

The question items of the fourth topic, News Context Reading, had a difficulty index of 0.43 to 0.54. Their discrimination indexes fell between 0.49 and 0.82; all of them were more significant than 0.40, indicating that all of the items had excellent discrimination. The overall difficulty index was 0.51, and the discrimination index was 0.55 (please refer to Table 6 for details).

4.3. News Literacy Analysis

This study used descriptive statistics to analyze students' overall performance on all factors in each topic, including means and standard deviations (SD). the accuracy percentage measured the understanding of news media and news context reading. In contrast, understanding of news media and news context reading was measured by accuracy percentage. In addition, the differences in the performance were also analyzed in terms of backgrounds collected in the first stage. The following independent variables are included: gender, the nature of the school (public or private), the name of the school, and the duration of one's exposure to news. In contrast, the dependent variables are the news literacy performances of the four topics.

Below is the description of 708 participants' demographic data. (1) Gender. Of the 708 respondents, 410 were male and 298 were females. (2) The nature of the school. Two hundred seventy-one respondents attended public schools, while 437 were from private ones.

Among them, 513 high school students and 195 attended higher vocational schools. The primary reason for division is the significant differences in school running characteristics between public and private schools, as well as between high schools and higher vocational schools in Taiwan. In most cases, private schools feature much stricter teaching management than public ones.

While higher vocational school students specialize in multiple technical disciplines, high school students primarily study general subjects. Therefore, the news literacy of students attending different types of schools may vary. (3) News reading time. People's exposure duration may also affect their news literacy. The duration was divided into four groups: less than 0.5 hours (268 participants), 0.5-1 hour (253 participants), 1-2 hours (121 participants), and more than 2 hours (66 participants). Taiwan primarily broadcasts news between 18:00 and 20:00, with rebroadcasts occurring every hour if necessary. Therefore, 1 and 2 hours were set as the boundary.

This study analyzed students' news literacy (see Table 7 for details), finding that female respondents showed better news literacy than males.

In comparison, those attending private high schools and higher vocational schools had better news literacy than those from private ones. Students answered the questions that measured media industries and content and correctly responded to 39.66% and 41.33% of the questions, respectively. Overall, the percentage of correct answers reached 47.14%. Moreover, this study revealed that the duration of their exposure to news influenced their news literacy, and most high school students read the news for less than 0.5 hours daily.

More than half of high school students read the news for less than one hour, knowing little about media industries. This indicates that compared to those who spend more time reading news, people who spend less time reading it are more likely to have less satisfactory performance on intellectual skills and personal locus (please refer to Table 8 for more details).

Therefore, it can be deduced that news reading time positively correlates with news literacy acquisition and promotion.

Table 2.
Oblique rotation statistics for factors with eigenvalues greater than 1.

Factor	Eigenvalue	% of variance	Cumulative %
Topic 1: Intellectual skills			
1	3.62	32.95	32.95
2	2.22	20.22	53.16
3	1.81	16.49	69.65
Topic 2: Personal locus			
1	4.025	26.832	26.832
2	3.477	23.182	50.014
3	2.001	13.337	63.351
Topic 3: Understanding of news media			
1	2.685	20.651	20.651
2	2.119	16.302	36.952
3	1.560	11.999	48.952

Table 3.
Factor loadings for oblique rotation by a priori attribute and questionnaire item.

Factor	Factor score	A priori attribute	Questionnaire item
Topic 1: Intellectual skills			
1	0.872	Automatic thought processing	I do not like to have to do much thinking. (Reverse-coded)
	0.891		I try to avoid situations that require thinking in depth about something. (Reverse-coded)
	0.795		Thinking hard and for a long time about something gives me little satisfaction. (Reverse-coded)
2	0.814	Mindful thought processing	I prefer doing something that challenges my thinking abilities rather than requiring little thought.
	0.863		I prefer complex to simple problems.
3	0.720	Skill	I compare and contrast the opposing perspectives of the same news.
	0.795		I am skeptical about the news I read.
	0.548		I am not influenced by the news headlines when I only read them.
	0.819		I question news sources and their purposes.
	0.864		I actively think about the authenticity of the news.
	0.761		I actively interpret and analyze the implications of the news.
Topic 2: Personal locus			
1	0.789	Motivation	I keep up with news because I should.
	0.834		I follow the news for my own good.
	0.675		I follow the news because I like to.
2	0.552	Control	If the news media misinforms me, my behavior determines how soon I will learn credible information.
	0.745		I am in control of the information I get from the news media.
	0.797		By paying attention to various news sources, I can prevent misinformation.
	0.741		If I take the right actions, I can stay informed.
	0.711		After I find the news I want, I will look for related news on other websites.
	0.743		I can judge whether a news report states facts objectively or communicates the opinions of the news media themselves.
	0.724		I can judge whether a particular news medium supports a specific topic based on its media content.
3	0.768	Skepticism	I think the news media tell the whole story. (Reverse-coded)
	0.904		I think the news media are accurate. (Reverse-coded)
	0.905		I think the news media facilitates solving its problems. (Reverse-coded)
	0.841		I think news headlines can reflect news content. (Reverse-coded)
Topic 3: Knowledge Structure			
1	0.500	Media industry	Most media outlets in Taiwan are *(A) for-profit businesses, (B) non-profit businesses, (C) owned by the government, and (D) do not know.
	0.378		If you wanted to get a job as a news reporter in Taiwan, you would need to get a license from (A) the national communications commission (NCC), (B) the Republic of China journalists association, (C) TV news channels; *(D) news reporters are not required to be licensed; (E) do not know.
	0.527		Which of the following organizations is responsible for punishing illegal programs? * (A) NCC; (B) Bureau of audiovisual and music industry development; (C) County/District or municipal bureaus of education; (D) Police departments; (E) Legislative Yuan
	0.618		There are multiple cable TV channels in Taiwan. Which of the following behaviors shall not public channels provided by cable system operators do? (A) airing programs commissioned by the government without disclosure of information on government funding, production, sponsorship, or subsidies; (B) airing programs or advertisements related to prospective candidates that are funded, produced, or sponsored by the government; (C) airing programs commissioned by the government for placement marketing; (D) airing commercials; * (E) All of the above.
	0.544		Which websites present news produced by their journalists rather than editors? (A) Google; *(B) United Daily News (UDN); (C) Yahoo!; (D) Twitter; (E) None of the above.
2	0.478	Media content	Who has the most influence on what gets aired on the TV news? (A) Individual reporters; (B) The anchor, the person reading the

Factor	Factor score	A priori attribute	Questionnaire item
			news; (C) The cameraman; *(D) The producer/Editor; (E) Do not know.
	0.566		In Taiwan, people enjoy the freedom of the press, but which of the following does not fall within its scope? (A) no interference about what is to be aired from the government; (B) airing information and opinions that are favorable to a particular party; (C) criticizing people in power; (D) celebrities talking openly about personal lives; (E) do not know.
	0.784		One common criticism of the news is that it is not objective. What do people who make that criticism typically mean by it? (A) The reporter gives only the facts about the story; *(B) The reporter puts their opinion in the story; (C) The reporter's story relies too much on the opinions of neutral people; (D) The reporter does not make the purpose of the story straightforward; (E) Do not know.
	0.792		Generally speaking, what are the significant sources of Taiwan's news media's benefits? * (A) advertisements/commercials; (B) monthly costs for cable TV packages; (C) subscription fee; (D) government subsidy; (E) do not know.
	0.683		Which of the following is not an essential criterion for news authenticity? (A) Whether the news includes the statement of authoritative experts; (B) Whether the news is endorsed by relevant interviews of the involved parties and persons; *(C) Anonymous inside information; (D) Whether the news clearly describes the process and place of occurrence; (E) Do not know.
3	0.609	Media effect	What are journalists' responsibilities? (A) verify the authenticity of the news; (B) supervise the government from the standpoint of the people; (C) report human interest news; (D) being independent of what or who is reported; * (E) all of the above.
	0.825		What is false news? (A) damaging and offensive reports; (B) unverified reports; (C) advertisements that are packaged as news; (D) reports that deliberately exaggerate and mislead the public * (E) all of the above
	0.783		You think the ways of judging false news include: (A) examining the reliability of the source; (B) confirming its authenticity by asking the author; (C) consulting experts; (D) judging whether the news is biased; * (E) all of the above.
Topic 4: News context reading			
Fake and biased news			Do you think the headline fully reveals the news content?
1	Open-ended situational questions	Skepticism	What do you think is the reason the headline fails to reveal the news content fully?
			Do you think the content of this news has credibility?
			Why do you think the news is not entirely credible?
2	Open-ended situational questions	Media content	What do you think is the main idea that the news means to convey?
Complete news story			Do you think the headline of the news reveals its content?
1	Open-ended situational questions	Skepticism	What do you think is the main idea that the news means to convey?

Note: * the correct answer of the item.

Table 4.
Alpha coefficients for factors resulting from factor analysis.

Factor	# Item in scale	Factor name	Alpha	Standardized item alpha
Topic 1: Intellectual skills				
1	3	Automatic thought processing	0.817	0.816
2	2	Mindful thought processing	0.787	0.788
3	6	Skill	0.868	0.872
Topic 2: Personal locus				
1	3	Motivation	0.755	0.755
2	4	Control	0.868	0.870
3	6	Skepticism	0.895	0.895
Topic 3: Knowledge structure				
1	5	Media industry	0.462	0.477
2	5	Media content	0.762	0.764
3	3	Media effect	0.685	0.704

Table 5.
Difficulty and discriminant indices for each item and test as a whole in the third topic.

Item no.	Difficulty index	Discriminant index	Item no.	Difficulty index	Discriminant index
1	0.41	0.14	8	0.60	0.45
2	0.04	0.06	9	0.44	0.59
3	0.60	0.57	10	0.51	0.55
4	0.34	0.38	11	0.46	0.63
5	0.25	0.44	12	0.53	0.77
6	0.33	0.50	13	0.57	0.77
7	0.56	0.71	Test as a whole	0.43	0.51

Table 6.
Difficulty and discriminant indices for each item and test as a whole in the fourth topic.

Item no.	Difficulty index	Discriminate index	Item no.	Difficulty index	Discriminate index
1	0.49	0.49	5	0.62	0.25
2	0.54	0.52	6	0.58	0.34
3	0.43	0.53	7	0.47	0.82
4	0.47	0.82	Test as a whole	0.51	0.55

Table 7.
Respondents' performance on knowledge structures and news context reading.

Background	sub	Knowledge structures				News context reading			
		Mean	SD	t	p	Mean	SD	t	p
Gender	Female	52.74	16.18	7.448	0.000	44.39	22.62	3.348	0.001
	Male	42.99	17.86			38.84	21.13		
Nature of school 1	Public	53.36	18.69	7.591	0.000	45.60	22.67	4.293	0.000
	Private	43.28	16.16			38.41	20.99		
Nature of schools 2	Senior high school	47.76	18.10	1.490	0.137	42.44	22.18	2.525	0.012
	Higher vocational college	45.52	17.10			37.80	20.88		

Table 8.
Respondents' performance — Correlation between news literacy and news reading time.

Variables	Sum of squares	Degrees of freedom	Mean squares	F value	*p*	Post hoc
Intellectual skills						
Organizations	6.220	3	2.073	7.199	0.000	*2>1, 3>1, 4>1
Error	202.742	704	0.288			
Total	208.961	707				
Personal locus						
Organizations	3.563	3	1.188	6.295	0.000	*2>1, 3>1
Error	132.824	704	0.189			
Total	136.387	707				
Knowledge structure						
Organizations	5446.771	3	1815.590	5.817	0.001	*1>4, 2>4, 3>4
Error	219719.127	704	312.101			
Total	225165.898	707				
News context reading						
Organizations	1707.450	3	569.150	1.186	0.314	
Error	337891.305	704	479.959			
Total	339598.755	707				

Note: *Group: (1) 1: < 0.5hr; (2) 2: 0.5-1hr; (3) 3: 1-2hr; (4) 4: > 2hr.

5. Conclusion

This study developed a news media literacy scale, including three factors and two news context reading questions. It was compiled to explore the self-rating performance of people's thinking and analysis when they read the news. The validity and reliability of the scale were examined. The coefficients for intellectual skills, personal locus, and understanding of news media were all higher than the threshold value (≈ 0.70), and all the eigenvalues exceeded 1. In addition to EFA results, all indexes indicate that every factor of the scale is reliable and effective. The scale's knowledge structure had an overall

difficulty index of 0.43 and a discrimination index of 0.51. In contrast, news context reading had an overall difficulty index of 0.51 and a discrimination index of 0.55. Overall, they had excellent difficulty and discrimination. This study had the following four findings: (1) The Chinese NMLS developed in this research has high reliability, considerable validity, proper discrimination, and an appropriate difficulty level. Thus, it applies to students in Taiwan and other Chinese-speaking areas. (2) Women exhibit a higher level of news literacy than men. (3) Public high school students with excellent academic performance have greater news literacy than private high school students. (4) News reading time is positively correlated with news literacy improvement.

This research also has some limitations. Convenience sampling allowed for both voluntary and requested participation among the respondents in this study. In addition, students completed the online scale independently; they were not required to fill it out under the guidance of the researcher at the same time. Therefore, the research results should be looked at conservatively. On the whole, the developed scale can be deemed effective and reliable. Therefore, future research is advised to use the scale to measure other ethnic groups, which can serve as a reference for planning and implementing subsequent media literacy courses.

In the digital era of new media, fake news and false messages manipulate topics like COVID-19, political party disputes, and climate change more and more sophisticatedly. Improving readers' news literacy and their ability to discern fake news. Therefore, we should continuously focus on improving reader's news literacy to withstand the impact of false news. However, recent studies mainly focus on the definition of fake news and the phenomenon caused. A limited number of studies have been conducted to develop education courses. Asia's media literacy survey primarily focuses on examining media usage and self-awareness, yet their evaluation items rarely take into account all relevant factors. This study centers on compiling a news literacy scale that evaluates readers' self-rating performance on their thinking and analysis when reading news. It is suggested that subsequent researchers can study the media literacy model proposed by Potter [2] further and delve deeper into the topics and questions of the scale to modify and improve the news literacy scale.

References

[1] L. Lee, D.-T. Chen, J.-Y. Li, and T.-B. Lin, "Understanding new media literacy: The development of a measuring instrument," *Computers & Education*, vol. 85, pp. 84-93, 2015. https://doi.org/10.1016/j.compedu.2015.02.006

[2] W. J. Potter, "Argument for the need for a cognitive theory of media literacy," *American Behavioral Scientist*, vol. 48, no. 2, pp. 266-272, 2004. https://doi.org/10.1177/0002764204267274

[3] W. J. Potter, *Theory of media literacy: A cognitive approach*. Thoasand Oaks, CA: Sage Publications, 2004.

[4] A. Maksl, S. Ashley, and S. Craft, "Measuring news media literacy," *Journal of Media Literacy Education*, vol. 6, no. 3, pp. 29-45, 2015. https://doi.org/10.23860/jmle-6-3-3

[5] S. Ashley, A. Maksl, and S. Craft, "Developing a news media literacy scale," *Journalism & Mass Communication Educator*, vol. 68, no. 1, pp. 7-21, 2013. https://doi.org/10.1177/1077695812469802

[6] M. Kumar and A. Husain, "The challenges of fake news and need of media literacy," *Mass Communicator: International Journal of Communication Studies*, vol. 13, no. 3, pp. 21-26, 2019. https://doi.org/10.5958/0973-967x.2019.00015.2

[7] A. Maksl, S. Craft, S. Ashley, and D. Miller, "The usefulness of a news media literacy measure in evaluating a news literacy curriculum," *Journalism & Mass Communication Educator*, vol. 72, no. 2, pp. 228-241, 2017. https://doi.org/10.1177/1077695816651970

[8] E. Vraga, M. Tully, J. E. Kotcher, A.-B. Smithson, and M. Broeckelman-Post, "A multi-dimensional approach to measuring news media literacy," *Journal of Media Literacy Education*, vol. 7, no. 3, pp. 41-53, 2015. https://doi.org/10.23860/jmle-7-3-4

[9] W. J. Potter, *Seven skills of media literacy*. Thousand Oaks, CA: SAGE Publications, 2019.

[10] R. Hobbs and R. Frost, "Measuring the acquisition of media-literacy skills," *Reading Research Quarterly*, vol. 38, no. 3, pp. 330-355, 2003.

[11] E. Thoman and T. Jolls, "Media literacy—A national priority for a changing world," *American Behavioral Scientist*, vol. 48, no. 1, pp. 18-29, 2004. https://doi.org/10.1177/0002764204267246

[12] D. Kellner and J. Share, "Toward critical media literacy: Core concepts, debates, organizations, and policy," *Discourse: Studies in the Cultural Politics of Education*, vol. 26, no. 3, pp. 369-386, 2005. https://doi.org/10.1080/01596300500200169

[13] S. Ashley, M. Poepsel, and E. Willis, "Media literacy and news credibility: Does knowledge of media ownership increase skepticism in news consumers?," *Journal of Media Literacy Education*, vol. 2, no. 1, pp. 37-46, 2010. https://doi.org/10.23860/jmle-2-1-3

[14] C. Ireton and J. Posetti, *Journalism, fake news & disinformation: Handbook for journalism education and training*. Paris: Unesco Publishing, 2018.

[15] D. Buckingham, "Defining digital literacy: What do young people need to know about digital media?," *Nordic Journal of Digital Literacy*, vol. 10, no. Jubileumsnummer, pp. 21–35, 2015. https://doi.org/10.18261/issn1891-943x-2015-jubileumsnummer-03

[16] D. Frau-Meigs, "Developing a critical mind against fake news," *UNESCO Courier*, vol. 2, pp. 12-15, 2017.

[17] C. Yang, X. Zhou, and R. Zafarani, "CHECKED: Chinese COVID-19 fake news dataset," *Social Network Analysis and Mining*, vol. 11, no. 1, p. 58, 2021. https://doi.org/10.1007/s13278-021-00766-8

[18] M. L. Hoffman, *Empathy, its development, and prosocial implications. In Nebraska symposium on motivation*. Lincoln: University of Nebraska Press, 1977.

[19] L. Batchelder, M. Brosnan, and C. Ashwin, "The development and validation of the empathy components questionnaire (ECQ)," *PloS One*, vol. 12, no. 1, p. e0169185, 2017. https://doi.org/10.1371/journal.pone.0169185