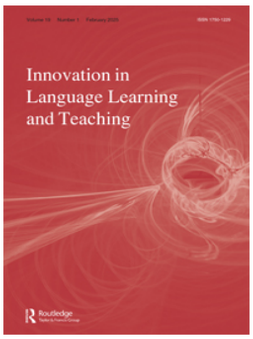

Innovation in Language Learning and Teaching

ISSN: (Print) (Online) Journal homepage: www.tandfonline.com/journals/rill20

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To cite this article: Danyang Zhang, Yang Wu & Junjie Gavin Wu (08 Mar 2025): Exploring language learners' new media literacy: instrument development and validation, Innovation in Language Learning and Teaching, DOI: 10.1080/17501229.2025.2473597

To link to this article: https://doi.org/10.1080/17501229.2025.2473597

Published online: 08 Mar 2025.

INNOVATION IN LANGUAGE LEARNING AND TEACHING
https://doi.org/10.1080/17501229.2025.2473597

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Exploring language learners' new media literacy: instrument development and validation

Danyang Zhang [a], Yang Wu [b] and Junjie Gavin Wu [c]

[a]College of International Studies, Shenzhen University, Shenzhen, People's Republic of China; [b]Department of Communication and Media, City University of Hong Kong, Hong Kong SAR; [c]Faculty of Applied Sciences, Macao Polytechnic University, Macao SAR

ABSTRACT

Purpose: Today, foreign language majors need to be able to actively and critically participate in the new media environment. This includes retrieving, comprehending, and evaluating information from new media sources. However, many lack the requisite skills. To support learners to become new media literate, the first step is to develop a reliable scale to evaluate their new media literacy (NML).

Design/methodology/approach: In this research, we have developed an NML scale for foreign language majors, which we validate via reliability and validity tests.

Findings and originality: The results show that the scale is reliable and valid. We also measured the NML level of a sample of foreign language majors. The students exhibited higher scores in prosuming and consuming skills, demonstrating their strengths in manipulating new media. However, their understanding, analysis, evaluation and creation scores were lower.

Value: This study furnishes future inquiries with a reliable and valid NML scale for foreign language majors. It also highlights the need for more support and guidance to help students consume and create new media content.

ARTICLE HISTORY
Received 13 September 2024
Accepted 24 February 2025

KEYWORDS
New media literacy; foreign language majors; instrument; validation; current level

1. Introduction

New media refers to various media production, distribution and consumption platforms, such as Facebook, Instagram and TikTok, which are characterised by their digital, interactive, hypertextual, virtual and networked nature (Lister et al. 2009). In the education field, new media provides students with access to a wide variety of information and services that help overcome the limitations of time and place in offline interactions (e.g. school day hours) (Hughes et al. 2000; Lee 2023; Liu and Fan 2024; Songmuang, Boonsuk and Assalihee 2024; Zhang and Wu 2023). New media literacy (NML), which is regarded as crucial for the twenty-first century, refers to an individual's ability to both consume and create content on digital platforms (Celik, Muukkonen and Dogan 2021; Chen, Wu and Wang 2011; Lin et al. 2013).

In university settings, students are familiar with and regularly engage in target language new media activities, such as reading news and using social media (Zhang and Pérez-Paredes 2021). These students are often referred to as 'digital natives' (Dingli and Seychell 2015, 9). However, previous studies (Luan, Dong and Zheng 2020; Luan et al. 2023) show that students' NML, which comprises the abilities of selecting, understanding, using, evaluating, analysing and creating various

CONTACT Yang Wu ywu273-c@my.cityu.edu.hk M5079, Department of Media and Communication, Run Run Shaw Creative Media Centre, 18 Tat Hong Avenue, Kowloon Tong, Hong Kong

media content, often falls short of the required level. Students therefore need explicit NML guidance and training, especially in the second language (L2) context, where language proficiency and L2 cultural factors come into play (Zhang and Pérez-Paredes 2021). Foreign language majors, in particular, must be able to analyse, synthesise and evaluate information from new media, as doing so enables them to navigate diverse cultural environments and facilitates their global communication and interaction (Liu, Zhang and Fang 2023).

While NML has been extensively investigated, until now, studies have mainly focused either on college-level EFL learners who are not undertaking a foreign language major, or young learners from Grades 4–11 (e.g. Lee et al. 2015]; Luan, Dong and Zheng 2020; Luan et al. 2023). In contrast, few studies have examined foreign language majors, who occupy a distinct position in academic and professional spheres, given their crucial role in global communication and cultural dissemination. The unique curriculum and learning objectives of foreign language majors necessitate an instrument that can precisely assess their ability to navigate new media platforms in the target language, critically evaluate information from multiple cultural perspectives, and create media content that reflects their cross-cultural competence (PRC Ministry of Education 2018, 2021). Therefore, it is more important than ever to provide instruction about NML to foreign language majors (Lim, Towndrow and Min Tan 2021; Zhang and Wu 2023). However, before that is possible, it is necessary to develop an NML scale that provides a better understanding of such students' current NML level. In this study, we have developed and validated an NML scale for foreign language majors in China and assessed their current NML level. We expect this study to provide insights for other NML-related research and offer suggestions for NML education in foreign language learning contexts.

2. Literature review

2.1. NML frameworks and scales

2.1.1. A preliminary NML framework by Chen, Wu and Wang (2011)

According to Chen, Wuand Wang (2011), NML refers to a series of information skills, conventional literacy skills and social skills. It also requires new media users to become engaged when viewing and producing media content. Users therefore need to be equipped with critical thinking, creativity and ethical awareness to actively participate in new media environments (Kara et al. 2018; Luan et al. 2023; Tour, Gindidis and Newton 2019). Chen, Wu and Wang (2011) first proposed a preliminary NML framework, arguing that NML could be conceptualised as comprising two continua: (1) from consuming literacy to prosuming literacy and (2) from functional literacy to critical literacy. They defined consuming literacy as learners' ability to access, consume and evaluate media content at different levels, while prosuming literacy requires learners to create media content and participate in media-rich environments. Meanwhile, functional literacy refers to using media to access information and produce media content; critical literacy is the ability of learners to critically analyse, synthesise, evaluate and create media messages, as well as actively participate in the new media environment. Based on these two continua, four main constructs of NML can be formed: (1) functional consuming (FC), (2) critical consuming (CC), (3) functional prosuming (FP) and (4) critical prosuming (CP).

However, although Chen, Wu and Wang's (2011) framework helps us to conceptualise NML and its key constructs, some limitations have been proposed. For instance, Lin et al. (2013) pointed out that while this framework showcases four key constructs in NML, the boundaries between the keywords in the constructs need clarification. For example, Chen, Wu and Wang (2011) argued that FC requires learners to access and understand media content at the textual level, while CC refers to learners' abilities to synthesise, analyse, evaluate and criticise media content based on their sociocultural values. However, these keywords (e.g. *understand, synthesise, analyse, evaluate*) lack precise definitions, and their differences have not been adequately distinguished.

Second, according to Lin et al. (2013), this framework should clarify the differences between Web 1.0 and Web 2.0, a key feature in distinguishing new media from traditional media. For instance, prosuming media literacy requires learners to not only create media content but also to participate in new media environments. This interpretation, which involves features relating to Web 1.0 (i.e. creating media content) and Web 2.0 (i.e. participating in new media environments), should be further differentiated.

2.1.2. A refined NML framework by Lin et al. (2013)

Considering the limitations of Chen, Wu and Wang's (2011) framework, Lin et al. (2013) proposed another widely recognised framework to understand NML. This framework follows the two continua and four key constructs from Chen, Wu and Wang (2011), but further defines 10 indicators. As Figure 1 shows, FC involves *consuming skill* and *understanding,* where *consuming skill* relates to technical abilities that learners should be equipped with when consuming media content, and *understanding* relates to learners' ability to textually decode media content. More critically, in CC, *analysis* refers to learners' ability to deconstruct media content, consider it at the textual level and interpret it via its languages, genres and modalities. *Synthesis* requires learners to remix and reconstruct media content by adding their opinions, while *evaluation* pertains to the critical abilities necessary to question, criticise and even challenge media content.

There are three FP indicators – *prosuming skill, distribution* and *production*. *Prosuming skill* comprises various technical skills to produce media content; *distribution* refers to disseminating and sharing media messages with others; and p*roduction* involves learners' ability to duplicate or mix media content. CP, with higher criticality requirements, comprises *participation* and *creation*. *Participation* is learners' ability to actively and critically participate in various media environments, and *creation* concerns whether learners can critically create media content by considering sociocultural and ideological values.

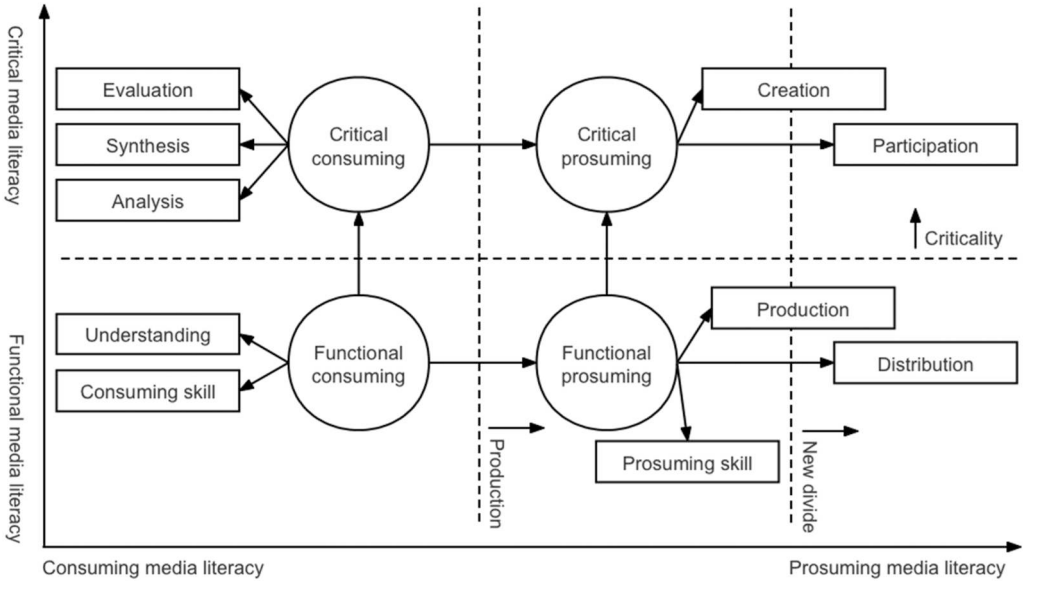

Figure 1. Lin et al.'s (2013) NML framework. *Notes*: The figure depicts four dimensions of NML. NML contains two continua: (1) from consuming literacy to prosuming literacy, and (2) from functional literacy to critical literacy. As such, NML contains four fundamental dimensions: (1) functional consuming (FC) literacy, including understanding and consuming skill; (2) functional prosuming (FP) literacy, including production, distribution, and prosuming skill; (3) critical consuming (CC) literacy, including evaluation, synthesis, and analysis; and (4) critical prosuming (CP) literacy, including creation and participation.

However, despite the value of Lin et al.'s (2013) framework, it is possible to identify some limitations regarding the conceptualisation of three of its indicators. *Synthesis* is the first controversial indicator. According to Lin et al. (2013, 164), *synthesis* refers to "individuals' ability to remix media content by integrating their viewpoints and to reconstruct media messages". It is assumed that this indicator requires students to combine different media viewpoints and add their own points of view. However, under the framework, *evaluation* also requires learners to compare information from different sources before questioning, criticising, and challenging the information's credibility. Moreover, *creation* involves the ability to create media content with criticality. Therefore, we contend that *synthesis*, *evaluation* and *creation* overlap. Specifically, we argue that there is an overlap between *synthesis* and *evaluation*, as well as between *synthesis* and *creation*. This overlap explains why in this study, unlike previous studies, we choose to exclude *synthesis*.

The second indicator that requires discussion is *production*. According to Lin et al. (2013, 165), "actions of production include scanning (or typing) a hardcopy document into digital format, producing a video clip by mixing images and audio materials, and scribbling online through a blog or *Facebook*". However, we argue that 'scanning (or typing) a hardcopy document into digital form' and 'producing a video clip by mixing images and audio material' should be classified as *prosuming skill*, and 'scribbling online through a blog or *Facebook*' should be part of *distribution*. Given this reclassification of actions from the original *production*, we suggest that this indicator (i.e. *production*) should also be omitted.

Third, according to Lin et al.'s (2013) conceptualisation, *creation* in CP refers to learners' ability to create information in the participatory new media environment, including the main features of *participation* related to interaction and engagement. Therefore, we advise retaining *creation* and omitting *participation* in future studies.

Thus, we propose a revised NML scale, specifically designed for foreign language majors (see Figure 2). Following the previous NML frameworks, our NML scale also consists of two continua: (1) from consuming literacy to prosuming literacy and (2) from functional literacy to critical literacy. This results in four dimensions: (1) functional consuming (FC) literacy, including *understanding* and *consuming skills*; (2) functional prosuming (FP) literacy, including *distribution* and *prosuming skills*; (3)

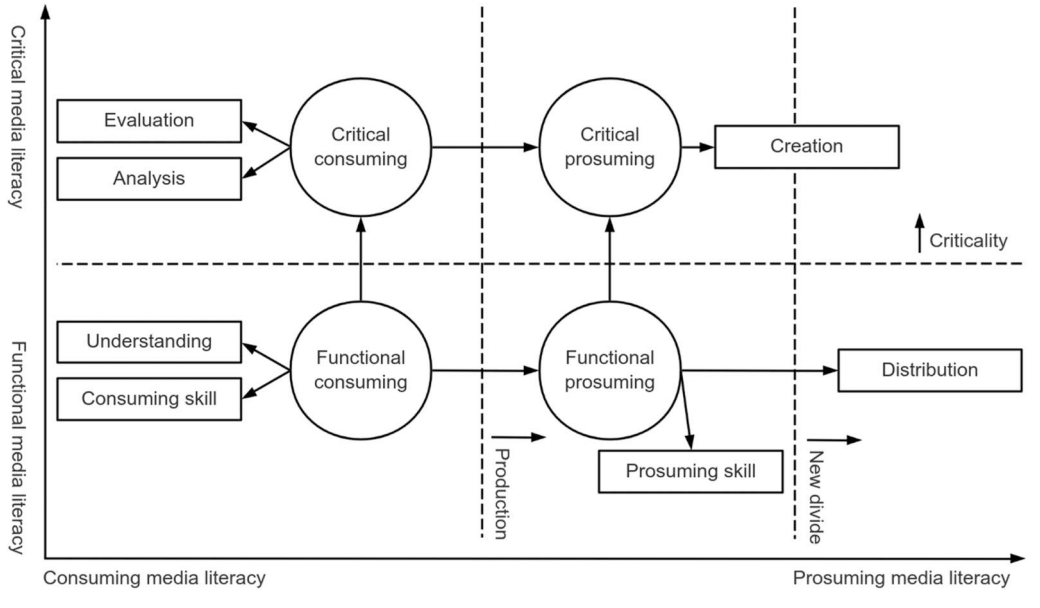

Figure 2. The NML framework proposed by the current study.

critical consuming (CC) literacy, including *evaluation* and *analysis*; and (4) critical prosuming (CP) literacy, which includes *creation*.

2.1.3. NML instruments and scales

Based on Lin et al.'s (2013) framework, Lee et al. (2015) developed and validated an instrument to evaluate students' NML. The participants comprised 572 Singaporean students aged 10–17. The instrument included 61 items, covering 10 indicators (i.e. *consuming skill, understanding, analysis, synthesis, evaluation, prosuming skill, distribution, production 1.0, production 2.0* and *participation*). This instrument helps us to understand NML and can assist scholars in measuring learners' NML in different contexts. Several examples are now discussed.

Koc and Barut's (2016) instrument was also theoretically based on Lin et al.'s (2013) framework. Their study investigated 1,226 participants from a state university in Turkey. Before 2016, very few studies had focused on young adults (i.e. university students). This study examined validity and reliability via exploratory and confirmatory factor analyses and item analyses, including internal consistency coefficients, item-total correlations, and item discrimination power. The 35 items in their NML scale were consistent with Lin et al.'s (2013) framework and could be classified into the four NML constructs (i.e. FC, CC, FP, CP).

Chen et al. (2018) adopted Lin et al.'s (2013) NML framework and Lee et al.'s (2015) instrument and tested them on a larger sample than the earlier studies. Their goal was to establish norms and explore factors (i.e. gender, grade level, socioeconomic status) which affect NML to provide recommendations for policy and pedagogy in Singapore. Results of the study show that the students had high technical skills related to NML, but there were still areas for improvement in critical prosuming competencies. There were no significant gender differences in NML skills. Furthermore, a positive correlation between NML and socioeconomic status, and a developmental trend in NML related to grade level were uncovered. The study produced insights for policymakers and educators, including how to address criticality and creativity in NML, reduce the digital divide related to socioeconomic status, and expand the scope of NML in education policies.

Kara et al.'s (2018) instrument was also designed based on Lee et al. (2015). It focused on the NML levels of a new group – Turkish pre-service teachers. Based on data from 972 participants in 11 teacher training programmes in five Turkish universities, they examined language equivalency, construct validity, internal consistency, item consistency and item discrimination, demonstrating the instrument's high validity and reliability. A critical innovation in this study is its focus – pre-service teachers, which fills a gap in NML studies and the previous predominant focus on students. Besides, this study also investigated factors that may affect pre-service NML, showing that male pre-service teachers had significantly higher NML scores in all scales than females. This adds to the existing literature on gender differences in NML and highlights the role of sociocultural factors. Furthermore, the study considered another key factor – teacher training programmes, demonstrating that pre-service NML levels differed significantly depending on their training programme. Some programmes (e.g. Physical Education and Sports) had higher mean scores, while others (e.g. Psychological Counselling and Guidance, Classroom Teaching) had lower scores. This indicates the need for programme-specific attention to NML development. However, Kara et al. (2018) did not include *creation,* which leaves a gap in evaluating learners' critical ability to create new media content. This should be addressed in future studies.

Another study which examined university students was conducted by Luan, Dong and Zheng (2020) in the context of China. They argued that few studies have investigated the NML of EFL learners (not majoring in foreign languages) in English language learning. Also, drawing on Lin et al. (2013) and Lee et al. (2015), their study developed and validated instruments for measuring Chinese EFL learners' NML. Based on the results from 974 Chinese university students, they examined the validity and reliability of their instrument. Alongside the 10 indicators from Lin et al.'s (2013) framework, they added a new indicator, *feedback*. This study illuminates our understanding of NML practices in China and raises valuable theoretical and methodological implications. However,

there are also some limitations. For instance, the instrument (i.e. Lee et al. 2015) that they drew on was mainly designed for young learners rather than adults, but the authors did not explain or verify whether the scale is appropriate for university students or why other instruments (e.g. Koc and Barut 2016) were not considered.

Table 1 summarises the methodological differences between the aforementioned studies, including participants (sample size and source), measurement tools and data collection and analysis methods. In short, these studies offer rich insights and constructive suggestions for defining, conceptualising and measuring NML among different groups of learners. However, only a few studies have concentrated on students majoring in foreign languages. This research gap has motivated us to explore foreign language majors' NML in university settings and to develop and validate an instrument to examine such students' NML levels.

2.1.3. Empirical study results

Lin et al.'s (2013) NML framework theoretically guides educators and learners to understand NML and its complex nature. Many scholars have followed this framework to research the NML level of different groups in various countries (e.g. Zhang and Wu 2023; Kara et al. 2018; Luan et al. 2023; Syam and Nurrahmi 2020). The Turkish pre-service teachers investigated by Kara et al. (2018) achieved the highest level of FC and the lowest level of CP, with differences emerging due to the variations in gender and teacher training programmes. In China, Luan et al. (2023) showed that EFL learners' NML level is generally low. Like Kara et al. (2018), Luan et al. (2023) found that Chinese EFL learners' functional literacy level is higher than their critical literacy, with especially significant differences between FC and CP. Furthermore, Syam and Nurrahmi (2020) explored

Table 1. The Methodological Differences between the Reviewed NML Studies.

Papers	Sample Size	Sample Source	Measurement Tools	Data Collection Methods	Data Analysis Methods
Lee et al. (2015)	574	Primary and secondary schools in Singapore	A measurement tool developed based on the theoretical framework of Lin et al. (2013), including 10 scales	Online questionnaire	Descriptive statistics, exploratory factor analysis, confirmatory factor analysis
Koc and Barut (2016)	1,226	A state university in Turkey	The New Media Literacy Scale (NMLS) developed based on the theoretical framework of Lin et al. (2013), including 35 items	Online questionnaire	Exploratory factor analysis, confirmatory factor analysis, second-order confirmatory factor analysis, internal consistency analysis, item analysis (including item-total correlation, item discrimination)
Chen et al. (2018)	4,577	52 schools in Singapore	The measurement tool developed by Lee et al. (2015)	Online questionnaire	Descriptive statistics, correlation analysis
Kara et al. (2018)	972	11 teacher training programmes in 5 public universities in Turkey	The NML survey tool developed by Lee et al. (2015), with language adaptation	Paper questionnaire in the classroom	Confirmatory factor analysis, Cronbach's alpha calculation, corrected item total correlation calculation, independent samples t-test, descriptive statistics, multivariate analysis of variance
Luan, Dong and Zheng (2020)	974	Students from an English course at a public university in northeast China	Adapted based on the measurement tool of Lee et al. (2015), adding the indicator *feedback*. The final scale includes 35 items	Anonymous questionnaire in the classroom	Exploratory factor analysis, confirmatory factor analysis, second-order confirmatory factor analysis, model comparison (through multiple fit indices)

Indonesian undergraduate students' NML level and their ability to identify and evaluate fake news on social media. Their results are consistent with the previous two studies, indicating the students' strengths in consuming new media messages (i.e. FC) and weaknesses in critically judging fake news and producing real content in participatory new media contexts (i.e. CP).

A previous study conducted by the first and second authors of the current study (Zhang and Wu 2023) showcased the current level and development of Chinese English majors' NML after taking a journalism English course. Specifically, 70 English-major students in a Chinese public university were invited to complete an NML questionnaire before and after taking the course. The NML questionnaire was designed based on Koc and Barut (2016). Results broadly align with the other studies discussed above (e.g. Chen et al. 2018; Kara et al. 2018; Koc and Barut 2016), but there are also some notable inconsistencies. For instance, the study showed that students' FC level is higher than their CC, but their CP achieved higher scores than FP both in the pre-and post-questionnaires. These inconsistencies have motivated us to further explore foreign language majors' NML level by implementing a self-developed NML instrument that may be more appropriate for this group of learners.

2.1.4. Research rationale

With the rapid advance of new media platforms in China, such as *rednote (i.e. Xiaohongshu)*, Chinese new media users increasingly rely on these platforms to communicate with a global audience (DeLisle, Goldstein and Yang 2016). Simultaneously, they have shown a growing interest in accessing information from diverse sources, including Western media like *BBC* and *Reuters*. This trend highlights the need for individuals, especially those engaged in global communication, to possess proficient NML skills.

Foreign language majors, in particular, play a crucial role in global communication and cultural dissemination (Luan, Dong and Zheng 2020; Luan et al. 2023; Sun 2024; Wang 2023; Zhao and Chang 2024). Their ability to effectively navigate new media platforms, understand and analyse information from various cultural perspectives, and engage in cross-cultural dialogue is thus of great importance.

However, as noted in previous research (Luan, Dong and Zheng 2020; Luan et al. 2023), the NML of students, including foreign language majors, requires further development, and dedicated instruments must be used to measure and evaluate their NML.

Therefore, grounded in Lin et al.'s (2013) NML framework and drawing on the limitations and insights from previous studies (Koc and Barut 2016; Kara et al. 2018; Lee et al. 2015), this study aims to develop an NML scale tailored to foreign language majors. By doing so, we seek to provide a reliable tool for assessing their NML and contribute to a better understanding of their current NML level. The study addresses two research questions:

(1) Is the scale reliable and valid for measuring foreign language majors' NML?
(2) What level of NML do foreign language majors currently possess?

3. Methodology

3.1. Participants

This study was conducted among Chinese foreign language majors. A convenience sampling strategy was applied to form a large participant group. In total, 1,264 students from various universities in China responded and indicated their willingness to voluntarily participate in the study. To ensure the reliability of participants' responses, the authors deleted those that took either a very short or long time to complete (i.e. less than 150 s or more than 5000 s). From this, 919 responses were collated to answer the two research questions. All participants voluntarily took part in the study, and they had the right to withdraw at any time if they felt uncomfortable or

were not satisfied with any aspect of the study. To maintain confidentiality, all participant information remained anonymous at all stages. It was saved only on the first author's computer, protected with a password.

Specifically, the study's sample comprised 143 male and 776 female participants, ranging from 18 to 24 years old. These Chinese foreign language majors studied in 69 universities in China and other countries. Of these universities, 61 are comprehensive universities, while 8 are dedicated to foreign languages. Most participants were undergraduate students (744, 80.96%), while 152 (16.54%) were postgraduates. Of the total sample, 65.18% were English majors; the rest studied Spanish, French, German, Portuguese, Italian, Japanese, Arabic, Korean or Russian.

3.2. Item development

Theoretically, our instrument referred to Lin et al.'s (2013) NML framework. As discussed above, we removed three indicators (i.e. *synthesis, production* and *participation*) from their framework. In our framework, the seven remaining indicators were grouped into four sub-scales: FC (including *consuming skill*, *understanding*), CC (including *analysis, evaluation*), FP (including *prosuming skill*, *distribution*) and CP (including *creation*).

Methodologically, the items in the instrument were developed based on Lee et al. (2015) and Koc and Barut (2016) with some modifications. As Lee et al.'s (2015) work mainly focused on young learners, we firstly removed items irrelevant to university students. Then, we compared the items in Lee et al. (2015) and Koc and Barut (2016), combining and deleting the overlapping questions. Because their two instruments were not developed for foreign language majors, the wording in our scale was modified according to the requirements of foreign language majors' key abilities as listed in various government policies and research frameworks. The policies we referred to include *Core Competencies and Values for Chinese Students' Development* (Core Competencies and Values Research Group 2016), *English Curriculum Standards for Senior High Schools* (PRC Ministry of Education 2017), and *National Standards for Teaching Quality of Foreign Languages and Literature* (Ministry of Education 2018). In terms of research frameworks, we drew on the Chinese foreign language learners' six key competencies in the Production-Oriented Approach (POA) (Wen 2018) and *A Global Framework to Measure Digital Literacy* (Antoninis 2018). Furthermore, we changed the wording of the items to conform to the reality of Chinese foreign language majors' studies and daily life. For instance, we changed the examples in the original item, '*I can send messages via instant message software such as MSN, Skype, Gmail, or Facebook*', to '*I can send messages via instant message software such as WeChat and QQ*'. The questionnaire applied a five-point Likert scale to explore foreign language majors' NML, with higher scores indicating higher NML levels (i.e. 1 for 'strongly disagree', 2 for 'disagree', 3 for 'neutral', 4 for 'agree', 5 for 'strongly agree').

We invited five experts in foreign language education and NML to examine the content validity of the items. They considered the items based on: (1) Lin et al.'s (2013) framework, (2) the two scales of Lee et al. (2015) and Koc and Barut (2016), (3) the aforementioned policies and guidance, and (4) their experiences in NML education and research. The experts evaluated the items and agreed that our NML scale comprehensively covers the key aspects of foreign language majors' NML. Their feedback affirmed the scale's strong content validity. Then, we invited 20 Chinese foreign language majors (excluded from the participant group) to take part in a pilot study and to share their opinions and suggestions concerning the comprehensibility of the questionnaire. The students gave us extensive constructive feedback to improve the items. For instance, they suggested translating the items into Chinese to make the questionnaire bilingual, which was intended to reduce any possible confusion caused by reading and understanding English. Moreover, they suggested some further examples of Chinese new media (e.g. *Douban* and *Zhihu*) that were added to the items. The final version of the questionnaire was written in Chinese and English. It took participants approximately 10–15 minutes to complete. Table 2

Table 2. Distribution of the Items and Item Examples.

Construct	Indicator	Total number of items	Item Examples
Functional consuming	Consuming skill	5 (Items 1–5)	1. I can install and upgrade applications on my devices. e.g. *Duolingo, China Daily, Longman Dictionary of Contemporary English*, etc.
	Understanding	4 (Items 6–9)	8. I can understand different opinions on the internet. e.g. different standpoints from the *China Daily* and *BBC*
Critical consuming	Analysis	8 (Items 10–17)	17. I can compare the information with the same theme from different online sources to clarify its similarities and differences. e.g. comparing the news about China's contributions to the COVID-19 vaccine in *China Daily* and *Reuters*
	Evaluation	5 (Items 18–22)	20. I can defend myself from the potential adverse effects of some new media content. e.g. distinguishing the negative influences of fake news
Functional prosuming	Prosuming skill	4 (Items 23–26)	25. I can use software to edit a video clip. e.g. *iMovie*, etc.
	Distribution	3 (Items 27–29)	28. I can post my original new media work on the internet. e.g. posting self-made short videos on *Tik Tok*
Critical prosuming	Creation	4 (Items 30–33)	32. I can comment to inform or direct people on the internet.

shows the distribution of the items in the four main constructs and the item samples. The questionnaire is provided in Appendix A.

3.3. Data analysis

To answer the first RQ, Confirmatory Factor Analysis (CFA) was conducted to assess the reliability and validity of the items. CFA is a multivariate statistical procedure used to evaluate how well-observed variables represent their corresponding underlying constructs. It is commonly employed in scale development to examine the latent structure of a measurement instrument (Brown 2015). In the current study, three indices from CFA were used: factor loading (FL), composite reliability (CR), and average variance extracted (AVE). Specifically, CR was used to evaluate our scale's reliability, while FL and AVE were used to assess its validity.

The second RQ, which focuses on Chinese foreign language majors' current NML level, was answered using descriptive data, including Mean and Standard Deviation (SD). The mean represents the average value of the students' self-evaluation of their NML level, and the SD is a summary measure of the differences between each observation and the mean. This study analysed the data of the two research questions using *SPSS Statistics (Version 26)* and *SPSS AMOS (Version 26)*.

4. Results

4.1. RQ 1: reliability and validity of the NML scale

A total of 33 items were analysed using CFA. The results indicated good model fit: $x^2/df = 2.94$, RMSEA = 0.05, NFI = 0.93, RFI = 0.92, IFI = 0.95, TLI = 0.94, and CFI = 0.95. Additionally, all items demonstrated satisfactory FLs, all of which exceeded 0.60. Typically, FL values above 0.50 suggest that items effectively measure their intended construct (Hair 1998). Therefore, our FL values signify strong associations between the 33 items and their respective constructs.

We calculated CR for each latent construct to assess internal consistency. The CR values, ranging from 0.83–0.89, surpassed the recommended threshold of 0.70 (Shrestha 2021), further confirming the strong reliability of the NML scale.

Finally, the AVE values for all constructs were above 0.50, except for *Analysis*, which had an AVE of 0.47. Although an AVE of 0.50 or higher is typically preferred, convergent validity can still be

considered adequate if CR values are above 0.60 (Shrestha 2021). Given that all the CR values in our NML scale exceeded 0.80, the convergent validity of the NML scale is confirmed.

In summary, the NML scale demonstrated satisfactory reliability, as indicated by CR, and validity, as evidenced by FL and AVE. Therefore, our scale is reliable and valid for measuring Chinese foreign language majors' NML. The full results are presented in Table 3.

4.2. RQ 2: current level of Chinese foreign language majors' NML

Table 4 reports the mean and SD scores of the 33 items among the 7 indicators (see details in Appendix B). The mean score of all items is 4.02, and the SD value is 0.90, indicating that their overall NML level is relatively high. The mean scores of the four constructs (i.e. FC, CC, FP, CP) are 4.09, 3.88, 4.18, 3.86, respectively, indicating that their functional literacy (i.e. FC and FP) is higher than their critical literacy counterparts (i.e. CC and CP).

As Table 4 shows, students scored higher in *consuming skill* and *prosuming skill*. In contrast, there are four indicators (i.e. *understanding*, *analysis*, *evaluation*, *creation*) with lower mean scores (i.e. below 4.00). These results indicate that the students are more skilled in technological than content-related aspects. Their abilities, not merely in deconstructing information (i.e. *understanding*) but also in critically analysing, evaluating and creating information (i.e. *analysis*, *evaluation*, *creation*), therefore need to be developed.

Item 1 (i.e. *I can install and upgrade applications on my devices*) and Item 3 (i.e. *I can use search engines to find the information I need*) in *consuming skill*, as well as Item 23 (i.e. *I can use software to edit a picture*) in *prosuming skill* exhibited higher mean scores, 4.32 (SD = 0.93), 4.34 (SD = 0.90) and 4.41 (SD = 0.84), respectively. The results of these three items reflect that the students have

Table 3. Results of Reliability and Validity Tests.

Factor	Item number	Factor loading	CR	AVE
Consuming skill	1	0.732	0.87	0.58
	2	0.734		
	3	0.789		
	4	0.804		
	5	0.758		
Understanding	6	0.734	0.83	0.55
	7	0.693		
	8	0.781		
	9	0.761		
Analysis	10	0.674	0.88	0.47
	11	0.652		
	12	0.729		
	13	0.723		
	14	0.663		
	15	0.681		
	16	0.730		
	17	0.653		
Evaluation	18	0.679	0.83	0.50
	19	0.727		
	20	0.734		
	21	0.751		
	22	0.624		
Prosuming skill	23	0.856	0.89	0.66
	24	0.746		
	25	0.824		
	26	0.819		
Distribution	27	0.722	0.85	0.65
	28	0.835		
	29	0.864		
Creation	30	0.776	0.83	0.55
	31	0.744		
	32	0.739		
	33	0.714		

Table 4. Mean and SD Scores of the Seven Indicators in the NML Questionnaire.

Indicator	Mean	SD
Consuming skill	4.25	0.94
Understanding	3.93	0.89
Analysis	3.87	0.84
Evaluation	3.89	0.81
Prosuming skill	4.23	0.93
Distribution	4.12	0.98
Creation	3.86	0.92
Total	4.02	0.90

acquired basic skills in manipulating software and applications, searching for information and editing static images.

In contrast, for Item 22 (i.e. *When I read a new media message, I can identify opposite viewpoints from other sources*) in *evaluation* and Item 32 (i.e. *I can design new media content that reflects my critical thinking on some issues*) in *creation*, the mean scores are lower than other item counterparts, 3.71 (SD = 0.86) and 3.74 (SD = 0.93), respectively. These two items require more critical and independent thinking, which is a higher-level ability for students to acquire.

5. Discussion

This study focuses on foreign language majors' NML, which is a new direction in NML research and practice. In the era of globalisation, this group of students are required to be able to navigate new media platforms, understand different cultures, analyse diverse cultural materials and engage in cross-cultural dialogue with a global audience. Given that previous NML frameworks and scales need certain improvements (Kara et al. 2018; Lee et al. 2015; Lin et al. 2013) and there is no dedicated NML scale for foreign language majors, the present study has attempted to develop a dedicated scale for this student group to examine their current NML level. The test results show that our NML scale has relatively high reliability and validity. Therefore, it can be applied in future studies and practical interventions in foreign language education and media education.

RQ1 aimed to examine the reliability and validity of our scale in measuring Chinese foreign language majors' NML. Before this study, there was no available scale to measure foreign language majors' NML, resulting in partial knowledge of their current NML status. Moreover, as discussed in the literature review, there are various limitations to previous NML scholarship, such as the confused boundaries between constructs and differences between Web 1.0 and Web 2.0 in Chen, Wu and Wang (2011), and poorly defined conceptualisations in Lin et al. (2013). Therefore, a new framework is necessary. To formulate this, we drew on previous studies to develop and validate our scale. We have demonstrated that this new scale effectively measures foreign language majors' NML and consequently that it provides an effective tool for future inquiries.

For educators in foreign language and media education, it offers a means to systematically assess students' NML levels at different stages of their learning. By administering the questionnaire regularly, they can track the progress of students' NML development and identify areas that require targeted instruction. For example, if a student shows lower scores in critical consuming (CC) or critical prosuming (CP), educators can design specific courses or activities to enhance their analytical, evaluative, and creative skills in new media contexts.

RQ2 evaluated Chinese foreign language students' current NML level based on the self-developed NML questionnaire. The results show that the Chinese foreign language majors exhibited higher scores in FC and FP (which achieved the highest mean scores), but displayed lower scores in CC and CP (which achieved the lowest mean scores). These results align with previous studies (e.g. Chen et al. 2018; Kara et al. 2018; Koc and Barut 2016; Luan et al. 2023) that found students' functional literacy is better than their critical literacy.

However, our study uncovered some noteworthy differences. For instance, compared with the authors' previous study on Chinese English majors (Zhang and Wu, 2023), this research has produced certain contrasting results. One of the most prominent is that in terms of prosuming literacy, the scores of CP (mean = 3.70) in our earlier study are higher than those for the other three constructs (mean of FC = 3.52; mean of CC = 3.51; mean of FP = 3.32). Two reasons could explain this. First, as we explained in our previous paper, the participants of that study had high-level English proficiency. They had been given tasks (e.g. writing evaluations about mainstream foreign media on their class *WeChat* public account) to improve their NML level (e.g. CP) during a journalism English course that they were undertaking. However, many students in the present study are unlikely to have taken specific courses to develop their CP. This difference aligns with Kara et al.'s (2018) study, which found that the training programme undertaken by the participants is a crucial factor that affects their NML. Second, students from the previous study were recruited from one of China's most economically developed cities, so they may be more open to participating in different 'we media' environments (Zhang and Wu, 2023). In contrast, the students in the present study come from different regions in China, have varying proficiency levels in their target languages, and differing acceptances of new media. Understanding that differences in students' socioeconomic status may influence their NML (Chen et al. 2018; Zhang, Wu and Fu, 2025 2018) can help ensure educational interventions are tailored to best meet the needs of diverse student populations.

Another main finding in this study is that the scores in *understanding, analysis* and *evaluation* are relatively low. According to Syam and Nurrahmi (2020), students frequently find themselves at a loss when attempting to deconstruct the underlying meanings of news stories. This could be attributed to the complex and often multi-faceted nature of news reporting, which may involve implicit biases, hidden agendas, or intricate political and social contexts (Buckingham 2013). Secondly, the fast-paced and information-saturated environment of new media makes it difficult for students to slow down and engage in a thorough examination of the content (Mrah 2022). They are often accustomed to quickly scrolling through their feeds and consuming information in a rather superficial manner. An issue of concern is while distinguishing between fake and real news is a critical skill in today's digital world, it appears to be lacking among many students. Students have been observed as often needing external help to make such distinctions (Syam and Nurrahmi 2020; Zhang and Wu 2023).

To summarise, the key variables that impact students' NML include: (1) their language proficiency, (2) their exposure to different media environments, and (3) the influence of the curriculum. In terms of language proficiency, higher proficiency might enable students to better understand and analyse media content in the target language, which could contribute to enhancing their critical literacy skills. In terms of exposure to diverse media environments, students from more developed regions or those who actively engage in various 'we media' platforms might have more opportunities to practice and develop their NML skills. Regarding the curriculum, the focus on language skills in traditional foreign language courses might overshadow the development of NML, and there could be a lack of specific courses dedicated to teaching students how to critically analyse and evaluate media content (Fahim and Sa'eepour 2011; Xue 2024; Zhang and Wu 2023).

Therefore, in the future, educational institutions should consider integrating more courses focusing on new media analysis, critical thinking in the context of new media, and content creation. These courses could enhance students' understanding, analysis, and evaluation abilities. For example, practical exercises could be incorporated to teach students how to identify reliable sources of information, deconstruct the structure and meaning of media messages, and use critical thinking to evaluate the credibility and value of content (Zhang and Wu 2023). In addition, extracurricular activities such as new media clubs or projects could be organised to provide students with more hands-on experience in creating media content. This would help them to better apply their skills and develop their creativity. Moreover, educators should also encourage students to engage in cross-cultural media projects to further enhance their ability to navigate different cultural perspectives in the new media landscape (Zhang, Wu and Fu 2025). By taking these actions, it is expected that the

NML of foreign language majors could be significantly improved, enabling them to better meet the challenges of the current era and its emphasis on global communication.

6. Conclusion

This study has focused on foreign language majors in China and attempted to develop a scale to measure their NML level. Following the development of such a scale, the study evaluated the current NML level of a large sample of foreign language students. The reliability and validity tests show that the NML scale is reliable and valid. Therefore, it is appropriate to assess foreign language majors' NML. According to the students' responses, they scored highest in FP relative to the other three constructs. Specifically, the scores in *consuming and prosuming skills* are higher than other indicators, especially *understanding, analysis* and *evaluation*. The results also show that these students are relatively skilful in new media technologies but still need support in understanding, analysing and evaluating new media information.

However, while this study has produced valuable insights, there are several limitations that should be acknowledged. First, this study applied a convenience sampling strategy to collect data, and most participants were undergraduates majoring in English. In future research, probability sampling should be used to gather data from students in different years of study and other language majors. Second, this study only asked participants to self-report their NML via a questionnaire. More data collection approaches, such as interviews and teacher evaluations, could be used to generate a more holistic picture of foreign language majors' NML. Third, as this study only focused on China, future research should be conducted in other countries to fully understand foreign language majors' NML development globally. Given the importance of university students' NML in the present-day multimedia and AI-enhanced learning environment, further investigation of these issues will undoubtedly generate valuable insights (Ivkovic 2020).

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

This work was supported by National Planning Office of Philosophy and Social Science [grant number 22CYY026].

Notes on contributors

Danyang Zhang is an Associate Professor and Associate Dean at the College of International Studies at Shenzhen University. She obtained her PhD in Education from the University of Cambridge. Danyang has published her work in numerous SSCI journals, including Applied Linguistics, System, Computer-Assisted Language Learning, and Language Teaching Research. She currently serves as a journal reviewer for ReCALL, Language Learning & Technology, Virtual Reality and Interactive Learning Environments. She has presented her projects at international conferences, including BERA, CALL and EUROCALL. She is the winner of the BJET Best EdTech Paper Award and an awardee of the mLearn Conference Best Paper. Her research interests include technology-enhanced language learning, international communication and teacher development.

Yang Wu is a PhD candidate at the Department of Media and Communication, City University of Hong Kong. He received his B.A. in Journalism from Northeastern University (China). His research focuses on the sociology of media and information technologies, journalism, digital disconnection cultures, and health disparities.

Junjie Gavin Wu is an Assistant Professor and a PhD Supervisor in the Faculty of Applied Sciences at Macao Polytechnic University. He is an Executive Editor in SN Social Sciences (Scopus) and an Executive Associate Editor in Computers & Education: X Reality (Scopus). Gavin is a Vice President of PacCALL and he serves on the committees of ChinaCALL and GLoCALL. He has around 60 English publications and over 25 papers appeared in SSCI journals. He also edited books with Springer (2021, 2025) and Routledge (2024, 2026) and edited over 10 special issues.

ORCID

Danyang Zhang http://orcid.org/0000-0003-2514-9488
Yang Wu http://orcid.org/0000-0002-0441-7925
Junjie Gavin Wu http://orcid.org/0000-0003-4937-4401

References

Antoninis, M.. 2018. *A Global Framework to Measure Digital Literacy*. https://uis.unesco.org/en/blog/global-framework-measure-digital-literacy

Brown, T. A. 2015. *Confirmatory Factor Analysis for Applied Research*. New York: Guilford Press.

Buckingham, D. 2013. *Media Education: Literacy, Learning and Contemporary Culture*. Cambridge: John Wiley & Sons.

Celik, I., H. Muukkonen, and S. Dogan. 2021. "A Model for Understanding new Media Literacy: Epistemological Beliefs and Social Media use." *Library & Information Science Research* 43 (4): 101125. https://doi.org/10.1016/j.lisr.2021.101125

Chen, D.-T., T.-B. Lin, J.-Y. Li, and L. Lee. 2018. "Establishing the Norm of new Media Literacy of Singaporean Students: Implications to Policy and Pedagogy." *Computers & Education* 124:1–13. https://doi.org/10.1016/j.compedu.2018.04.010.

Chen, D.-T., J. Wu, and Y.-M. Wang. 2011. "Unpacking New Media Literacy." *Journal on Systemics, Cybernetics and Informatics* 9 (2): 84–88.

Core Competencies and Values Research Group. 2016. "中国学生发展核心素养" [Core Competencies and Values for Chinese Students Development]. *Journal of The Chinese Society of Education* 282 (10): 1–3.

DeLisle, J., A. Goldstein, and G. Yang. 2016. *The Internet, Social Media, and a Changing China*. Philadelphia: University of Pennsylvania Press.

Dingli, A., and D. Seychell. 2015. "Who are the Digital Natives?" In *The new Digital Natives: Cutting the Chord*, edited by A. Dingli, and D. Seychell, 9–22. Berlin: Springer Berlin Heidelberg.

Fahim, M., and M. Sa'eepour. 2011. "The Impact of Teaching Critical Thinking Skills on Reading Comprehension of Iranian EFL Learners." *Journal of Language Teaching and Research* 2 (4): 867–874. https://doi.org/10.4304/jltr.2.4.867-874

Hair, J. F. 1998. *Multivariate Data Analysis*, 5th ed. New Jersey: Prentice Hall.

Hughes, J. E., B. W.-L. Packard, and P. D. Pearson. 2000. "Preservice Teachers' Perceptions of Using Hypermedia and Video to Examine the Nature of Literacy Instruction." *Journal of Literacy Research* 32 (4): 599–629. https://doi.org/10.1080/10862960009548097.

Ivkovic, D. 2020. "Multilingualism, Collaboration and Experiential Learning with Multiple Modalities: The Case of Mondovision." *Innovation in Language Learning and Teaching* 14 (4): 307–316. https://doi.org/10.1080/17501229.2019.1599002.

Kara, M., S. Caner, A. Günay Gökben, C. Cengiz, E. İşgör Şimşek, and S. Yıldırım. 2018. "Validation of an Instrument for Preservice Teachers and an Investigation of their New Media Literacy." *Journal of Educational Computing Research* 56 (7): 1005–1029. https://doi.org/10.1177/0735633117731380.

Koc, M., and E. Barut. 2016. "Development and Validation of New Media Literacy Scale (NMLS) for University Students." *Computers in Human Behavior* 63:834–843. https://doi.org/10.1016/j.chb.2016.06.035.

Lee, Y.-J. 2023. "Language Learning Affordances of Instagram and TikTok." *Innovation in Language Learning and Teaching* 17 (2): 408–423. https://doi.org/10.1080/17501229.2022.2051517.

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

Lim, F. V., P. A. Towndrow, and J. Min Tan. 2021. "Unpacking the Teachers' Multimodal Pedagogies in the Primary English Language Classroom in Singapore." *RELC Journal* 54 (3): 729–743. https://doi.org/10.1177/00336882211011783.

Lin, T.-B., J.-Y. Li, F. Deng, and L. Lee. 2013. "Understanding New Media Literacy: An Explorative Theoretical Framework." *Educational Technology & Society* 16 (4): 160–170.

Lister, M., S. Giddings, J. Dovey, I. Grant, and K. Kelly. 2009. *New Media: A Critical Introduction*. New York: Routledge. https://doi.org/10.4324/9780203884829

Liu, H., and J. Fan. 2024. "AI-mediated Communication in EFL Classrooms: The Role of Technical and Pedagogical Stimuli and the Mediating Effects of AI Literacy and Enjoyment." *European Journal of Education* 60 (1): e12813. https://doi.org/10.1111/ejed.12813

Liu, H., X. Zhang, and F. Fang. 2023. "Young English Learners'attitudes Towards China English: Unpacking Their Identity Construction with Implications for Secondary Level Language Education in China." *Asia Pacific Journal of Education* 43 (1): 283–298. https://doi.org/10.1080/02188791.2021.1908228.

Luan, L., Y. Dong, and C. Zheng. 2020. "大学生英文新媒介素养的内涵与结构——兼论其与英语自我效能感的关系" [The Connotation and Structure of College Students English new Media Literacy —— With the Analysis of its Impact on English Language Self-Efficacy]. *Modern Distance Education Research* 32 (2): 104–112.

Luan, L., J.-C. Liang, C. S. Chai, T.-B. Lin, and Y. Dong. 2023. "Development of the New Media Literacy Scale for EFL Learners in China: A Validation Study." *Interactive Learning Environments* 31 (1): 244–257. https://doi.org/10.1080/10494820.2020.1774396.

Ministry of Education. 2017. *English Curriculum Standards for Senior High Schools*. Beijing: Peoples Education Press.

Ministry of Education. 2018. *National Standards for Teaching Quality of Foreign Languages and Literature*. Shanghai: Shanghai Foreign Language Education Press.

Ministry of Education. 2021. 普通高等学校本科外国语言文学类专业教学指南 [The Teaching Guidelines for Undergraduate Foreign Language and Literature Majors in Regular Institutions of Higher Education]. Beijing: Foreign Language Teaching and Research Press.

Mrah, I. 2022. "Digital Media Literacy in the age of mis/Disinformation: The Case of Moroccan University Students." *Digital Education Review* 41:176–194. https://doi.org/10.1344/der.2022.41.176-194

Shrestha, N. 2021. "Factor Analysis as a Tool for Survey Analysis." *American Journal of Applied Mathematics and Statistics* 9 (1): 4–11. https://doi.org/10.12691/ajams-9-1-2

Songmuang, J., Y. Boonsuk, and M. Assalihee. 2024. "English Learning Behaviors in Computer-Mediated Communication During COVID-19 in Thailand's Deep South." *Innovation in Language Learning and Teaching* 19 (1): 33–47. https://doi.org/10.1080/17501229.2024.2321267.

Sun, L. 2024. "Enhancing Intercultural Competence of Chinese English Majors Through AI-Enabled Collaborative Online International Learning (COIL) in the Digital Era." *Education and Information Technologies*. https://doi.org/10.1007/s10639-024-13143-7

Syam, H. M., and F. Nurrahmi. 2020. "I Don't Know if it is Fake or Real News": How Little Indonesian University Students Understand Social Media Literacy." *Jurnal Komunikasi: Malaysian Journal of Communication* 36 (2): 92–105. https://doi.org/10.17576/JKMJC-2020-3602-06.

Tour, E., M. Gindidis, and A. Newton. 2019. "Learning Digital Literacies Through Experiential Digital Storytelling in an EAL Context: An Exploratory Study." *Innovation in Language Learning and Teaching* 15 (1): 26–41. https://doi.org/10.1080/17501229.2019.1659278.

Wang, X. 2023. "外语专业人才的国际传播能力内涵与培养路径" [Foreign Language Education: Development of Capacity for International Communication]. *Foreign Language Learning Theory and Practice* 03 (1): 1–8. https://doi.org/10.23971/jfllt.v3i1.7196

Wen, Q. 2018. "新时代高校外语课程中关键能力的培养：思考与建议" [Cultivating key Competencies Through University Foreign Language Courses in the new era: Reflections and Suggestions]. *Foreign Language Education in China* 1 (1): 3–11.

Xue, L. 2024. "Urgent, but How? Developing English Foreign Language Teachers' Digital Literacy in a Professional Learning Community Focusing on Large Language Models." *European Journal of Education* 60 (1): e12899.

Zhang, D., J. G. Wu, and Z. Fu. 2025. "Improving Pre-service English Teachers' Native Cultural Knowledge and English Language Knowledge of Native Culture in a PBL Classroom." *Innovation in Language Learning and Teaching* 19 (1): 1–15.

Zhang, D., and P. Pérez-Paredes. 2021. "Chinese Postgraduate EFL Learners' Self-directed Use of Mobile English Learning Resources." *Computer Assisted Language Learning* 34 (8): 1128–1153.

Zhang, D., and Y. Wu. 2023. "Becoming Smart "Digital Natives": Cultivating Chinese English Majors' New Media Literacy via Journalism English Reading and Listening." *Journal of China Computer-Assisted Language Learning* 3: 263–286.

Zhao, H., and Y. Chang. 2024. "外语人才的国际传播能力：概念内涵与要素框架.浙江外国语学院学报" [On International Communication Capacity of Foreign Studies Talents: Concept and Framework]." *Journal of Zhejiang International Studies University* 01:17–23.

Appendix

Appendix A The NML Questionnaire

Indicator	Item Number	Item
Consuming skill 取用技能	1	I can install and upgrade applications on my devices. e.g., Duolingo, China Daily, Longman Dictionary of Contemporary English, etc. 我可以在我的设备上安装并更新软件。例如：多邻国、中国日报、朗文当代英语词典等。
	2	I can download files from the Internet. e.g., language learning podcasts, MOOC clips, micro lectures, etc. 我可以从网络上下载文件。例如：语言学习播客、慕课片段、微课等。
	3	I can use search engines to find the information I need. e.g., finding a language learning theory on Google Scholar or Baidu Scholar 我可以使用搜索引擎来查找我需要的信息。例如：在谷歌学术或百度学术上查找语言学习理论

(*Continued*)

Continued.

Indicator	Item Number	Item
	4	I can use build-in functions in web browsers to record useful websites. e.g., using the Favourite folder to record useful language learning websites 我可以使用网络浏览器中的内置功能来保存有用的网站。例如：使用收藏夹记录有用的语言学习网站
	5	I can relocate the information I have found before on the Internet. e.g., relocating useful media websites recorded in the Favourite folder 我可以重新加载之前在互联网上找到的信息。例如：重新加载储存在收藏夹中的有用媒体网站
Understanding 理解	6	I can understand the meaning of the texts on the Internet. e.g., news on CGTN 我可以理解互联网上文本的含义。例如：在CGTN上的新闻
	7	I can understand the meaning of the emoticons on the Internet. e.g., emojis in chats on WeChat 我可以理解互联网上的表情符号。例如：微信聊天中的emoji
	8	I can understand different opinions on the Internet. e.g., different standpoints from the China Daily and BBC 我可以理解互联网上的不同看法。例如：中国日报和BBC的不同观点
	9	I can understand new media contents on different themes. e.g., political, economic, sports news 我可以理解不同主题的新媒介内容。例如：政治、经济、体育新闻
Analysis 分析	10	When I read a new media message, I know whether it is telling a fact or an opinion. e.g., a fact: Xi says China ready to work with US; an opinion: Washington must be clear-eyed of risks: China Daily editorial 例如： 事实：习近平说中国准备与美国合作 观点：华盛顿必须清醒地看待风险：中国日报社论
	11	When I read a new media message, I can find it in favour of certain groups. e.g., The news "UK, Italy and Japan team up for new fighter jet" published on BBC stands for the UK government. 例如：BBC新闻'英国，意大利和日本联手购买新型战斗机'是站在英国政府的立场上发表的。
	12	When I read a new media message, I can find it is selling some value. e.g., CGTN reported Beijing 2022 Winter Olympics and the athletes' achievements in order to promote Olympic sportsmanship and stimulate the enthusiasm for sports. 例如：CGTN报道北京2022年冬奥会和运动员们取得的成就以弘扬奥林匹克精神，激发人们对体育运动的热情。
	13	I can classify new media messages by producers (e.g., different media such as BBC). 我可以通过内容的生产者（如不同的媒体：BBC）将新媒介内容进行分类。
	14	I can classify new media messages by types (e.g., different genres such as news briefs, features, commentary, academic journal papers). 我可以通过内容的类型（如不同的体裁：新闻简报，特写，评论，学术期刊论文）将新媒介内容进行分类。
	15	I can classify new media messages by purposes (e.g., communicative, recreational, educational purposes). 我可以通过传播的目的（如不同的目的：流、娱乐、教育）将新媒介内容进行分类。
	16	I can compare the information with the same theme from different online sources to clarify their similarities and differences. e.g., comparing the news about China's contributions to the COVID-19 vaccine in China Daily and Reuters 我可以比较不同在线资源中相同主题的信息，以辨别它们的异同。例如：比较中国日报和路透社报道的关于中国对COVID-19疫苗贡献的新闻
	17	When I read a new media message, I can identify opposite viewpoints from other sources. e.g., identifying opposite perspectives in Reuters when reading news in China Daily 当我阅读新媒介信息时，我可以识别出来自其他来源的相反观点。 例如：在阅读中国日报的新闻时，可以在路透社的新闻中找到相反的观点
Evaluation 评价	18	I can examine new media contents in terms of credibility. 我可以根据可信度（即是否被信任）评估新媒介内容。
	19	I can examine new media contents in terms of objectivity. 我可以根据客观性（即是否客观）评估新媒介内容。
	20	I can examine new media contents in terms of currency. 我可以根据现时性即是否被普遍接受或使用评估新媒介内容。

(*Continued*)

Continued.

Indicator	Item Number	Item
	21	I can analyse the effects (both positive and negative ones) of new media contents on individuals or society. e.g., analysing the information that is harmful to children on new media 我可以分析新媒介内容对个人或社会（正面和负面）的影响。例如：分析部分对儿童有危害的新媒体信息
	22	I can fend myself from the potential adverse effects of some new media contents. e.g., distinguishing the negative influences of fake news 我可以保护自己免受某些新媒介内容的潜在不利影响。例如：辨别假新闻带来的负面影响
Prosuming skill 取用技能	23	I can use software to edit a picture. e.g., Adobe Photoshop, Meitu Pic, etc. 我可以使用软件编辑图片。例如： Adobe Photoshop，美图秀秀等
	24	I can use software to edit a video clip. e.g., iMovie, etc. 我可以使用软件编辑视频。例如：iMovie等
	25	I can turn hardcopy into digital format. 我可以将纸质版文件转换为电子版。
	26	I can remix existing digital resources into a new one. e.g., remixing several images into a video 我可以将现有的数字资源重新组合成一个新的文件。例如：将多个图像重新融入进一个视频中
Distribution 共享	27	I can post my original new media work on the Internet. e.g., posting my self-made short videos on Tik Tok 我可以在网上发布我的原创新媒介作品。例如：在抖音上发布我自制的短视频
	28	I can share the information I have found through emailing, blog posting, or other social networking platforms. 我可以通过电子邮件、博客或其他社交网络平台分享我找到的信息。
	29	I can use build-in functions on social network sites to share my feelings. e.g., giving my friends thumbs up in WeChat Moments, Douban, Zhihu. 我可以使用社交网站中的内置功能来分享我的感受。例如：在微信朋友圈、豆瓣或知乎中给我的朋友点赞。
Creation 创造	30	I can make contributions on the Internet by reviewing current matters from different perspectives. 我可以通过从不同角度审时度势，在互联网上发表自己的看法。
	31	I can comment to inform or direct people on the Internet. 我可以通过在互联网上发表评论来告知或指引他人。
	32	I can design new media contents that reflect my critical thinking on some issues. e.g., posting an essay analysing the positive and negative influences of some current affairs in the society 我可以在我设计的新媒介内容中反映我对某些问题的批判性思考。例如：发表一篇文章分析一些时事对社会的正负面影响
	33	I can produce new media contents respectful to peoples different perspectives. e.g., making polite comments even though I can't entirely agree with others' opinions on Weibo 我可以创作考虑人们不同观点的新媒介内容。例如：即使不能完全同意他人在微博上的观点，也会发表礼貌的评论

Appendix B Descriptive Results of the NML Questionnaire

Indicator	Item number	Min value	Max value	Mean	SD	Median
Consuming skill	1	1	5	4.32	0.93	5
	2	1	5	4.22	0.95	4
	3	1	5	4.34	0.89	5
	4	1	5	4.21	0.96	4
	5	1	5	4.15	0.96	4
Understanding	6	1	5	3.75	0.90	4
	7	1	5	4.11	0.91	4
	8	1	5	3.99	0.88	4
	9	1	5	3.89	0.89	4

(*Continued*)

Continued.

Indicator	Item number	Min value	Max value	Mean	SD	Median
Analysis	10	1	5	3.88	0.88	4
	11	1	5	3.86	0.85	4
	12	1	5	4.00	0.83	4
	13	1	5	3.92	0.85	4
	14	1	5	3.87	0.82	4
	15	1	5	3.96	0.83	4
	16	1	5	3.83	0.82	4
	17	1	5	3.71	0.86	4
Evaluation	18	1	5	3.86	0.81	4
	19	1	5	3.86	0.81	4
	20	1	5	3.84	0.80	4
	21	1	5	4.05	0.78	4
	22	1	5	3.85	0.84	4
Prosuming skill	23	1	5	4.41	0.84	5
	24	1	5	4.14	1.02	4
	25	1	5	4.30	0.90	5
	26	1	5	4.08	0.99	4
Distribution	27	1	5	3.93	1.09	4
	28	1	5	4.15	0.94	4
	29	1	5	4.27	0.91	4
Creation	30	1	5	3.92	0.92	4
	31	1	5	3.85	0.94	4
	32	1	5	3.74	0.93	4
	33	1	5	3.93	0.91	4