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The role of network culture and digital etiquette in student learning: a systematic review

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Abstract. *Introduction*. The rapid advancement of digital technologies is transforming the educational environment, presenting new challenges for communication among participants in the educational process. University online communities are becoming central platforms for academic interaction, where the culture of network communication and digital etiquette play a crucial role in enhancing the effectiveness of learning and the professional development of students. *Aim*. This research *aims* to analyse the impact of network communication culture and digital etiquette on the effectiveness of students' learning and professional development. *Methodology and research methods*. Materials were sourced from the Web of Science database, covering the period from 1975 to 2025. Based on the inclusion criteria, five key studies were selected and analysed, authored by researchers affiliated with universities in the USA, Taiwan, Sweden, Spain, and New Zealand. *Results*. The findings demonstrate an evolution from fundamental principles of network communication culture and digital etiquette to complex multimodal communication utilising artificial intelligence tools. This research reveals that effective online communication significantly impacts educational outcomes through three key mechanisms: (1) structured frameworks for digital interaction, (2) balanced integration of traditional and innovative communication methods, and (3) the development of professional digital competencies. *Scientific novelty*. The research findings confirm the importance of network communication culture and digital etiquette as key factors influencing the quality of the educational process within online communities and shaping the trajectory of students' professional development in the digital era. *Practical significance*. The research materials can be utilised in the development of regulatory documents governing digital interactions within academic online communities of higher education institutions.

Keywords: network communication culture, digital etiquette, online community, teachers and students of the university, academic communication, professional formation

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Роль сетевой культуры и цифрового этикета в обучении студентов: систематический обзор

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Аннотация*. Введение.* Стремительное развитие цифровых технологий трансформирует образовательную среду, создавая новые вызовы для коммуникации между участниками образовательного процесса. Онлайн-коммьюнити университетов становятся центральными площадками для академического взаимодействия, где сетевая коммуникативная культура и цифровой этикет играют определяющую роль в эффективности обучения и профессионального развития студентов. *Цель* – анализ влияния сетевой коммуникативной культуры и цифрового этикета на эффективность обучения и профессиональное развитие студентов. *Методология, методы и методики*. Использованы материалы базы данных Web of Science за период 1975–2025 гг. На основе критериев включения были отобраны и проанализированы 5 ключевых исследований, авторы которых аффилированы с университетами США, Тайваня, Швеции, Испании и Новой Зеландии. *Результаты*. Показана эволюция от базовых принципов сетевой коммуникативной культуры и цифрового этикета до сложной мультимодальной коммуникации с использованием инструментов искусственного интеллекта. Исследование демонстрирует, что эффективная онлайн-коммуникация существенно влияет на образовательные результаты через три ключевых механизма: 1) структурированные рамки цифрового взаимодействия, 2) сбалансированную интеграцию традиционных и инновационных форм коммуникации, 3) развитие профессиональных цифровых компетенций. *Научная новизна*. Результаты исследования подтверждают значимость сетевой коммуникативной культуры и цифрового этикета как ключевого фактора, определяющего качество образовательного процесса в условиях онлайн-коммьюнити и траекторию профессионального становления студентов в цифровую эпоху. *Практическая значимость*. Материалы исследования могут быть использованы при составлении регламентирующих документов цифрового взаимодействия для академических онлайн-сообществ вуза.

Ключевые слова: сетевая коммуникативная культура, цифровой этикет, онлайн-сообщество, преподаватели и студенты университета, академическая коммуникация, профессиональное становление

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Introduction

In the context of global digitalisation of higher education, according to research conducted by A. Telukdarie and M.Munsamy [1], A. Al-Abdullatif and A. Gameil [2], E. G. Belyakova, S. A. Bykov, M. P. Zemlyanova et al. [3], A. Jamiai [4], R. Soler-Costa, A. J. Moreno-Guerrero, J. López-Belmonte et al. [5], S. Farshadnia, S. S. Marandi [6], the study of network communication culture and digital etiquette acquires fundamental importance for the development of educational science and practice. This transformation is driven by the intensive development of information and communication technologies, which have significantly changed the nature of interaction between members of the academic community. Traditional forms of communication between faculty and students are not only supplemented but in some cases (COVID-19, distance learning) completely replaced by digital formats of interaction within the online communities of educational institutions, as confirmed by studies conducted by S. Mahmood [7] and J. T. Clark [8].

Analysis of contemporary scientific literature demonstrates significant research interest in the problem of network communication culture in the educational context, as shown by S. Mistretta [9]. The fundamental term "network communication culture" was introduced by Howard Rheingold in "The Virtual Community: Homesteading on the Electronic Frontier", who defined it as "a system of values, norms, and rules of communication in the digital environment, forming a special type of social interaction" [10]. In modern interpretation, network communication culture represents a complex system of knowledge, values, norms, and behavioural models that ensure effective interaction in the digital environment. Inextricably linked to it, digital etiquette, first conceptualised by Virginia Shea in the book "Netiquette", is defined as "a set of behavioural rules accepted on the Internet, based on the traditions and culture of the network community" [11].

Of particular importance is the study of mechanisms by which network communication culture and digital etiquette influence the quality of interaction between teachers and students in the digital environment, as demonstrated by recent research conducted by Y. Zheng, J. Zhang, Y. Li et al. [12] and M. Heitmayer and R. Schimmelpfennig [12]. This research, conducted in the format of a systematic review, represents a logical continuation and deepening of a previously conducted bibliometric analysis on the impact of network communication culture and digital etiquette on the effectiveness of learning and professional development of students in the university online community [14]. The bibliometric study revealed

general trends in the development of scientific discourse, identified key research directions, and identified the most cited authors in this field of knowledge. However, the quantitative nature of bibliometric analysis did not provide deep substantive understanding of the identified patterns and mechanisms of impact of the studied phenomena on the educational process.

The necessity of conducting a systematic review was determined by the need for qualitative analysis of empirical data presented in the scientific literature, with the aim of synthesising theoretical concepts and practical research results. The systematic review provided the opportunity for critical analysis of methodological approaches used in primary studies, assessment of the quality of obtained data, and formulation of evidence-based conclusions about the degree of effectiveness of various forms of digital communication in the academic environment.

The scientific novelty of the research lies in a comprehensive comparative analysis of the influence of various forms of communication on the educational process, which allows overcoming the gap existing in scientific literature between the theoretical understanding of digital communication and practical aspects of its implementation.

Traditional Forms of Academic Communication

Traditional forms of academic communication in higher educational institutions, as studied by M. Shachar and Y. Neumann [15] and E. L. MacGeorge, W. Samter and S. J. Gillihan [16], represent a multi-level system of interactive engagement among all participants in the educational process. Direct personal contact acquires fundamental importance, mediating not only the formal transfer of knowledge but also the implicit exchange of expert experience through immediate nonverbal feedback and emotional interaction. Empirical research from the last decade conducted by D. R. Garrison and N. D. Vaughan Garrison [17], N. Dabbagh and A. Kitsantas [18] confirms that traditional communication models contribute to the formation of stable professional connections, the development of socio-emotional competencies, and cognitive structures necessary for integration into the professional community. Moreover, direct communicative interaction in the academic environment stimulates the development of metacognitive skills in students and facilitates the internalisation of disciplinary patterns of thinking, which cannot be achieved exclusively through mediated forms of communication.

Online Communities as an Emergent Form of Academic Communication

Online communities, as conceptualised by H. Rheingold [19–20], represent a modern digital ecosystem of academic communication, as further developed by D. Ellis, R. Oldridge and A. Vasconcelos [21], K. F. Hew [22], A. Armstrong and J. Hagel [23], T. Zhou [24]. These communities integrate various forms of virtual interaction and function as multi-level platforms that combine official educational portals, learning management systems (LMS), social media, and specialised academic networks. In the context of digital transformation of education, online communities provide key advantages including temporal and spatial flexibility of interaction,

democratisation of academic discourse, and the ability to integrate multimedia technologies to enhance the effectiveness of educational initiatives.

Thus, the transformation of the higher education system has led to the formation of a hybrid model of academic interaction, where traditional communication is integrated with online communities. While in the traditional format, the effectiveness of professional development is ensured through direct contact between students and teachers, live discussions, and practical interaction, in the digital environment, the quality of educational outcomes directly depends on the level of network communication culture and adherence to digital etiquette [25].

The relevance of this research is determined by the need for scientific understanding of the transformation of academic communication in the digital age. A comparative analysis of traditional and digital forms of communication will reveal optimal approaches to organising interaction between teachers and students in the modern educational environment and determine the role of network communication culture and digital etiquette in the context of higher professional education.

This systematic review has several limitations, primarily the use of only one database, Web of Science, which limits the coverage of relevant research, as significant publications may be present in Scopus, ERIC, or Google Scholar. The temporal limitation (the final sample is represented by studies covering the period from 2000 to 2023) of the search influenced the comprehensiveness of the review, given the rapid development of digital technologies and online communication. The geographical distribution of studies is also uneven, with a predominance of works from developed countries with a high level of digitalisation. The context of the COVID-19 pandemic could have influenced the objectivity of research results, creating a certain bias in assessing the effectiveness of online communication.

Methodology, Materials and Methods

Protocol

We utilised the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) protocol as the methodological foundation for our review. This widely recognised framework has been implemented in numerous scholarly reviews to ensure methodological rigour and transparent reporting [26]. Comprehensive details of the PRISMA protocol, including its checklist and flow diagram, can be accessed online. Our specific implementation of this protocol was formally registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on February 26, 2025, receiving registration number INPLASY202520115 and DOI number 10.37766/inplasy2025.2.0115/ (accessed February 26, 2025) [27]. The following sections detail how we adapted each component of the PRISMA framework to meet the specific requirements of this systematic review.

Methodology for Determining Eligibility Criteria, Information Sources, and Search Strategy

This systematic review aims to examine the impact of network communication culture and digital etiquette on the effectiveness of interaction between faculty and

students in the university online community, taking into account the comparison of various forms of communication and their influence on learning outcomes and professional development of students.

Inclusion and exclusion criteria were developed based on the PICO research question in the study: how do network communication culture and digital etiquette in online communities (I) affect the interaction between faculty and students (P) compared to traditional forms of academic communication (C) to ensure effective learning and professional development of students (O)?

Accordingly, for the systematic review, only studies were selected that examined the phenomenon of "network communication culture and digital etiquette", online communities (Table 1), forms of academic communication, and their impact on the effectiveness of learning and professional development of students. Participants in the selected studies were exclusively university faculty and students (the field of study is not significant).

Table 1

Basic concepts of the systematic review

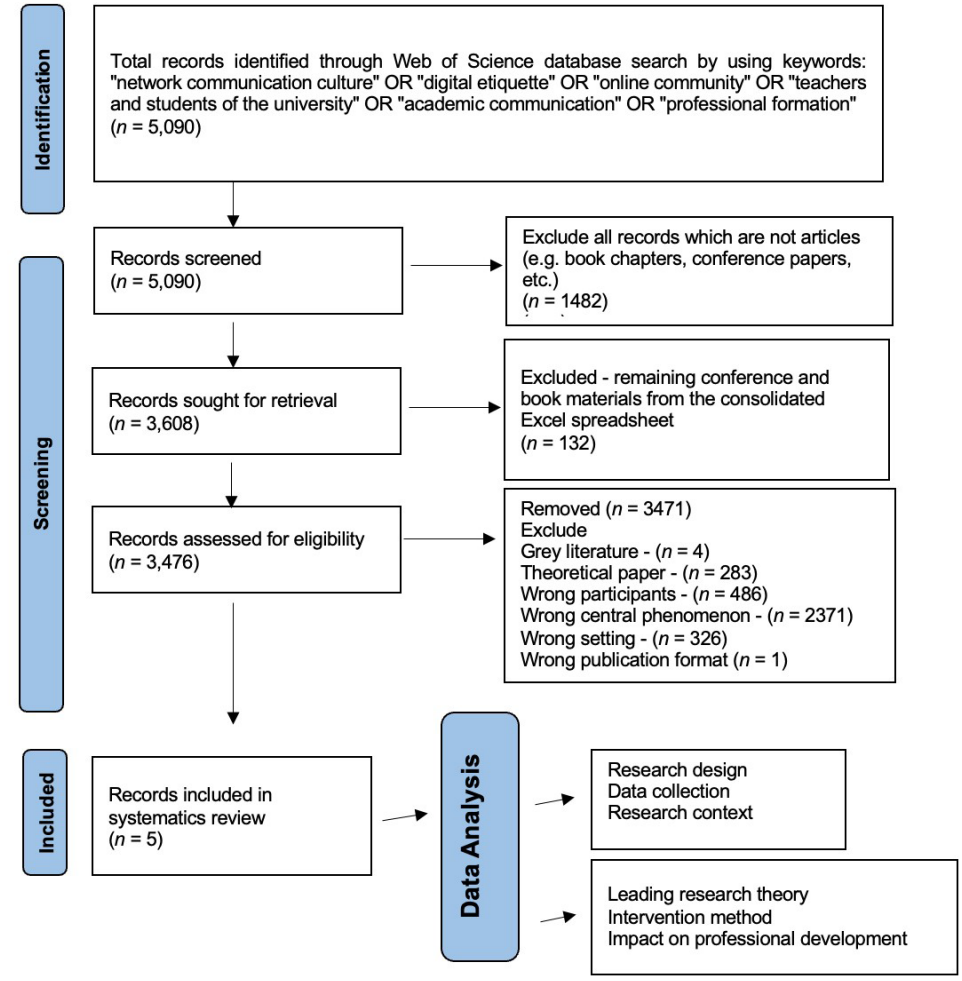
PICO	Keywords	Alternative
P	university lecturer university student	teachers and students of the university
I	network communication culture digital etiquette online community	netiquette
C	classroom classes extracurricular activities forms of control and assessment	lecture, practical classes circles, sections, electives exam
O	professional development	academic achievement professional formation

The empirical basis of the research comprised materials indexed in the Web of Science scientometric database, as it features the most stringent selection criteria for scientific journals, ensuring maximum quality of indexed publications. The built-in tools allowed for complex searches using Boolean operators and various filters, tracking citations and scientific trends, as well as exporting bibliographic data for further analysis. The ability to select by keywords ensured accuracy and relevance of search results for the specified research topic.

Search descriptors for the categories "title", "abstract", and "keywords" included the following terms: "network communication culture" OR "digital etiquette" OR "online community" OR "teachers and students of the university" OR "academic communication" OR "professional formation". The chronological framework of the

study covers the period from 1975 to 2025, although the first article on the research topic according to Web of Science data was in 1980, and steady growth began in 2016, reaching a maximum peak in 2022 with more than 400 articles per year and 9793 citations. Peer-reviewed journal publications were used as the selection criterion, excluding conference materials, dissertations, monographs, individual chapters, and report documentation. Language restrictions were not applied when selecting materials [14].

The methodological design used in this study is visually presented in Figure 1 and described in detail in the subsequent sections.



Source: Syzdykbayeva et al., 2025

Fig. 1. PRISMA flow diagram

Data Selection and Extraction Process

The quality of included studies was assessed using the Joanna Briggs Institute (JBI) checklist, which is well-suited for evaluating qualitative research [28]. Considering that this review covers qualitative, mixed methods, and quantitative research, the JBI approach was chosen for its versatility in assessing various methodologies. The JBI checklist consists of 10 criteria, each rated as either "Yes", "No", or "Uncertain". The assessment process was conducted independently by the third and fourth authors. Any discrepancies were resolved jointly (Table 2).

Table 2

Inter-rater assessment correlation

Rater B Response	Rater A: Yes	Rater A: No	Rater A: Maybe	Total (Rater B)
Rater B: Yes	870	100	100	1070
Rater B: No	180	1200	200	1580
Rater B: Maybe	20	80	726	826
Total (Rater A)	1070	1380	1026	3476
Total Observations (N)	3476			
Observed Agreement (Po)	0,804372842			
Expected Agreement (Pe)	0,345354832			
Cohen's Kappa (Kappa)	0,7011707			

The presented contingency table demonstrates a statistically significant level of inter-rater agreement ($\kappa = 0.7$), indicating a high degree of reproducibility of results. Cohen's Kappa coefficient empirically confirms that the concordance of expert assessments significantly exceeds the random level, indicating the reliability of the methodology and the validity of the research tools. This value of inter-rater reliability meets established standards for scientific research and confirms the objectivity of the obtained data.

When conducting a systematic search in the Web of Science scientometric database using the complex search query "network communication culture" OR "digital etiquette" OR "online community" OR "teachers and students of the university" OR "Netiquette" OR "academic communication" OR "professional formation", 5,090 potentially relevant publications were identified. To increase the methodological rigour of selection, at the first stage, the publication type filter "Article" was applied, which allowed for the exclusion of conference materials, dissertation research, monographs, individual chapters, and report documentation, reducing the corpus of texts to 3,608 articles.

Further manual filtering of bibliographic information, carried out in Excel spreadsheet editor, ensured the exclusion of an additional 132 publications, including 52 conference materials (category S), 53 book fragments (category B), and 27 re-

cords with missing bibliographic data. As a result of the primary selection, an array of 3,476 articles was formed for subsequent screening.

The application of inclusion and exclusion criteria, focusing on thematic domains of network communication culture, digital etiquette in online communities, professional formation in the context of interaction between teachers and students of higher educational institutions, allowed for the identification of only 5 publications that fully met all established criteria (Table 2).

From 3,476 articles, 2,371 were excluded based on the indicator - does not correspond to the studied process: medical topics (articles dedicated to online communities of patients with various diseases – diabetes, oncology, mental disorders, studies in reproductive health, publications on mental health issues), socio-demographic studies (works focusing on elderly populations, migration process research, publications on social adaptation problems), commercial activities (marketing research, brand and sales analysis, studies of illegal commercial activities), social platforms and entertainment (studies of social networks, including Facebook, publications about online games, works dedicated to tourist online communities), social problems and deviant behaviour (studies of various forms of violence, publications on suicidal behaviour, works on alcoholism problems), sociocultural studies (publications on gender issues, studies of religious aspects, works on interpersonal relationships). A significant number of excluded publications were related to COVID-19 topics, reflecting the relevance of this issue during the period under review, but beyond the main focus of this study.

Also excluded from the analysis were 4 publications from the category of "grey literature" (unpublished dissertation research, preprints, project reports, and conference materials) that did not undergo peer review, which significantly limits the validity of the presented results and methodological reliability for integration into a systematic review of high level of evidence.

A significant array of excluded publications (n = 283) consists of theoretical works characterised by the absence of an empirical research component: conceptual articles, analytical reviews, and methodological works that do not present verifiable quantitative or qualitative data on the impact of network communication culture and digital etiquette on educational processes. These publications were limited to formulating theoretical models and hypothetical concepts without their subsequent empirical verification in a university educational environment.

The category of excluded works also included 486 articles with irrelevant samples of research participants, including pre-professional education schoolchildren, corporate training program attendees, and teaching staff without integration of the student contingent.

A separate category of excluded materials consisted of 326 articles demonstrating thematic proximity to the subject of research, but not meeting one or more inclusion criteria detailed in Table 3. A single case (n = 1) is represented by a publication of an inappropriate format – a descriptive report on a three-week virtual workshop on developing staff competencies for working with Web 2.0 technologies,

which does not contain structured scientific methodology, valid tools, and statistically substantiated conclusions, which does not meet the criteria requirements for scientific publications to be included in a systematic review [29–34].

This selection process allowed for focusing attention on publications directly related to the research issues, excluding works that do not correspond to the goals and objectives of the research.

Table 3

Thematically relevant studies excluded due to non-compliance with inclusion criteria

Example of a research identifier	Leading idea	Research contexts
A. Deroncele-Acosta, M. L. Palacios-Núñez, A. Toribio-López [29]	Digital transformation of education	– network etiquette and digital citizenship in the educational environment; – use of social networks and platforms (WeChat, Facebook, Twitter) for educational purposes; – implementation of e-learning and blended formats; – development of digital competencies and information literacy.
I. O. Gurianov, N. V. Konopleva, N. A. Gluzman et al. [30]	Professional development of educators	– modernisation of professional education for teachers; – creation and functioning of online communities of practice for teachers; – professional development and formation of educators; – development of pedagogical competencies in various subject areas.
A. Dolzhikova, V. Kurilenko, Y. Biryukova et al. [31]	Academic communication	– intercultural communication in the educational environment; – characteristics of student-teacher interaction; – development of communication skills in the online environment; – language aspects of academic communication.
L. C. Jackson, A. C. Jackson, D. Chambers [32]	Organisation of online learning	– creating and managing online communities; – development of effective distance learning methods; – ensuring the quality of online education; – supporting students in a virtual environment.
D. Lowe, T. Goldfinch, A. Kadi et al. [33]	Professional formation of students	– formation of professional identity; – development of professional competencies; – training of specialists in various profiles; – practical training in online format.
D. Mali, H. Lim [34]	Adaptation to post-COVID reality	– transformation of educational practices; – psychological aspects of online learning; – new models of interaction in the educational environment; – innovative approaches to organising the educational process.

Analysing these articles, the following general main ideas and themes can be identified. The digitalisation of education and the adaptation to online learning, especially in the context of the COVID-19 pandemic, have significantly transformed the educational process. Research conducted by F. Martin, C. Wang and A. Sadaf [35] demonstrated that the success of online learning substantially depends on the strategies teachers use to maintain student presence and engagement in the digital environment. C. Rapanta, L. Botturi, P. Goodyear et al. [36] emphasised the need to rethink pedagogical presence and learning activities in an online format.

Analysing communication aspects in the digital educational environment, M. Bond, V. I. Marín, C. Dolch et al. [37] investigated issues of effective interaction between teachers and students, including the use of various digital platforms for academic communication. F. J. García-Peñalvo, A. Corell, V. Abella-García et al. [38] noted the importance of developing digital competencies of teachers to ensure quality online education.

The integration of new technologies into the educational process, including artificial intelligence and digital tools, is becoming a key factor in the transformation of education. W. Holmes, M. Bialik and C. Fadel [39] investigated the impact of AI technologies on the quality of education and academic communication, emphasising the need to develop ethical principles for their use.

In the context of professional development of educators, J. König, D. J. Jäger-Biela and N. Glutsch [40] noted the importance of developing digital competencies of teachers and their adaptation to new teaching methods. P. Mishra and M. J. Koehler [41] developed the Technological Pedagogical Content Knowledge concept, defining key areas of professional development for educators in the digital era.

C. R. Graham, J. Borup, C. R. Short et al. [42] conducted a meta-analysis of the effectiveness of various learning formats, demonstrating the advantages of blended learning compared to traditional formats. H. Liu and X. Zhang [43] investigated success factors for mobile learning in higher education. The formation of professional identity of students in online education conditions acquires special significance. J. Tondeur, S. K. Howard and J. Yang [44] investigated the development of digital competencies of future specialists, emphasising the importance of integrating technological skills with professional knowledge. G. Falloon's research [45] demonstrated how digital tools affect the formation of professional identity of students in an online environment.

In the context of the international aspect of online education, language and cultural barriers in the virtual educational environment present significant challenges. The adaptation characteristics of foreign students to online learning reveal several key factors for successful integration into the digital educational environment.

Summarising the research results, it can be noted that the digital transformation of education requires a comprehensive approach to organising learning and communication. As B. Williamson, R. Eynon and Potter J. [46] demonstrated, the

success of the educational process in a digital environment depends on the balanced development of technological infrastructure, pedagogical approaches, and communication practices.

Despite non-compliance with criteria 2 and 3, some articles were strong and engaging for reading and analysis. These include studies on the knowledge and practice of digital citizenship among higher education students conducted by A. Al-Abdullatif and A. Gameil [2]; students' perceptions of digital opportunities in university education by E.G. Belyakova, S. A. Bykov, M. P. Zemlyanova et al. [3]; and an experimental study on collaborative recommendation of e-learning resources by N. Manouselis, R. Vuorikari and F. Van Assche [47].

Results and Discussion

In accordance with the established inclusion criteria for the systematic review, five studies were selected that meet the stated research objective. Following the PRISMA methodology, the selection process included screening by titles and abstracts, followed by full-text assessment of publication relevance. The final sample is represented by studies covering the period from 2000 to 2023 and demonstrating geographic diversity (USA, Taiwan, Sweden, Spain, and New Zealand) (Tables 4, 5).

Table 4

Main characteristics of the reviewed studies for the systematic review

N	Research identifier	Research design	Data collection	Research context
1	J. A. Goett, K. E. Foote [48]	Qualitative	– observation of student work; – generalisation of pedagogical experience; – review of literature and existing resources.	United States (Research on Web-Based Learning of Students in Higher Education)
2	K. Y. Liu [49]	Qualitative	– analysis of documents and literature; – analysis of existing online community cases (e.g. Tapped In, FarNet, ILF).	Taiwan (Development of an Online Community Model for Professional Development of Future Teachers)
3	A. W. Ou, H. Malmström [50]	Mixed	– semi-structured individual interviews with 19 master's students.	Sweden (Research on Communicative Competencies in English-Medium Higher Education)
4	F. Sánchez Vera, A. Tellez Infantes, J. E. Martínez Guirao et al. [51]	Mixed	– assessment sheets to determine achievement level for each project; – Likert-type surveys for students at the end of each course; – open interviews with teachers and the management team; – ethnographic field research over two academic years; – documentary sources; – direct observation.	Spain (Development of Pre-Professional Identity among Vocational Education Students)

5	K. Shephard, K. Brown, T. Guiney et al. [52]	Qualitative	– semi-structured interviews	New Zealand (University Community's Use of Social Media)

Note. Research identifier is presented in alphabetical order.

Within the framework of a systematic analysis of the influence of network communicative culture and digital etiquette on the effectiveness of interaction between teachers and students in university online communities, six key studies were examined, covering the period from 2000 to 2023. The geographical diversity of the research, including experiences from the United States, Taiwan, Sweden, Australia, Spain, and New Zealand, allows for examining the issue in various cultural contexts of higher education.

The evolution of network communicative culture can be traced from the basic principles of digital etiquette, studied by J. A. Goett and K. E. Foote [48], including rules for effective email communication and correct use of online resources, to modern forms of digital communication, explored by A. W. Ou and H. Malmström [50], where digital multimodalities and AI tools have become an integral part of academic communication. A structural approach to organising online communication is presented in K. Y. Liu's [49] research, which proposed a comprehensive model of online communities with clearly defined communicative tools and participant roles.

The studies demonstrate the transformation of interaction between teachers and students. G. Samarawickrema, R. Benson and C. Brack [53] investigated teachers' adaptation to new pedagogical approaches through the mastery of Web 2.0 technologies, while K. Shephard, K. Brown, T. Guiney et al. [52] analysed the integration of social media into the university community. Of particular interest is the research conducted by F. Sánchez Vera, A. Tellez Infantes, J. E. Martínez Guirao et al. [51], who examined the interaction through the lens of open pedagogy.

An important aspect of the research is the comparison between new and traditional forms of communication. K. Shephard, K. Brown, T. Guiney et al. [52] noted a balanced combination of innovative digital tools with traditional communication methods, a finding supported by the study of A. W. Ou and H. Malmström [50], which demonstrates the organic integration of digital tools into academic communication.

The research results demonstrate the multifaceted impact of digital communication on educational outcomes. K. Y. Liu [49] emphasised the significance of online communities for the professional development of future educators, while F. Sánchez Vera, A. Tellez Infantes, J. E. Martínez Guirao et al. [51] demonstrated a positive influence on the formation of pre-professional identity and academic performance. The foundational study by J. A. Goett and K. E. Foote [48] highlighted the emergence of new research and learning skills within the digital environment.

The methodological diversity of the studies, including both qualitative [48, 49, 52] and mixed methods [50, 51], as well as practice-oriented approaches [53], provides a comprehensive understanding of the impact of network communicative cul-

ture on the educational process in higher education, allowing us to trace not only the evolution of digital communicative practices but also their impact on the quality of education and professional development of students.

Table 5

Approaches to professional formation in the digital environment

N	Research identifier	Theory	Method	Professional formation
1	J. A. Goett, K. E. Foote [48]	Concepts of Network Etiquette (netiquette)	– web warm-up activities; – working with search engines (Alta Vista, Excite, Infoseek, Lycos, MetaCrawler).	Web skills training techniques
2	K. Y. Liu [49]	Concepts of "Community of Practice"	– live chat; – collaborative spaces; – inquiry Learning Forum; – collaborative reflection using the Japanese Lesson Study Model.	– creating opportunities for continuous professional interaction; – development of reflective practice.
3	A. W. Ou, H. Malmström [50]	Theory of Communicative Competence in EMI (English Medium Instruction)	– AI subtitles for better understanding of lectures through reading and listening; – text-and-speech for listening to scientific articles in an informal setting Grammarly Google Translate.	Expanding the communicative repertoire through digital tools developing skills in using AI tools for academic communication
4	F. Sánchez Vera, A. Tellez Infantes, J. E. Martínez Guirao et al. [51]	Concept of Pre-Professional Identity (PPI) OER-enabled pedagogy	– project-based learning; – publishing works in open space (YouTube); – local Networks: 5 Hours of Training on Open Licenses, Creative Commons, Digital Identity Computer Safety.	– the quality of work documentation improved; – student motivation increased; – a better understanding of copyright and open licenses was formed; – students' perception of their professional competence improved; – students became more actively involved in the professional community.
5	K. Shephard, K. Brown, T. Guiney et al. [52]	Theory of Social Embeddedness of Technologies Theory of University Interaction with Communities	Purposeful use of different platforms for different audiences: Instagram – for undergraduate students; Twitter; – for academics and postgraduate students; Facebook; – for student groups as a permanent community resource transfer of personal social media experience into the professional sphere.	– using social media for professional development; – mastering social media through personal communication.

The analysis of the theoretical foundations, methods, and results of professional formation in the examined studies allows revealing various aspects of the network communicative culture's impact on the educational process. Regarding network

communicative culture and digital etiquette (I), the studies demonstrate an evolution of theoretical approaches. J. A. Goett and K. E. Foote [48] laid the groundwork through the netiquette concept, focusing on rules of correct internet behaviour and email communication. K. Y. Liu [49] developed this direction through the "Community of Practice" concept, while A. W. Ou and H. Malmström [50] brought the understanding of communicative competence to a new level, incorporating digital multimodalities and AI tools.

The interaction between teachers and students (P) is investigated through various methodological approaches. G. Samarawickrema, R. Benson and C. Brack [53], drawing on the situated cognition concept, studied this interaction through the experience of collaborative work in a wiki environment. F. Sánchez Vera, A. Tellez Infantes, J. E. Martínez Guirao et al. [51] explored the interaction through the lens of Project-Based Learning and publishing works in an open space. K. Shephard, K. Brown, T. Guiney et al. [52] analysed differentiated use of social platforms for various educational purposes and audiences.

Compared to traditional communication forms (C), the studies show the integration of new tools into the educational process. From basic Web Warmup Activities and search systems [48] to modern AI subtitles, Text-and-Speech technologies, and tools like Grammarly [50]. Meanwhile, K. Shephard, K. Brown, T. Guiney et al. [52] noted the importance of a rational combination of new technologies with traditional approaches.

Regarding educational outcomes and professional development (O), the studies demonstrate a comprehensive impact of digital communication. K. Y. Liu [49] demonstrated how online communities create opportunities for continuous professional interaction and reflective practice. F. Sánchez Vera, A. Tellez Infantes, J. E. Martínez Guirao et al. [51] recorded improvements in work documentation quality, increased motivation, better understanding of copyrights, and more active participation in the professional community. K. Shephard, K. Brown, T. Guiney et al. [52] emphasised the significance of transferring personal social media experience into the professional sphere.

Thus, the development of theoretical approaches and methodological tools shows how network communicative culture and digital etiquette transform educational interaction, creating new opportunities for professional development while maintaining a balance with traditional communication forms.

Conclusion

The systematic review enabled us to address the primary research question regarding the impact of network communicative culture and digital etiquette in online communities on the interaction between university teachers and students, compared to traditional forms of academic communication, in promoting effective learning and professional development. The analysis demonstrated that online communication, grounded in the principles of digital etiquette and network communicative culture, is comparable to traditional forms of interaction and, in some

respects, offers additional advantages – particularly in the context of developing professional digital competencies. The evolution of network communicative culture from 2000 to 2023 demonstrates a clear progression from basic digital etiquette to complex multimodal interaction systems. This transformation has fundamentally changed the ways of knowledge transmission and professional competence development in higher education. A key finding is the formation of hybrid communication models that effectively combine traditional academic interaction with digital innovations. The success of these models largely depends on the development of both technical competencies and cultural understanding of digital communication norms. Moreover, our study shows that well-structured online communities can significantly enhance professional development by providing opportunities for continuous learning and reflective practice.

Our review also reveals critical challenges requiring resolution in future research and practice. These include ensuring equal access to digital resources, developing comprehensive digital competency frameworks, and maintaining meaningful human interaction in the context of increasingly technology-mediated communication. As higher education evolves, institutions need to focus on forming communicative cultures that improve both immediate learning outcomes and long-term professional development. Future research should investigate the impact of emerging technologies, such as artificial intelligence, on academic communication, explore intercultural aspects of digital interaction, and develop more robust frameworks for assessing the effectiveness of online community engagement in professional education. Thus, our study confirmed that network communicative culture and digital etiquette are key factors determining the effectiveness of interaction between teachers and students in university online communities. The most effective approach is a hybrid model that combines the advantages of traditional and digital communication, addressing the research question about the comparative effectiveness of various forms of academic interaction.

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