

## Postprint: Model Construction of “Serendipitous Learning” from the Perspective of Information Encountering Theory

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### Abstract

[Purpose/Significance] In the “Internet Plus” ecosystem, information encountering is an important and efficient way of information acquisition, and learning after information encountering (serendipitous learning) is even more significant. [Method/Process] Based on a review of the concept of information encountering, related theories and models, this study analyzes serendipitous learning from the perspectives of connectivism and new constructivism, constructs a serendipitous learning model, and proposes relevant strategies to promote serendipitous learning. [Results/Conclusion] The serendipitous learning model includes six major elements: information encountering, serendipitous information management, learning strategies, learning process, learning outcomes, and learning sharing. Strategies to promote serendipitous learning include: improving information literacy education, perfecting the technical ecosystem, and designing community information architecture.

### Full Text

#### Abstract

[Purpose/Significance] Under the “Internet Plus” ecological environment, information encountering represents an important and highly efficient method of information acquisition. Consequently, learning that occurs after information encountering—termed encountered-information-based learning (EI-learning)—holds even greater significance. [Method/Process] This paper reviews the concepts, relevant theories, and models of information encountering, analyzes EI-learning from the perspectives of connectivism and new constructivism, constructs an EI-learning model, and proposes strategies for facilitating such learning. [Result/Conclusion] The EI-learning model comprises six core elements: information encountering, encountered information management, learning strate-

gies, learning process, learning outcomes, and learning sharing. Strategies to promote EI-learning include improving information literacy education, perfecting the technological ecosystem, and designing community information architecture.

**Keywords:** “Internet Plus” ecology; information encountering; encountered-information-based learning; model construction

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## 1 Introduction

In the “Internet Plus” ecological environment, anyone can become a creator, disseminator, and receiver of information. The cumulative nature of information production, exchange, dissemination, and utilization has endowed new technologies with information generation and transmission capabilities that far exceed individuals’ capacity to assimilate information. Consequently, while enjoying convenient access to abundant information, people face numerous challenges. On one hand, limited cognitive resources make individuals vulnerable to information overload and cognitive overload when the volume of acquired information exceeds their processing capacity. On the other hand, among the information obtained, information scarcity often prevails regarding content that meets users’ needs or solves their problems, due to information pollution, noise, and redundancy.

In today’ s era of Web 2.0 applications and mobile internet proliferation, information encountering has become a ubiquitous and highly effective information acquisition method that subtly influences how people obtain, transmit, and share information. Consider this scenario: Student A wants to know about Student B’ s recent activities and discovers through B’ s WeChat Moments or QQ Space that B has shared an article titled “Information Retrieval Methods and Techniques.” By clicking the link, A accesses this information—a topic of personal interest (or something A had previously wanted to learn or solve), yet not the information originally sought at that moment. This exemplifies a typical information encountering situation.

Current research on information encountering predominantly originates from the field of library and information science, with most scholars focusing on the acquisition phase of encountered information while rarely addressing the learning that follows. This subsequent learning involves individuals expanding upon, re-searching, comprehending, and applying encountered information, then internalizing it into their existing knowledge structures to form corresponding knowledge, beliefs, and attitudes, and finally using media to disseminate and share relevant thematic knowledge. Interest-driven and problem-oriented “information-encountering-based learning” helps address issues of information

overload, information waste, and information fragmentation. Therefore, based on a systematic review of current research on information encountering, this paper attempts to construct an EI-learning model and propose corresponding strategies for its promotion.

## 2.1 Conceptual Origins of Information Encountering

During information seeking processes in both online and daily life contexts, individuals are not purely “rational users” and frequently experience unplanned encounters. The concept of information encountering was first proposed by S. Erdelez and introduced to China by Pan Shuguang in 2008. To date, scholars have not reached a unified definition [1-2]. Erdelez [3] defined it as “a memorable experience of accidentally discovering useful or interesting information” in information retrieval contexts—information related to background problems in one’s subconscious. This process (see Figure 1 [Figure 1: see original paper]) involves noticing, stopping, examining, and acquiring encountered information, which Erdelez categorized as problem-related (past, present, or future) or interest-related information [4].

Other scholars have defined information encountering from different perspectives. Zhang Qian and Deng Xiaozhao [2] view it as users obtaining useful or interesting information with low engagement and without planning or expectation. K. Williamson [5] describes it as unexpectedly discovering certain information while engaged in other activities. In summary, the essence of information encountering is a non-linear, passive information behavior occurring with low engagement and without expectation, ubiquitous in physical environments (e.g., libraries), virtual environments (e.g., communities, digital searches, browsing), and everyday life information seeking (ELIS). It typically occurs in two scenarios: (1) active information searching based on current needs (purposeful, active information seeking), such as when searching for A and accidentally discovering B, as described by E. Erdelez et al. [6]; or (2) passive information seeking (purposeless, passive information seeking, purely by chance), such as when aimless browsing, scanning, or searching leads to exciting, beneficial results (though frustration or disappointment may also occur depending on the type of encountered information).

Characteristics of information encountering include: other-purpose or no-purpose, low expectation, unexpectedness, and unpredictability. Influenced by users, environment, information, and time, it can enhance users’ information acquisition capabilities and interests, save time, and inform the design and improvement of information systems.

## 2.2 The Position of Information Encountering in Information Behavior

T. D. Wilson [7] analyzed and integrated existing research models to propose a nested model of information behavior (see left side of Figure 2 [Figure 2: see

original paper]). This model elucidates the relationships among information behavior, information seeking, and information searching, positioning web-based information searching as nested within information seeking, which in turn is part of information behavior. Although this model implicitly includes information encountering within information seeking, it does not explicitly explain this behavior. N. K. Agarwal [8] argues that unexpectedly encountered information is frequently overlooked in information behavior models. Building upon Wilson's nested model, Agarwal embedded information encountering within information behavior to propose an extended nested model of information behavior (see Figure 2 [Figure 2: see original paper]).

### 2.3 Related Models of Information Encountering

Scholars have proposed various information encountering models from different perspectives. Regarding users' perception of information encountering, J. Lawley and P. Tompkins [9] developed a perception steps model that divides the perception of information encountering into six stages, denoted by E (for Encountering): E-1, E, E+1, E+2, E+3, and E+4. E-1 represents the pre-encounter perceptual state, while E+1 represents the post-encounter state. These six stages describe users' mental preparation before encountering, the encountering occurrence, perceiving the potential role of encountered information, further confirming its role, taking action, and evaluating the information encounter, with "E+1  $\rightarrow$  E+2  $\rightarrow$  E+3" forming an interactive cycle of repeated perception and confirmation.

From the perspective of information encountering occurrence, S. Erdelez [4], L. McCay-Peet and E. G. Toms [10], and L. Dantonio, S. Makri, and A. Blandford [11] have proposed process models of information encountering. S. Makri and A. Blandford [12] discussed an extended model of the information encountering process by refining their earlier model, describing the process as: encountering occurring in unexpected situations under the influence of personal insight; users connecting information to their problems or interests; predicting information value; exploring its value; and generating beneficial results. They further explored how to design digital information environments to support information encountering. M. P. E. Cunha [13], in his organizational-level model of information encountering development, posited that the information encountering process involves users unintentionally discovering solutions to problem B while seeking answers to problem A, facilitated by enabling conditions and bidirectional associations.

From the perspective of influencing factors and characteristics, T. Jiang [14] constructed an integrated model of online information encountering using qualitative analysis and critical incident technique, comprising three stages: information encountering environment (browsing, searching, socializing), three steps of information encountering occurrence (noticing, examining, acquiring), and further utilization of encountered information (storing, self-using, sharing). Jiang also analyzed three major influencing factors: user (emotion, attitude, etc.), in-

formation (type, quality, etc.), and environment (time, interface, etc.). Tian Lizhong and Yu Biyang [15] explained the occurrence mechanism of academic problem-solving encounters for researchers using individual, situational, and informational factors. Yu Biyang [16] proposed a characteristic model of information encountering based on its core feature of being purposeless or other-purpose.

## 2.4 Shortcomings in Information Encountering Research

Domestic research on information encountering remains in its infancy, primarily introducing foreign scholars' findings, while international research has focused on theoretical frameworks, conceptual definitions, characteristic analysis, process models, and element models. Summarizing the current state of research reveals several problems and deficiencies: (1) Scholars have primarily focused on and remained at the acquisition stage of encountered information, with little attention paid to deep learning and transfer application after encountering. In reality, under the "Internet Plus" ecological environment, encountered learning holds greater value for improving information subjects' knowledge systems, enhancing their competency structures, and solving practical problems. Moreover, information encountering constitutes only part of information behavior, whereas learning based on information encountering deserves greater attention. (2) Existing information encountering models suffer from procedural or path defects, failing to incorporate post-encounter behaviors such as re-searching, understanding, learning, and sharing into a complete, systematic learning model. (3) How does information encountering learning integrate with education in the "Internet Plus" environment? How can people leverage the transformation of information acquisition and learning methods along with new information technologies to convert encountered information into knowledge and skills, and subsequently internalize them into competencies and wisdom? Searching for "encountered learning" or "information-encountered-based learning" as keywords in CNKI and Google Scholar yields no literature that elaborates deeply on encountered learning. Therefore, this paper attempts to construct an EI-learning model and propose enhancement strategies to address these questions.

## 3.1 The Concept of Encountered Learning

This paper abbreviates "information-encountering-based learning" as "encountered learning." Encountered learning can be understood as: learning based on users' problems (past, present, future) and interests that develops into personalized knowledge, competencies, and wisdom through the processing of information obtained via information encountering. Like micro-learning and mobile learning, encountered learning represents a form of informal, social, and ubiquitous learning. However, its most distinctive characteristic is the progression from passive to active to automatic learning—passively encountering useful information, actively managing and learning from encountered information, and internalizing it into an automatic learning habit or approach due to the valuable outcomes produced. Encountered learning is a learning behavior that can

only occur after information encountering, representing the processing of encountered information within a digital information environment supported by the “Internet Plus” ecosystem.

Anyone may experience information encountering anytime and anywhere in the “Internet Plus” environment, which serves as a primary pathway for information sharing. By registering accounts on social media platforms like Zhihu, WeChat, and QQ using mobile devices, individuals can unexpectedly encounter and share various types of information and creative ideas. The same information may become encountered information in different people’s “horizons,” as certain information always resonates and connects with one’s thinking. Supported by new-generation information technologies, information encountering can both broaden horizons and enable information dividends and sharing. However, from a knowledge construction perspective, information encountering alone does not achieve knowledge sharing after individual learning, nor does it internalize encountered information into knowledge, wisdom, creativity, or inspiration. The relationships among information encountering, knowledge sharing, and encountered learning are illustrated in Figure 3 [Figure 3: see original paper].

### 3.1.2 Connectivist Perspective on Encountered Learning

In the “Internet Plus” environment, the concept of learning has shifted from memorizing repetitive information to discovering and effectively utilizing information. Information encountering-based learning represents an information-based learning approach focused on knowledge connectivity, through which discretely distributed data and information can be effectively transformed into information networks and knowledge systems to achieve integrated understanding. Connectivism [17] posits that nodes (information sources) in the networked world can autonomously refine, recreate, and interpret knowledge, with knowledge organized in dynamic network and ecological forms. Learning is the process of continuously connecting nodes and forming internal knowledge networks, including creating external network nodes and forming internal intelligent learning networks (a knowledge structure) that individuals constantly adjust and reshape. Learning aims to connect and aggregate nodes to maintain knowledge currency and connect with new knowledge. In the new technological ecology, various information sources form networked knowledge networks containing vast amounts of information and knowledge existing in fragmented forms. Information encountering occurs constantly at every node, and individuals can actively connect and engage in encountered learning across multiple nodes using hypermedia, mobile internet, cloud computing, and other technologies, thereby forming personalized, dynamic knowledge networks within larger knowledge networks that continuously adapt.

### 3.1.3 New Constructivist Perspective on Encountered Learning

New constructivism [17] holds that learning is a process of creative multi-level construction based on personal interests and needs, advocating that individu-

als select information centered on problem-solving and personal needs to avoid information overload. Encountering represents an alternative form of information selection, and encountered learning involves selecting information related to personal needs and problems (non-current consciousness) through encountering, then engaging in deep processing and multi-level construction. Therefore, personalized encountered learning can construct unique personal knowledge systems, and integrating encountered information with existing knowledge structures based on personal needs helps generate inspiration and creativity.

From the perspectives of both connectivism and new constructivism, encountered learning demonstrates a balance between individual learning socialization and personalization, reflecting the “Internet Plus” characteristics of integrated innovation, structural reshaping, and connecting everything. Connectivism emphasizes knowledge breadth, new constructivism emphasizes knowledge depth, and encountered learning can achieve the transition from connection to innovation, realizing the integration of knowledge depth and breadth.

## 3.2 Construction of the Encountered Learning Model

Based on a systematic review of domestic and international research on information encountering and existing information encountering models, this paper constructs an EI-learning model (see Figure 4 [Figure 4: see original paper]) through analysis of encountered learning.

### 3.2.1 Information Encountering

The “Internet Plus” characteristic of connecting everything, combined with a new-generation technological ecosystem, has made information encountering inevitable. The transition from information encountering to encountered learning requires a process of managing encountered information. Information encountering occurs when individuals passively and casually encounter information related to their interests and problems (past, current, future) within communities (BBS, Zhihu, WeChat, Weibo, etc.), during information searches, website browsing, or ELIS activities. When these needs automatically match with encountered information (acquisition of encountered information), the process enters the encountered information management stage, where personal, environmental, informational, and need-related factors influence the occurrence of information encountering. The brain is a multi-task, multi-problem storage system, and experience influence refers to the process where individuals’ interests and problems in non-current consciousness—derived from past experiences—transfer to the conscious level to influence current information behavior, serving as a prerequisite for encountered learning.

### 3.2.2 Encountered Information Management

The encountered information management stage involves two scenarios: (1) When encountered information cannot satisfy users’ need for deep understanding

of a topic, learners will actively use technical tools in the information environment to further conduct directed, network-style searches for relevant information and knowledge to compensate for deficiencies in encountered learning. However, exceptions may occur: during this search process, users might enter into another topic's information encountering and learning cycle. (2) When encountered information satisfies users' interests and needs, modern information technologies can be employed to manage encountered information, including storage, classification, and organization.

### 3.2.3 Encountered Learning Strategies

Encountered information based on interest and need stimulates users' expectations and motivation for further exploration, driving the entire encountered learning process and prompting individuals to employ both traditional learning strategies (cognitive, metacognitive, and resource management strategies) and networked learning strategies [17] (such as the "zero-storage and whole-retrieval" method, inclusive thinking, and deconstruction-reconstruction strategies) to learn from encountered information.

### 3.2.4 Encountered Learning Process

Encountered learning is guided by new learning theories for the network era, such as connectivism and new constructivism, and comprises three stages: (1) **Exploration and Absorption:** Primarily involves mining valuable components from encountered information and data, and using information technology and learning strategies for research, exploration, digestion, and absorption. (2) **Connection and Construction:** Includes both internal connection of encountered information and connection between encountered information and existing knowledge structures. Mere connection to expand knowledge network breadth is insufficient; multi-level selection and construction must increase knowledge network depth, similar to a shingle-overlapping process from simple to complex, from low-level to high-level, to personalize and "prune" the knowledge network and form knowledge and competencies based on encountered information. (3) **Reflection and Evaluation:** Through this stage, knowledge and competencies develop into personal wisdom with information technology support. Intelligent push technologies and services exist throughout the entire process from information encountering to encountered learning.

### 3.2.5 Encountered Learning Outcomes

Encountered learning outcomes include explicit knowledge: puzzle-solving (problems individuals were aware of but had not solved), new knowledge structures (processes, comparisons, classifications, etc.), experiential explanations (problems individuals were not aware they had, which encountering made them aware of and solved), creativity, and inspiration. Implicit knowledge refers to the internalization of encountered information into individuals' attitudinal,

behavioral, and emotional systems through encountered learning, which individuals may or may not be consciously aware of.

### 3.2.6 Encountered Learning Sharing

Encountered learning outcomes can achieve knowledge sharing through communities and websites, promoting information encountering and learning for oneself, others, or groups. Throughout this process, wisdom undergoes fluctuations from group to individual to group. When this encountered learning approach becomes an unconscious habit—reaching automaticity—it returns to the essence of information encountering.

## 4.1 Improving Information Literacy Education

You may have experienced this: when facing a situation, certain previously browsed information automatically comes to mind, or some information feels “familiar” yet you cannot recall its specific source or content. If casually “bumped-into” information is not well-organized and stored, it cannot be effectively utilized in the future. Most users frequently encounter information online but fail to capture and utilize it. S. Erdelez, J. Basic, and D. D. Levitov [18] found that American primary and secondary schools generally adopt five information literacy models as training standards, yet none explicitly includes information encountering, although these models all possess self-regulating capabilities that could “integrate” information encountering.

Integrating information encountering, personal encountered information management, and encountered learning into information literacy models can promote teachers’ overall information literacy improvement. By evaluating information credibility, validity, and relevance, and using digital technology to collect, retrieve, organize, and store it, students can enhance their encountered information management and learning levels. Information literacy courses should not only be incorporated into formal school curricula but, with the continuous popularization and openness of high-quality massive online resources such as MOOCs, micro-courses, open universities, and distance education, should also be included in online courses to cultivate encountered thinking and habits among teachers, students, and enterprise staff, teaching individuals to deeply analyze personal needs and establish connections with encountered information, using “What, How, Why” patterns to stimulate exploration desire for encountered information and raise awareness of encountered learning.

## 4.2 Perfecting the Technology Ecosystem

Although information technologies in the Web 2.0 era are dazzling, they are essentially mechanized, procedural Turing machine models. Future development requires more intelligent technologies and digital information environment designs to promote information encountering occurrence and facilitate encountered learning. For information system improvements, suggestions include: pushing

unrelated and related information at a 1:3 ratio, placing potentially interesting information at the one-third division line of horizontal or vertical layouts, improving information quality and visualization, and optimizing interactive interfaces. From the user perspective, diversifying search paths and maintaining a good mood and mental preparation for information encountering can increase the probability of information encountering and encountered learning. Technology has the potential to create information encountering experiences and can motivate users to adopt necessary strategies to increase encountering frequency. In summary, perfecting the technology ecosystem with information technology support can enhance favorable influencing factors for information encountering, comprehensively perceive different users' physical contexts (humidity, brightness, temperature, etc.), social contexts (community, interpersonal, economic, etc.), and psychological contexts (information seeking ability, interests, preferences, etc.), and provide targeted encountered information search assistance and personalized intelligent technologies and services required for encountered learning through integrated analysis.

### 4.3 Designing Community Information Architecture

Social media provides a favorable environment for information encountering. In the era of big data-driven learning, search engines such as Baidu, Google, and Sogou record and store users' complete and incomplete information behavior data. Using big data analysis to dissect individuals' search footprints and historical data, communities can be automatically generated by search systems for users who search for the same type of information beyond a certain frequency, sorted by attention level. Employing intelligent perception and push technologies to directionally push potentially relevant information to users of different age groups and integrating users' information behavior data with social media can increase encountering frequency during entertainment and chatting. Adding an "information push section" to existing social media or having systems automatically generate communities can both enhance encountering opportunities.

## 5 Conclusion

From the perspective of future education's more open, autonomous, authentic, and mobile characteristics, encountered learning will become one of the important ways for people to acquire knowledge and generate wisdom. Encountered learning increases the breadth, depth, and freedom of information and knowledge, facilitating the informatization process and forming a self-directed learning environment circle. "Internet Plus" drives the evolution from digital to intelligent and further to wisdom. In this process, information encountering transmits information and knowledge, while encountered learning acquires and develops wisdom. Research on encountered learning can help users effectively utilize encountered information. However, current research remains in its initial stages, and future studies should focus on developing technical support for encountered learning and implementing information literacy education integrated

with encountered learning into practice.

## References

- [1] Pan Shuguang. Research on Information Encountering in Different Contexts[J]. *Information Research*, 2012(8): 15-18.
- [2] Zhang Qian, Deng Xiaozhao. Literature Review on the Utilization of Encountered Information[J]. *Library and Information Service*, 2014, 58(20): 138-144.
- [3] ERDELEZ S. Information encountering: a conceptual framework for accidental information discovery[C]//*Proceedings of an international conference on Information seeking in context*. London: Taylor Graham Publishing, 1997: 412-421.
- [4] ERDELEZ, S. Information encountering: it' s more than just bumping into information[J]. *Bulletin of the American Society for Information Science and Technology*, 1999, 25(3): 26-29.
- [5] WILLIAMSON K. Discovered by chance: the role of incidental information acquisition in an ecological model of information use[J]. *Library & information science research*, 1998, 20(1): 23-40.
- [6] FISHER K E, ERDELEZ S, MCKECHNIE L. Theories of information behavior[M]. New York: Information Today, 2005: 179-184.
- [7] WILSON T D. Models in information behavior research[J]. *Journal of documentation*, 1999, 55(3): 249-270.
- [8] AGARWAL N K. Towards a definition of serendipity in information behaviour[J]. *Information research: an international electronic journal*, 2015, 20(3): 1-16.
- [9] LAWLEY J, TOMPKINS P. Maximising serendipity: the art of recognising and fostering potential[DB/OL]. [2016-04-20]. <http://www.cleanlanguage.co.uk/articles/articles/224/1/Maximising-Serendipity/Page1.html>.
- [10] MCCAY-PEET L, TOMS E G. The process of serendipity in knowledge work[C]//*Proceedings of the third symposium on Information interaction in context*. New York: ACM, 2010: 377-382.
- [11] DANTONIO L, MAKRI S, BLANDFORD A. Coming across academic social media content serendipitously[J]. *Proceedings of the American Society for Information Science & Technology*, 2012, 49(1): 1-10.
- [12] MAKRI S, BLANDFORD A, Woods M, et al. "Making my own luck" : serendipity strategies and how to support them in digital information environments[J]. *Journal of the Association for Information Science & Technology*, 2014, 65(11): 2179-2194.
- [13] CUNHA M P E. Serendipity: why some organizations are luckier than others[DB/OL]. [2016-09-08]. <http://fesrvsd.fe.unl.pt/WPFEUNL/WP2005/wp472.pdf>.
- [14] JIANG T. Online information encountering: modeling the process and influencing factors[J]. *Journal of documentation*, 2015, 71(6): 1135-1157.
- [15] Tian Lizhong, Yu Biyang. Research on Influencing Factors of Information Encountering Among Researchers[J]. *Information Science*, 2013(4): 71-77,85.
- [16] Yu Biyang. Empirical Analysis of Information Encountering Concepts and

Characteristics: Taking Researchers as an Example[J]. Journal of the China Society for Scientific and Technical Information, 2012, 31(7): 759-769.

[17] Wang Zhuli. Connectivism and New Constructivism: From Connection to Innovation[J]. Distance Education Journal, 2011, 29(5): 34-40.

[18] ERDELEZ S, BASIC J, LEVITOV D D. Potential for inclusion of information encountering within information literacy Models[J]. Information research, 2011, 16(3): 1-16.

### **Author Contributions**

Wang Wanwan: Drafted and revised the manuscript.

Zhang Jianian: Conceived the research and provided revision guidance.

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