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Theoretical Issues in Developing Scientific Research Competence in Higher Education

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ABSTRACT: In the context of higher education reforms oriented toward competency development and the strengthening of research elements in academic training, developing scientific research competence among students has become an urgent requirement. Engagement in scientific research activities enables students to cultivate scientific thinking, self-directed learning abilities, and creativity. This paper analyzes fundamental theoretical issues related to the development of scientific research competence for students in higher education. Based on a synthesis of domestic and international studies, the article clarifies key theoretical aspects, including the definition and structure of scientific research competence, major theoretical approaches to competence development, and factors influencing the formation and enhancement of students' scientific research competence. The findings contribute to theoretical foundations for guiding instructional design and building academic environments that promote research-oriented thinking in contemporary higher education.

KEYWORDS: Developing scientific research competence, higher education, research competence, scientific research, students.

1. INTRODUCTION

In the current context of higher education reform and global integration, scientific research activities are not only responsibilities of academic faculty but also constitute an essential component of students' learning processes. Participation in research enables students to develop scientific thinking, problem-identification and problem-solving abilities, while cultivating lifelong learning and research attitudes. However, in the reality of Vietnamese higher education, students' awareness of scientific research remains limited; most students have yet to fully understand the significance, procedures, and value of research for their academic development and future careers. Meanwhile, contemporary higher education is shifting from a knowledge-transmission model to a model that emphasizes research competence and creativity, requiring learners to possess solid scientific awareness. Therefore, fostering scientific research competence among university students has become an indispensable requirement, contributing to improving research-oriented higher education quality.

To effectively implement this objective, a clear theoretical foundation is required as a basis for designing curricula, instructional methods, and supportive academic environments. Derived from this practical need, this paper analyzes key theoretical issues in developing scientific research competence among students in higher education, including:

- Clarifying the concept and structural components of scientific research competence.
- Analyzing major theoretical approaches to the development of research awareness and competence.
- Identifying influencing factors and proposing measures to foster scientific research competence in the context of ongoing higher education reforms in Vietnam.

2. THEORETICAL ISSUES CONCERNING STUDENTS' SCIENTIFIC RESEARCH COMPETENCE

2.1. Concept of Scientific Research Competence

There are various perspectives on the concept of scientific research. According to Babbie (2011), scientific research is a systematic approach through which individuals investigate scientific phenomena, applying ideas and principles to generate new knowledge that explains objects and events. Vu Cao Dam (2011) contends that scientific research involves discovering the essence of phenomena, advancing scientific cognition of the world, or creating new methods and technical means to transform reality in service of human purposes. Operationally, scientific research may be defined as the process of constructing and validating scientific arguments about a phenomenon under investigation. Thus, scientific research is essentially a creative human activity aimed at understanding the world and generating valuable knowledge to transform it.

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According to Sebarová (2008), scientific research competence is an evolving and "open" system that includes disciplinary knowledge, procedural knowledge in the research field, and individual attitudes and dispositions that enable educators to conduct educational research within their professional roles. Nguyen Xuan Quy (2015) defines scientific research competence as the ability to explore and generate new scientific knowledge by uncovering the nature and laws of natural, social, and cognitive phenomena. In this sense, scientific research competence can be understood as the integrated capacity comprising subject knowledge, methods of scientific reasoning, and creativity that enable individuals to effectively identify and address research problems aligned with their professional field and responsibilities.

From our perspective, scientific research competence refers to the integrated capacity that encompasses disciplinary knowledge, logical thinking methods, and creative abilities enabling individuals to identify the essence and underlying laws of phenomena and solve discipline-specific problems efficiently and effectively

2.2. Structure of Scientific Research Competence

According to (Mori et al., 2025). research competence is a combination of skills, knowledge, and abilities. These abilities range from effectively applying technological tools and managing databases and software to adhering to ethical standards in research contexts. Research competence is not limited to technical proficiency; rather, it involves a broad and deliberate approach to acquiring and applying scientific knowledge to solve problems.

Their study proposes three dimensions of research competence (illustrated in Figure 1):

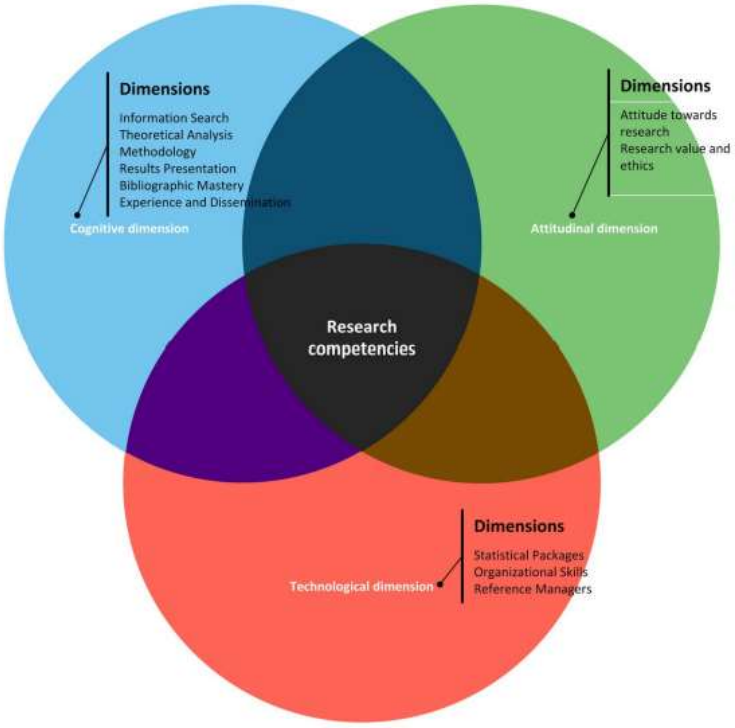

Figure 1. Design of the Dimensions of Research Competencies

The first is the Cognitive Dimension, which refers to the knowledge, skills, and abilities students possess to conduct research. Key components include information searching, theoretical content analysis, identifying appropriate methodological approaches, and presenting research findings. This dimension also entails mastering reference materials and dissemination processes.

The second is the Technological Dimension, which pertains to proficiency in technological tools relevant to research. Components include the use of statistical tools or software for information processing (descriptive and inferential statistics). It also

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encompasses skills in designing presentations to organize and communicate findings, as well as proficiency in various reference-management tools.

The third is the Attitudinal Dimension, referring to an individual's interest and commitment to developing a research project. This dimension includes the practice of ethical values to ensure the credibility and integrity of research outputs.

In summary, research competence comprises three core domains: cognitive (knowledge and methodology), technological (technical tools), and attitudinal (motivation and ethics), contributing to a comprehensive understanding of how these skills should be developed and assessed.

3. THEORETICAL APPROACHES TO DEVELOPING SCIENTIFIC RESEARCH COMPETENCE

Both international and domestic studies have proposed various theoretical approaches to developing scientific research competence. Prominent among them are:

Constructivist Approach. The constructivist perspective posits that knowledge is not transmitted unidirectionally from teacher to learner; instead, it is constructed through learners' active engagement based on their personal experiences (Piaget, 1972; Vygotsky, 1978). In the context of developing scientific research competence, this approach emphasizes students' agency in formulating research questions, independently searching for documents, and collecting and analyzing data. Instructors assume the role of facilitators who design open learning environments and encourage scholarly dialogue rather than imposing content or research outcomes. This approach enables students not only to acquire research knowledge but also to develop deep learning and independent research thinking.

Experiential Learning Approach. Rooted in Kolb's (1984) experiential learning model, this approach positions students in authentic research situations to develop a deeper understanding of the research process. Knowledge is constructed through a four-stage learning cycle: concrete experience, reflective observation, abstract conceptualization, and active experimentation. Applied to research competence development, students directly engage in practical research tasks such as sociological surveys, analysis of real-world datasets, scientific report writing, or participating in faculty-led research projects.

Competency-Based Approach. This approach focuses on identifying the constituent components of scientific research competence and subsequently designing training programs to ensure students achieve defined competency-based learning outcomes (Mulder, 2014). Research competence is viewed as an integrated construct comprising knowledge, methodology, research skills, critical thinking, scientific dispositions, and research ethics and values (Creswell & Creswell, 2018). Competency-based education emphasizes not only final learning outcomes but also the developmental process of competence formation, assessed through authentic evidence such as research reports, scholarly products, peer critiques, or individual research projects.

4. FACTORS INFLUENCING THE DEVELOPMENT OF STUDENTS' SCIENTIFIC RESEARCH COMPETENCE

Individual Factors.

Learners' personal attributes determine their readiness and effectiveness in engaging in research activities. Research motivation and interest are primary determinants that drive students to proactively identify problems and pursue research initiatives. Critical thinking ability, analytical skills, and self-regulated learning capacity play decisive roles in determining research quality.

Faculty-Related Factors.

Faculty members serve as mentors who guide and inspire students' research engagement. They influence students through research-oriented pedagogical approaches, topic selection support, methodological guidance, and assessment of research processes. Faculty research competence and their willingness to support students directly affect students' motivation and the quality of research outcomes.

Academic Environment Factors.

The academic environment comprises facilities, research centers, libraries, digital databases, scholarly communities, and opportunities to participate in research projects. Institutions with a strong research culture provide conditions for students to access scientific knowledge and engage in authentic research practices. Academic networks and research clubs further enhance students' experience and foster collaborative inquiry.

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Policy and Institutional Factors.

Institutional policies, curricula, and incentive mechanisms are foundational for promoting student research engagement. In many countries, research competencies are embedded in undergraduate learning outcomes to cultivate future knowledge producers. Universities should implement policies such as research scholarships, scientific awards, and credit recognition for research activities to encourage student participation.

5. MEASURES TO DEVELOP SCIENTIFIC RESEARCH COMPETENCE FOR UNIVERSITY STUDENTS

5.1. Developing Research Motivation, Attitudes, and Thinking

Research motivation and attitudes are fundamental factors determining students' initiative, perseverance, and quality of engagement in scientific research. To foster these factors, universities should organize seminars, colloquia, and inspirational research activities that help students understand the role of research in academia and professional practice. Through interactions with scientists, guest speakers, and research groups, students have the opportunity to cultivate research interest and appreciate the professional value of research, thereby enhancing intrinsic motivation.

Additionally, facilitating students' participation in regular academic workshops, seminars, and professional presentations allows them to gradually become familiar with authentic research environments, expand academic networks, and develop skills in questioning, critical thinking, and scholarly discussion. These activities are particularly important for establishing a research culture in higher education.

Moreover, curricula should integrate courses focused on critical thinking, academic skills, and research methodology. Such courses provide students with the theoretical foundation and essential skills necessary for conducting independent research. Consequently, students acquire not only methodological knowledge but also a proactive and positive research attitude. According to Ryan and Deci (2020), when intrinsic motivation is activated through meaningful and autonomous experiences, students tend to engage in research more sustainably and effectively.

5.2. Innovating Research Oriented Teaching Methods

To develop scientific research competence, university teaching needs to shift from knowledge-transmission models to research-oriented pedagogical approaches. Research-based learning enables students to acquire knowledge through investigation, discovery, data collection, and problem-solving rather than passive reception. This approach constitutes a core framework for "learning by doing," allowing students to experience authentic research processes within individual courses.

Within disciplinary courses, instructors can assign small research tasks such as data analysis, literature review, research proposal drafting, or conducting experimental surveys in groups. These tasks not only strengthen students' research methodology skills but also enhance collaboration and academic communication abilities. Furthermore, personalized guidance through research mentoring ensures that students receive support tailored to their competencies and project directions.

According to Healey and Jenkins (2009), integrating research experiences into coursework enables students to develop practical research skills and apply scientific methods to solve academic and professional problems. This underscores the critical role of innovating teaching methods in research-oriented higher education.

5.3. Building a Research Supportive Academic Environment

The academic environment functions as a comprehensive ecosystem supporting students' scientific research activities. Firstly, developing modern digital library systems and expanding access to international academic databases such as Scopus, Web of Science, and ResearchGate allows students to access up-to-date knowledge and practice standardized literature search and citation skills. This is a fundamental prerequisite for ensuring research rigor.

Universities should also establish student research support centers, research laboratories, or strong research groups that provide training in research methods, statistical consulting, data analysis support, guidance on scientific publication, and access to specialized research tools. The existence of such units fosters a vibrant scholarly community and encourages early and continuous student engagement in research.

Beyond the university, collaboration with enterprises, research institutes, and social organizations offers students opportunities to implement research projects in real-world contexts, access empirical data, and address problems arising from societal needs.

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5.4. Enhancing Policies, Support Mechanisms, and Incentives for Research

In addition to pedagogical methods and environment, institutional policies and support mechanisms are crucial for guiding and sustaining student research activities. Universities should establish funding programs to support student research, including financial grants for projects, assistance in conducting experimental research, international publication, and participation in academic conferences. Adequate financial resources empower students to propose research topics confidently and pursue long-term studies.

Reward and evaluation systems should be implemented comprehensively, including awards for scientific publications, student innovation prizes, and recognition of research outputs through academic credits or graduation requirements. This approach not only motivates students but also elevates the status of research within undergraduate education.

Furthermore, universities need to develop regulations, learning outcomes, and research development strategies aligned with a research-oriented institutional framework. Policies and organizational mechanisms ensure strategic direction and maintain research momentum in higher education. Well-designed policies thus support individual students while contributing to the cultivation of a research culture across the institution.

6. CONCLUSION

Developing scientific research competence among university students is both a necessary requirement and a strategic solution for modernizing Vietnamese higher education toward research-oriented, contemporary, and internationally integrated standards. The analyses presented in this paper not only contribute to the theoretical foundation but also provide practical guidance for designing curricula, teaching methodologies, and research development policies within higher education institutions. Future research could extend this work by empirically evaluating the effectiveness of the proposed measures, developing instruments to assess research competence, and surveying students across different academic disciplines, thereby refining both the theoretical framework and practical implementation strategies.

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