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# Investigation and Research on Students' Learning Ability in Vocational Undergraduate Education: A Case Study of the Integrated Circuits Major at Shenzhen Polytechnic University

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Vocational undergraduate education has entered a new stage of high-quality development, making the cultivation of students' learning ability a core issue in enhancing talent cultivation quality. This study conducted a questionnaire survey with 177 students majoring in integrated circuits at Shenzhen Polytechnic University (SZPU), focusing on six dimensions: self-learning proficiency, academic competence, goal planning, self-discipline, learning initiative, and learning environment. The results indicate that while students possess a solid learning foundation and clear career planning, significant deficiencies exist in the execution of academic plans, self-discipline, and learning initiative. In response to these issues, this study proposes four systematic improvement pathways from the institutional perspective: establishing a closed-loop academic navigation system incorporating "goal-process-feedback", creating an immersive "virtual-physical integrated" learning environment, implementing a multi-dimensional "cognitive-affective-practical" initiative activation plan, and building a synergistic cultivation mechanism for "self-discipline and core competencies". The findings aim to provide references for talent cultivation and teaching reform in vocational undergraduate integrated circuit programs.

*Keywords:* vocational undergraduate education, students' learning ability, integrated circuit major

## Introduction

As China steadily advances towards a learning society, the concept of lifelong learning has gradually become mainstream in modern educational thought, and learning ability is regarded as an indispensable core competence for students in vocational institutions. Since the promulgation and implementation of the newly revised "Vocational Education Law" in 2022, China's vocational undergraduate education has entered a new developmental stage, with significant progress made in various aspects such as institutional positioning, system construction, and institutional guarantees across all levels of vocational undergraduate schools. Under this background, how to promote the high-quality development of vocational undergraduate education has become a key issue requiring in-depth discussion. As one of the important majors within the vocational undergraduate education system, the integrated circuit major combines theoretical depth with practical requirements, and its construction and development have attracted considerable social attention. Compared to other majors, positions related to integrated circuits often require students to possess both a solid theoretical foundation and proficient

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practical operation and innovation capabilities, making the cultivation of comprehensive learning ability particularly important for students in this major.

Based on the current research status regarding the learning ability of students in vocational undergraduate integrated circuit programs, although scholars have paid some attention, related research remains in the preliminary exploration stage. This paper investigates the learning ability of students majoring in integrated circuits at Shenzhen Polytechnic University (SZPU) based on six core dimensions: self-learning level, academic status, goal planning, self-discipline, initiative, and interfering factors. The research adopted a questionnaire survey method, collecting 177 valid responses. By analyzing the survey data, current main problems are identified, and corresponding improvement strategies are proposed, aiming to provide theoretical reference for the teaching reform and professional construction of vocational undergraduate integrated circuit programs.

## Related Concepts

### Learning Ability

Learning ability, as a core literacy for individuals to adapt to society and achieve lifelong development, has long been an important field of research in education and psychology. The progress of research shows an evolution trend from single cognition to multiple integration, and from universality to contextualization. In Western research, early studies mostly focused on the cognitive level, regarding learning ability as an intellectual activity centered on thinking. Jean Piaget's cognitive development theory laid the foundation for staged learning, while Benjamin Bloom's taxonomy of educational objectives refined the cognitive process, providing a framework for assessing learning depth (Shanmugam, 2014). With the rise of humanistic and constructivist theory, the research perspective gradually shifted from "teaching" to "learning", beginning to emphasize the subjectivity of the learner. Albert Bandura's (Rumjaun & Narod, 2025) social learning theory, and subsequent research on self-efficacy, greatly enriched the understanding of learning motivation and belief systems. In recent decades, research has tended more towards comprehensive models. For example, "Learning to Learn" is regarded by the European Union as a key competence, integrating metacognitive strategies (planning, monitoring, regulating), cognitive strategies (memory, critical thinking), and affective strategies (motivation, perseverance) (Halász & Michel, 2011). Furthermore, research on "Learning Power" in the digital age has brought non-cognitive factors such as openness, curiosity, resilience, and strategic awareness to the forefront, considering learning ability as a malleable dynamic psychological spectrum.

Chinese research initially focused more on the field of basic education, concerned with the relationship between students' general intellectual factors and academic achievement. With the deepening of quality-oriented education and curriculum reform, the horizon of domestic scholars has continuously broadened, beginning to systematically introduce and localize other theories such as metacognition and self-regulated learning, and conducting in-depth exploration of the internal psychological mechanisms and cultivation paths of "autonomous learning". Particularly with the strategic advancement of China's vocational education modernization, learning ability research has gained specific attention in the context of vocational education. In recent years, Chinese research has increasingly focused on the contextualized learning ability composition and evaluation of specific majors and specific student groups, paying attention to the comprehensive ability of technical and skilled talents to analyze problems, transfer knowledge, and innovate in complex work scenarios, reflecting a strong application orientation.

In summary, although the theoretical construction and empirical research on learning ability in Chinese and foreign academia are quite abundant, empirical research focusing on students' micro-learning behaviors and psychological traits in the emerging field of vocational undergraduate education, especially in cutting-edge engineering majors like integrated circuits, is still relatively weak. Therefore, it is against this research background that this paper, based on the specific context of the vocational undergraduate integrated circuit major, will conduct a systematic analysis and empirical investigation of students' learning ability based on the six core dimensions of self-learning level, academic status, goal planning, self-discipline, initiative, and interfering factors.

**Learning Ability From the Perspective of Vocational Undergraduate Education**

The formal implementation of the newly revised "Vocational Education Law" in 2022 has further clarified the legal status and development direction of vocational undergraduate education, injecting strong momentum into the deep transformation of the vocational education system. In this context, vocational undergraduate education faces both important opportunities and many challenges. How to promote the higher-quality development of vocational undergraduate education, how to effectively enhance students' comprehensive abilities, and how to promote students' all-round growth have become practical issues that current vocational undergraduate institutions must deeply consider and strive to solve. Currently, vocational undergraduate institutions generally emphasize the cultivation of students' technical application ability and practical operational skills in education and teaching, and the curriculum is often designed around specific job requirements. However, this job-competency-oriented training model can easily confine students to a specific professional role, treating them as targeted technical tools, thereby somewhat neglecting the systematic cultivation of students' comprehensive quality and sustainable learning ability, which is not conducive to their long-term development and comprehensive growth.

Students in vocational undergraduate institutions should not only master solid professional knowledge and proficient practical skills but also gradually cultivate a series of key qualities during professional course learning and practical training, such as independent thinking ability, self-management ability, anti-interference ability, innovation awareness, language expression and communication skills, teamwork and leadership skills. Only with these comprehensive abilities can students flexibly respond in complex and changing work environments, effectively analyze and solve practical problems, properly handle various social relationships, and realize the transformation from "technical talent" to "skilled talent".

**Essential Learning Abilities for Integrated Circuit Talents in Vocational Undergraduate Education**

The integrated circuit major is a typical field that deeply integrates theory and practice. It should be a significant advantage for vocational undergraduate institutions to undertake its talent cultivation. In the education and teaching process of vocational undergraduate institutions, students' learning ability is always a key factor affecting teaching effectiveness, directly related to the overall quality of talent cultivation. With the accelerated technological iteration and continuous expansion of application scenarios in the integrated circuit industry, the requirements for talents are increasingly high. Integrated circuit professionals not only need solid professional knowledge reserves and proficient process operation skills but also must possess system analysis ability, technological innovation ability, cross-domain collaboration ability, project organization ability, problem troubleshooting and solving ability, and continuous learning ability. The formation of these key abilities is inseparable from the foundational support of learning ability—learning ability is the fundamental prerequisite for improving all other abilities. Therefore, in the talent cultivation process of the vocational undergraduate

integrated circuit major, systematic cultivation and effective enhancement of students' learning ability must be highly emphasized.

## Current Status of Learning Ability Among Integrated Circuit Majors at SZPU

### Good Self-Learning Proficiency

The 177 students involved in this survey were all enrolled through the National College Entrance Examination, originating from seven provinces including Guangdong. Their scores ranged from 557 to 588 points, with specific subject averages as follows: Chinese 108, Mathematics 98, Foreign Language 117. All students were science stream candidates (with Physics), and the comprehensive subject average was 242 points. From the above data, it can be analyzed that this student group overall possesses a solid learning foundation and good self-learning ability. Specifically regarding disciplinary abilities, their foreign language level shows a relative advantage, while their mathematics foundation is relatively weak.

For vocational undergraduate colleges, especially for a major like integrated circuits characterized by rapid technological iteration and deep integration of theory and practice, students' solid self-learning ability is particularly important. It is not only the foundation for digesting and absorbing classroom knowledge and compensating for disciplinary shortcomings but also the core engine for the sustainable development of their future careers. At the academic level, good self-learning ability means that students can actively construct knowledge systems, efficiently consult literature, and independently tackle difficult problems, thereby transforming passive reception into active inquiry and deepening their understanding of complex professional theories. At the practical level, technologies and processes in all links of integrated circuits, from design and manufacturing to packaging and testing, are rapidly updated. The specific technologies learned in the classroom may become outdated within a few years. Therefore, compared with mastering static knowledge points, possessing strong self-learning ability enables students to continuously track the technological frontier in future work, constantly adapt to new tools, and solve new problems.

### Insufficient Academic Competence

Survey data reveal a significant gap between the formulation and execution of students' learning plans. While the vast majority of students have the awareness to create learning plans, only 22.5% can strictly adhere to them long-term; more than half (53.1%) create plans but struggle to implement them consistently; a small number of students (3.3%) only plan and study systematically as exams approach, and 20.9% have no learning plan at all, with their learning behavior being relatively casual. This result indicates that only a minority of students can systematically plan and effectively execute their learning process.

It is noteworthy that despite the lack in the execution of learning plans, a high percentage of students (81.3%) are satisfied with their current learning status, while only 18.7% are dissatisfied. This phenomenon of "low execution-high satisfaction" reflects that some students may not yet have established a clear academic self-awareness, or have low self-imposed demands and target setting for the learning process.

The data reveal not only a lack of time management skills but also a deficiency in deeper academic competence. The learning plan, as an important tool for self-regulated learning, if not executed effectively, often indicates shortcomings in students' key abilities such as goal decomposition, process monitoring, and willpower/self-discipline. The phenomenon may point to problems such as vague goals, lack of reference, or low self-expectations, which to some extent obscures the real needs and potential for improvement in academic

development. In the context of vocational undergraduate education, the challenges posed by this academic state are particularly severe. If students are content with low-standard "completion" and lack the academic habit of striving for excellence and self-driven progression, they will find it difficult to maintain competitiveness in a rapidly changing industrial environment.

**Clear Goal Planning**

Survey data show that students' post-graduation plans are characterized by a distinct employment-oriented focus. Among them, 78% plan to seek employment directly after graduation, 6.2% tend to start a business, and another 14.6% plan to continue their studies abroad or domestically for higher degrees. This distribution structure highly aligns with the employment-centered educational orientation of vocational undergraduate education, reflecting that through four years of study and training, students can effectively align their personal development with market demands. In terms of ability certification, students' goal setting is equally clear: All students (100%) plan to pass the College English Test Band 4 (CET-4) during their university studies, and 61.5% have included the more challenging CET-6 certificate in their study plans, demonstrating a certain level of self-imposed demands and improvement awareness in their academic pursuits.

The above data indicate that students generally possess relatively clear short-term and medium-term development plans. This clear planning awareness plays a vital guiding role in their personal growth and academic effectiveness. Clear planning goals, first, provide students with the internal driving force for continuous learning. Once specific goals like "passing CET-6" and "achieving high-quality employment" are established, students' learning behavior shifts from passive coping to active pursuit, allowing them to allocate time and energy more rationally and achieve focused breakthroughs in key tasks. Secondly, clear planning helps students decompose macro career visions into executable phased tasks, making the four years of university learning a process of gradual accumulation and targeted effort, effectively avoiding blindness and confusion.

**Self-Discipline Needs Improvement**

Survey data indicate that the overall proportion of students who actively go to the library or study rooms is relatively low. Only 28.7% of students have formed the habit of going frequently, and 33.3% go only occasionally, while a high proportion of 37.8% usually do not frequently use these learning spaces; their learning behavior is significantly exam-driven, often concentrating their visits only before exams. This learning behavior pattern, to some extent, reflects that there is room for improvement in the student group's self-management and daily self-discipline.

The issue of self-discipline is crucial in the growth of vocational undergraduate students. Self-discipline is not merely the habit of studying on time; it more deeply embodies persistence towards personal goals, control over the learning process, and the ability to maintain focus in the face of distractions. For vocational undergraduate students aimed at technological application and innovation, what is taught in the classroom is merely the skeleton of knowledge. The refinement of extensive practical skills and the solution of complex engineering problems rely on continuous, in-depth independent study and project practice after class. A lack of self-discipline will make it difficult to guarantee the occurrence of this high-quality independent learning, leading to a superficial knowledge system and insufficient mastery of skills.

**Weak Learning Initiative**

Survey data show a polarized trend in students' annual extracurricular reading volume. 19.7% of students read more than 10 books per year, demonstrating good reading habits; 43.5% read between 5 and 10 books, at a

medium level; still, 36.7% read less than five books per year, indicating relatively limited investment in extracurricular reading. In terms of professional identity, 57.6% of students expressed great passion for their major, showing strong internal learning motivation; but it is noteworthy that 42.3% of students still lack a deep understanding of their own major and remain in a stage of cognitive ambiguity and emotional neutrality.

Active learning ability is crucial for the growth of vocational undergraduate students. The difference in extracurricular reading volume is essentially a direct reflection of autonomous learning habits and the awareness to self-expand knowledge boundaries, while the cognitive and emotional state towards the major profoundly affects students' willingness and initiative to engage in deep learning. From the perspective of vocational undergraduate education, the rapid iteration of technology determines that classroom instruction is only the starting point of the knowledge base. A student who is only satisfied with classroom textbooks and lacks the habit of autonomously constructing knowledge systems and tracking industry development through extensive reading will find it difficult to form sustainable professional competitiveness. Meanwhile, passion and understanding for one's field are the fundamental driving forces behind proactive exploration. Only when students truly recognize the value of what they are learning will they actively engage in project research, skill expansion, and cross-disciplinary learning.

**Influence of Learning Atmosphere and Environment**

The survey shows that the vast majority of students (83.5%) have a relatively clear understanding of the training objectives, educational models, and school characteristics of vocational undergraduate education, but 16.5% still have a vague understanding. In terms of academic development, the main confusions encountered by students in their university studies focus on three points: 41.8% of students identified "unclear learning goals" as the biggest obstacle, 29.3% reported not adapting to the university's teaching and learning, and another 10.7% admitted to having "insufficient learning motivation". Furthermore, students' internet usage habits reflect their time management and learning investment tendencies. 58.1% of students spend more than three hours online daily, and 32.7% spend two-three hours on the internet. Notably, nearly 60% (59.3%) spend most of their time on social networking and online games, while only 23.1% use the internet primarily for learning activities, indicating a significant diversion of learning energy by the online environment.

The above data collectively reveal the critical impact of the learning atmosphere and environment on student development. Clear goal awareness is the prerequisite for effective learning, and the fact that a considerable proportion of students are trapped in goal ambiguity and motivational deficiency requires not only systematic academic guidance but also relies on an overall atmosphere with clear goal orientation and visible paths to guide and shape. The dual effect of the online environment deserves attention. When nearly 60% of students invest a large amount of time in entertainment applications, the virtual space constitutes their important "second learning environment. Without positive guidance and effective management, this environment can easily become a source of distraction that consumes learning willpower and exacerbates goal loss; conversely, if online resources can be utilized effectively to build an online learning ecology that supports independent inquiry, collaborative communication, and professional expansion, it can be transformed into an important land for expanding horizons and empowering growth.

## Pathways for Enhancing the Learning Ability of Integrated Circuit Majors at SZPU

The above analysis indicates that integrated circuit majors at SZPU already possess a good learning foundation and clear goal planning, but there are still obvious deficiencies in academic competence, self-

discipline, and learning initiative. Under the dual background of high-quality development of vocational education and the rapid iteration of the integrated circuit industry, how to transform students' potential advantages into core competencies for sustainable development has become a key issue in talent cultivation. Based on the principle of "leveraging strengths, addressing weaknesses, and promoting integration", the school needs to build a systematic support system to promote the transformation of students from "passive learning" to "autonomous growth". Specifically, it can proceed along the following four paths:

**Constructing a Closed-Loop "Goal-Process-Feedback" Academic Navigation System**

Aiming at the problems of students' vague goals and poor plan execution, institutions should establish a progressive academic navigation mechanism spanning four years. In the first year, institutions carry out professional cognition and career planning education, decomposing macro goals into operable semester plans; in the second and third years, institutions arm "Learning Development Plans" and project-based tasks, where students formulate weekly/monthly plans and conduct regular reviews; in the fourth year, institutions focus on the integration of professional abilities and graduation standard assessment. Students utilize the online student management and service platform to record learning trajectories and generate personalized academic reports, helping students form a virtuous cycle of "planning-execution-reflection" (Long & Aleven, 2013).

**Creating an Immersive "Virtual-Physical Integrated" Learning Environment**

To optimize the learning atmosphere and reduce the negative impact of online entertainment, the school can further reshape the physical and virtual learning spaces. At the physical level, the school constructs one-stop student communities to support various innovation activities, extends laboratory opening hours, and establishes student innovation zones; at the virtual level, build professional learning communities, introduce industry case libraries, micro-lecture resources, virtual practice course resources, and online collaboration platforms, establish "online learning points", and incorporate online activity into course evaluation, guiding students to shift the focus of their internet use towards professional communication and resource acquisition.

**Implementing a Multi-dimensional "Cognitive-Affective-Practical" Driven Initiative Activation Plan**

Aiming at the problem of insufficient learning initiative, we design a "Three-Stage Activation" scheme: at the cognitive level, offer courses like "Introduction to Integrated Circuits", inviting industry experts to interpret technology trends; at the affective level, organize activities such as domestic chip innovation competitions and enterprise visits to strengthen professional identity and internal learning motivation; at the practical level, implement a "Reading Expansion Plan", release professional reading lists each semester, hold reading report meetings, and link extracurricular reading with course credits, systematically expanding students' knowledge horizons and exploration willingness.

**Establishing an Empowerment Mechanism for the Synergistic Cultivation of "Self-Discipline and Core Competencies"**

We embed the cultivation of self-discipline ability into the entire process of daily teaching and management. We promote habit-forming activities like "21-Day Learning Check-ins", strengthen the training in using time management tools; add phased small goals, peer assessment, and self-monitoring links in courses, increasing the weight of process assessment; simultaneously, incorporate anti-interference ability and concentration training into comprehensive quality development courses, and hone students' self-regulation ability in complex environments through team projects and time-limited tasks, laying a solid foundation for lifelong development.

## Conclusion

In the era of building a learning society and promoting the high-quality development of vocational education, enhancing students' learning ability has become a key grasp for vocational undergraduate institutions to implement the fundamental task of "Fostering Virtue Through Education" and strengthen talent competitiveness. Through a systematic investigation of integrated circuit majors at SZPU, this paper reveals their practical difficulties in academic competence, self-discipline, and learning initiative, and accordingly proposes actionable institutional support paths. In the future, vocational undergraduate institutions should further strengthen the "student-centered" educational philosophy, continuously optimize academic guidance mechanisms, learning environments, and cultural ecology, and integrate the cultivation of students' learning ability into the entire process of professional construction and teaching. Only in this way can we cultivate high-quality integrated circuit talents who not only master exquisite technical skills but also possess the internal drive for sustainable growth, providing solid talent support for the independent and innovative development of my country's semiconductor industry.

## References

Halász, G., & Michel, A. (2011). Key competences in Europe: Interpretation, policy formulation and implementation. *European Journal of Education, 46*(3), 289-306.

Long, Y., & Aleven, V. (2013). Supporting students' self-regulated learning with an open learner model in a linear equation tutor. *The 16th International Conference on Artificial Intelligence in Education (AIED 2013)*. Berlin, Heidelberg: Springer.

Rumjaun, A., & Narod, F. (2025). *Social learning theory—Albert Bandura*. Cham: Springer.

Shanmugam, P. N. L. (2014). Taxonomy of educational objectives. *Of Educational Goals' Handbook Cognitive Domain, 28*, 58-60.