

Construction of a Self-Directed Learning Model in a Blended Learning Environment

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Abstract: With blended learning emerging as a mainstream paradigm in higher education, the Document Security Technology course faces persistent challenges, including vague instructional objectives and low learning efficiency. Simultaneously, the profession demands stronger self-directed learning capabilities from practitioners. To address these issues, this study develops a “Five-in-One” self-directed learning model comprising five interrelated dimensions: goal orientation, instructional regulation, cognitive development, technological resources, and process monitoring. The application of this model has significantly improved course evaluation outcomes, enhanced faculty teaching and research capacity, strengthened students’ practical and innovative skills, and expanded the course’s reach and social impact. The model thus provides both a theoretical framework and a practical pathway for the reform of similar applied courses.

Keywords: Blended learning; Document security technology; Immigration management; Police education; Self-directed learning

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1. Introduction

The digital transformation of education has accelerated the integration of online convenience and face-to-face interaction, positioning blended learning as a dominant instructional paradigm ^[1]. While this model expands learning pathways, it also raises new challenges regarding learners’ initiative, self-discipline, and self-regulation. Empirical evidence highlights a strong correlation between self-directed learning competence and overall learning effectiveness in blended contexts ^[2]. Yet, many blended teaching practices exhibit structural shortcomings, failing to systematically support the cultivation of self-directed learning. Fragmented resources and loosely designed activities often leave learners disoriented, preventing them from fully leveraging the potential advantages of blended environments ^[3].

The Document Security Technology course exemplifies these challenges. As a compulsory and highly technical subject within immigration management programs, it introduces students to anti-counterfeiting

principles, document verification methods, and electronic security systems. However, due to its interdisciplinary complexity and professional rigor, students frequently experience anxiety and disengagement. Traditional lecture-driven instruction further restricts active learning, resulting in superficial comprehension and weak practical application.

The document security field is characterized by rapid technological iteration, high practical requirements, and significant security responsibilities^[4]. Professionals must not only master current methods but also maintain the capacity for continuous, self-directed knowledge updating. This intensifies the need for teaching reforms that embed systematic support for self-directed learning within blended environments. In this context, the present study proposes a “Five-in-One” self-directed learning model designed to align instructional processes with industry demands.

2. Challenges in teaching the document security technology course

2.1. Ambiguity of learning objectives

The formulation of course objectives remains overly generic, lacking alignment with the complex and evolving demands of the field. Goals such as “understand basic principles” or “be familiar with methods” do not differentiate between the cognitive levels of learning or the practical competencies required in real-world policing contexts. For example, front-line officers must be proficient in recognizing counterfeit features during time-sensitive inspections, while research-oriented professionals must design or test new security algorithms. Without explicit stratification between foundational, intermediate, and advanced objectives, the curriculum cannot guide students in developing progressively sophisticated skills. This ambiguity leads to fragmented learning and misalignment between academic training and occupational realities.

2.2. Inefficiency in the learning process

Learning inefficiency manifests in multiple ways. First, real-time monitoring tools are absent, meaning instructors often depend on static metrics such as attendance and assignment completion. These indicators are inadequate for assessing students’ mastery of abstract or technical content, such as optical anti-counterfeiting mechanisms. Second, teacher–student interaction is limited, typically confined to in-class questioning without the support of continuous digital platforms. As a result, students facing conceptual barriers lack timely assistance, which hampers their motivation and progress. Third, practice exercises are highly standardized, rarely adapted to different learner profiles. This uniformity restricts opportunities for remediation among weaker learners and stifles advanced exploration for stronger ones, thereby reducing overall efficiency and engagement.

2.3. Inadequate resource alignment

The rapid pace of technological innovation in document security creates a mismatch between available teaching resources and learner needs. Existing platforms still emphasize traditional domains such as paper and printing techniques, while students increasingly require exposure to emerging areas like digital forensics, biometrics, and blockchain-based authentication. Moreover, resource allocation lacks adaptive mechanisms; all students are provided identical materials irrespective of proficiency levels or professional aspirations. This “one-size-fits-all” distribution creates cognitive overload for some learners and under-stimulation for others, disrupting knowledge construction and weakening self-directed learning capacity.

2.4. Single-dimensional evaluation mechanisms

Current evaluation practices prioritize summative examinations and teacher-led grading, offering little insight into students' developmental trajectories. Process-based evaluations, such as mid-term project reviews or practice-based peer assessments, are underutilized. The feedback provided is generally limited to numerical scores, omitting detailed commentary on dimensions such as theoretical understanding, technical application, critical thinking, and innovation. This narrow evaluative focus deprives students of the reflective guidance necessary to adjust strategies, consolidate strengths, and address weaknesses. As a result, the evaluation system fails to reinforce continuous learning or promote higher-order cognitive and practical skills.

2.5. Broader structural and pedagogical barriers

Beyond these four primary challenges, broader systemic issues also hinder effective teaching. The rapid evolution of the industry outpaces curriculum updates, leading to outdated syllabi that cannot keep pace with current professional practices. Faculty development opportunities are limited, constraining teachers' ability to integrate emerging technologies and methodologies into their pedagogy. Furthermore, the heavy reliance on didactic teaching methods restricts active learning, collaboration, and inquiry, which are essential for fostering the autonomy and problem-solving skills required in security-related professions.

In summary, the course faces interrelated challenges: unclear objectives, inefficient processes, resource misalignment, and restrictive evaluation systems, compounded by structural barriers in curriculum design and pedagogy. Together, these limitations reduce the effectiveness of instruction and impede the development of students' professional competence and self-directed learning abilities ^[5].

3. The “five-in-one” self-directed learning model

Drawing on the cognitive development principles of self-directed learning and the empowering potential of AI, this study integrates AI technologies into the self-directed learning framework. By conducting a multidimensional analysis of learner characteristics, technological adaptation mechanisms, and instructional context, the research embeds AI organically within the pedagogical design. The result is a course-specific self-directed learning model comprising five interrelated components: the Goal Orientation Layer, the Instructional Regulation Layer, the Cognitive Development Layer, the Technological Resource Layer, and the Process Monitoring Layer, as illustrated in **Figure 1**.

3.1. Goal orientation layer

The goal-oriented layer structures learning through four coordinated goal types: common lower-order, common higher-order, individualized lower-order, and individualized higher-order goals. Foundational common goals ensure mastery of essential public security knowledge and skills, while higher-order common goals develop complex cognitive and social abilities for problem-solving in practical scenarios. Individualized lower-order goals address learners' unique needs, allowing customized learning paths that enhance efficiency and motivation, while individualized higher-order goals promote deep, self-directed learning, encouraging students to integrate real-world cases and AI technologies for document verification, linking learning autonomy with personal growth and professional development.

3.2. Instructional regulation layer

Teachers support self-directed learning by forming a closed-loop system of learner diagnosis, feedback,

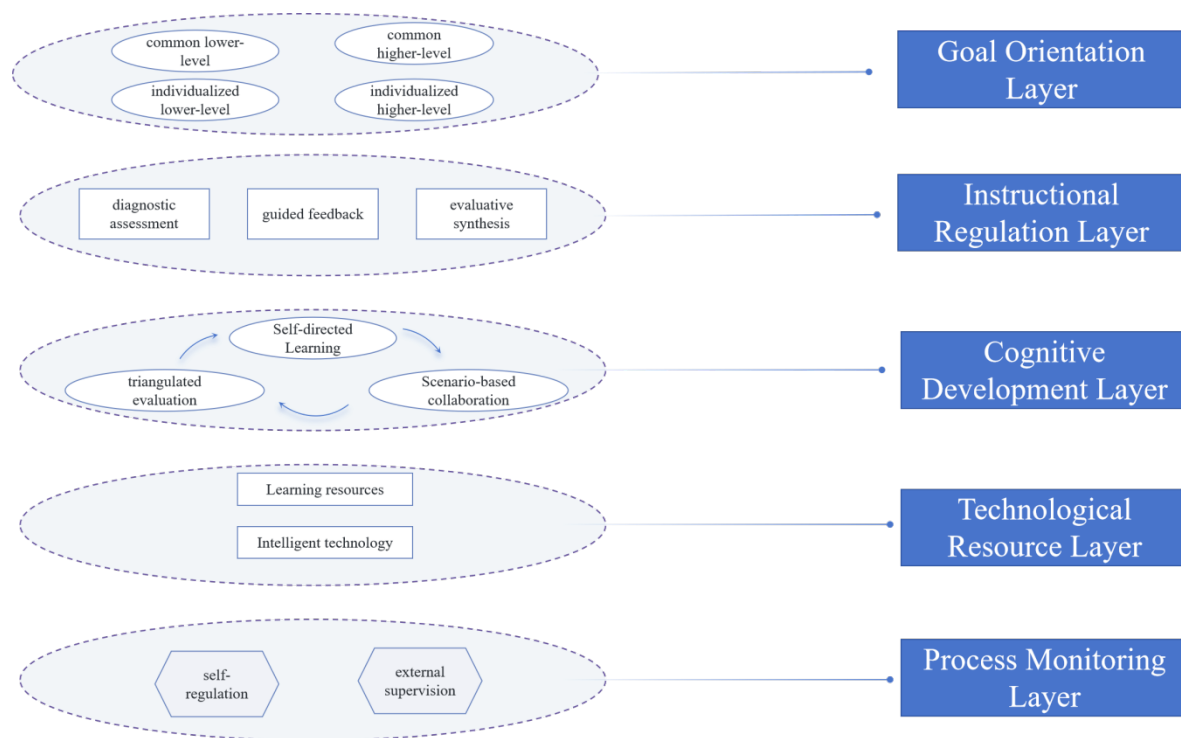


Figure 1. Course self-directed learning model.

and evaluation. They analyze historical data and classroom behaviors to identify knowledge gaps, guide students through stage-specific tasks, provide structured resources, and intervene when necessary. Summative evaluation consolidates core knowledge, assesses assignments, and addresses common issues through targeted reinforcement, ensuring that students' cognitive abilities improve steadily while maintaining alignment with learning goals.

3.3. Cognitive development layer

Learners establish clear goals, follow systematic study plans, and employ metacognitive strategies with intelligent tools for ongoing monitoring and reflection. Scenario-based collaboration fosters deeper knowledge reconstruction, while triangulated evaluations—incorporating teacher, peer, and self-assessment—reinforce cognitive progression.

3.4. Technological resource layer

This dimension integrates micro-lectures, adaptive test banks, interactive courseware, AI-driven personalized learning, and intelligent assessment systems. Generative AI enhances task customization, feedback quality, and resource adaptability, enabling precision teaching at scale.

3.5. Process monitoring layer

Combining learner self-regulation with external supervision, the model establishes dual monitoring mechanisms. Students employ learning plans, reflection journals, and adaptive tests for self-evaluation, while teachers and peers provide complementary oversight. This duality cultivates responsibility, autonomy, and sustained engagement.

4. Outcomes of the course reform

The reform of the Document Security Technology course under the “Five-in-One” model has generated a range of notable achievements, which can be elaborated along four major dimensions:

4.1. Enhanced course evaluation and student satisfaction

Through the integration of clear learning goals, intelligent resources, and multi-dimensional monitoring, students reported stronger engagement and clarity in the learning process. Over the past three years, the course has consistently received excellent or above-average ratings in institutional teaching evaluations. Student feedback emphasized the practical alignment of course content, reduced difficulty in grasping complex technical principles, and improved readiness for real-world application. External teaching supervisors also recognized the course as a pioneering model, frequently citing it in faculty development workshops.

4.2. Advancement in faculty teaching and research capacity

The teaching team has leveraged the reform to expand both pedagogical practice and scholarly inquiry. Faculty members won prizes in national and provincial teaching innovation competitions, evidencing the effectiveness of their instructional strategies. At the same time, the course team secured competitive grants on blended learning reform and published multiple research papers, thus linking classroom practice with academic output. This dual advancement strengthened the course’s sustainability and academic influence.

4.3. Improved student innovation and practical competence

The model has successfully stimulated students’ motivation for independent exploration and collaborative problem-solving. Students demonstrated improved skills in applying theory to practice, with several excelling in innovation competitions and entrepreneurship projects. For instance, one student team designed an “Automated Passport Detection System” that combined AI image recognition with forensic document analysis, earning a software copyright certificate and adoption by frontline immigration units. Such outcomes reflect not only enhanced learning performance but also the course’s ability to nurture innovation aligned with industry needs.

4.4. Broadened social impact and knowledge dissemination

By being included in the “Police University Online Open Course Platform”, the course reached audiences far beyond its home institution. Its resources have been accessed by students from other universities, professional practitioners, and frontline officers, providing ongoing professional training opportunities. This expansion strengthened the role of the course as a public service resource, linking higher education with practical policing needs and extending the social impact of the university’s educational innovations.

5. Conclusion

The Document Security Technology course, as a cornerstone of immigration management education, exerts a decisive influence on students’ subsequent professional learning and competence development. The breadth and depth of knowledge gained in this course determine not only their academic progression but also their ability to address complex challenges in border and immigration security practice.

This study responds to long-standing pedagogical bottlenecks by introducing a “Five-in-One” self-directed learning model tailored to blended environments. By integrating goal orientation, instructional regulation, cognitive development, technological resources, and process monitoring into a coherent framework, the model

addresses structural deficiencies that previously undermined teaching effectiveness.

The contributions of this research are twofold. Theoretically, it provides a replicable framework for embedding self-directed learning within applied, technology-intensive disciplines, extending existing scholarship on blended learning design. Practically, it offers actionable strategies for educators and institutions seeking to enhance student autonomy, innovation capacity, and professional readiness in fast-evolving fields.

Ultimately, the reform not only elevates the quality of the Document Security Technology course but also serves as a reference model for similar practice-oriented courses, supporting the cultivation of adaptive, high-caliber professionals capable of meeting the dynamic demands of law enforcement and public security sectors.

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References

- [1] Shi Y, Chen L, Chen H, et al., 2025, A study on the influencing factors of students' deep blended learning in a smart classroom environment. *Modern Educational Technology*, 35(05): 71–81.
- [2] Lu L, 2019, A study on the relationship between perceived teacher autonomy support and the effectiveness of online English autonomous learning: The mediating effect of self-directed learning. *Journal of Guangdong Open University*, 28(05): 16–22.
- [3] Du X, 2023, Optimization strategies for the allocation of “dual-line” blended teaching resources in universities. *Modern Educational Management*, 2023(03): 103–111.
- [4] Xu J, Zhang Y, 2025, Research on the application of deep learning in passport identification. *Journal of Liaoning Police College*, 27(02): 71–77.
- [5] Jiang Z, Liu L, 2018, On the diversification of social evaluation standards for adult learning. *China Adult Education*, 2018(07): 31–33.

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