ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202507_8(7).0027

Research on Teaching Reform and Practice Based on the BOPPPS Model: A Case Study of RPA Financial Robot Course

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Abstract

Under the background of digital transformation, the process of financial field intelligence accelerates, and RPA financial robot technology is widely used, but the teaching of related courses in higher vocational colleges and universities is faced with the dilemma of ambiguous course orientation, outdated teaching methods, and lack of practical resources. This study focuses on the teaching reform of RPA financial robotics course, takes BOPPPS model as the theoretical framework, and adopts the action research path of "teaching reconstruction-practice verification-evaluation optimization", aiming at constructing a new type of "Competency-based and Scene-driven" teaching method. We adopt the action research path of "teaching reconstruction-practice verification-evaluation optimization", aiming to construct a new teaching mode of "competence-based" and "scene-driven". Firstly, we analyze the status quo of traditional teaching, pointing out that the curriculum system is out of line with job requirements, the teaching method is single, and the evaluation system focuses on result assessment. Based on the BOPPPS model, the teaching process is reconstructed in three stages: before, during and after class, and the application of the BOPPPS model effectively bridges the gap between technical operation and financial business, improves students' process design ability, innovative thinking and vocational literacy, and provides a "business, finance and technology fusion" course paradigm for the digital transformation of vocational education, and is helpful for cultivating students who are suitable for the smart business and who are capable to work in the financial industry. It provides a "business, finance and technology integration" curriculum paradigm for the digital transformation of vocational education, and has popularization value for cultivating RPA technical and skilled talents suitable for the development of smart finance.

Keywords

BOPPPS model, RPA financial robot, teaching reform, evaluation system.

1. Introduction

At a time when digital transformation is accelerating, the financial sector is experiencing a profound change from manual accounting to intelligent operation[1]. RPA (Robotic Process Automation) technology, with its efficient handling of repetitive financial processes, has become a core tool for enterprises to reduce costs and increase efficiency, and it is widely used in invoice identification, bank reconciliation, report generation and other scenarios. According to Avery Consulting's "2024 China RPA Industry Development Report", China's RPA penetration rate in the financial field has reached 63%, but there is a shortage of more than 800,000 professionals with the ability to integrate RPA process design and financial business[2]. Higher vocational colleges and universities, as the main position of technical skills training, are

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202507_8(7).0027

generally faced with a threefold dilemma in the teaching of RPA financial robotics courses: first, the course positioning is vague, focusing on software operation teaching and neglecting financial scenarios; second, the teaching method is old, "teacher demonstration and student imitation" model is difficult to cultivate innovative thinking; third, the practice of the lack of resources, lack of real-life business relationships with enterprises. Third, there is a lack of practical resources, and a lack of practical training environment docked with the real business of enterprises[3]. In this context, how to break through the traditional teaching framework and build a new teaching mode of "competence-based and scenario-driven" has become a key issue for vocational education to serve the industrial upgrading.

This study takes the BOPPPS model as the framework[4,5], adopts the action research path of "teaching reconstruction - practice verification - evaluation optimization", and systematically explores the application effect of the model in the RPA financial robotics course through classroom observation, teacher-student interviews, and analysis of project results[6]. Through classroom observation, interviews with teachers and students, and analysis of project results, we systematically investigated the application of the model in the RPA financial robotics course, focusing on the design of the teaching process, the development of practical tasks, and the construction of process evaluation system[7].

2. Overview of the BOPPPS Teaching Model

The BOPPPS instructional model, which originated from the Canadian Teacher Skills Training System (ISW), is a closed-loop, student-centered instructional framework based on constructivist learning theory that emphasizes structured design to enhance teaching effectiveness and student engagement[8,9,10]. The model divides the teaching process into six logically tight links:

1) Bridge-in: Stimulate students' interest and establish the connection between old and new knowledge by creating a situation. Teachers can use case studies, video presentations, interesting questions and other ways to focus students' attention to the teaching theme, such as RPA financial robot in the enterprise expense reimbursement scenarios in the actual application of cases analogous to the abstract concepts, or through the cutting-edge industry dynamics triggered by the desire to explore.

2) Objective: clearly define the teaching objectives and refine the learning outcomes in three dimensions: knowledge, ability and literacy. Specific and measurable objectives, such as "to be able to accurately recapitulate the process design principles of RPA financial robots", "to be able to design the automated process of invoice identification and verification", "to develop professional habits of data security and process compliance", to ensure that students have a clear understanding of the teaching objectives. "To ensure that students have a clear understanding of the learning direction and expected results.

3) Pre-assessment: Evaluating students' prior knowledge and skill levels through questionnaires, tests, interviews, etc., and diagnosing differences in the starting point of learning. The results of pre-assessment are used to adjust the depth and rhythm of teaching content, for example, to increase the introductory explanation of software operation for students with a weak foundation in RPA, or to provide advanced development tasks for students who are familiar with financial business processes.

4) Participatory Learning: As the core part of the model, it emphasizes the active participation of students instead of passive acceptance. Teachers guide students to construct knowledge in interaction through group discussion, role-playing, project practice and other activities, for example, through the simulation of enterprise financial sharing center RPA development task-driven, so that students can master the skills in the process of solving bank reconciliation automation and other practical problems.

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5) Post-assessment: To check the achievement of learning objectives through stage testing, results demonstration and practical exercises. Post-assessment not only focuses on the memorization of RPA theoretical knowledge, but also focuses on the assessment of application ability, such as whether the RPA process design theory can be transformed into an executable automation program, or whether it is possible to logically dismantle the abnormalities of the robots in the complex financial scenarios.

6) Summary: guide students to review the core content, organize the knowledge framework, and extend the depth of learning through extension tasks. The summary can be in the form of mind map, case review, future application outlook, etc., to strengthen the systematic and migratory nature of the learning content.

The core value of the BOPPPS model is to ensure that all aspects of teaching are closely related to the development of students' abilities through the design of standardized processes, and at the same time, teachers are given the flexibility to adjust the space, which is not only applicable to the theoretical knowledge explanation, but also can be adapted to the practical teaching of skills. Its closed-loop structure enables teaching to form a complete cycle of "assessment-design-implementation-feedback", providing a scientific path to improve classroom efficiency and teaching quality.

3. Status of Traditional Teaching of RPA Financial Robotics

3.1. Disconnect between the Curriculum System and Iob Requirements

The current RPA financial robotics courses in higher vocational colleges and universities generally have the tendency of "focusing on technical operation and financial scenarios", and the contents of the courses are mostly focused on the operation of the RPA software interface and basic programming knowledge, such as the process recording of UiPath and the basic syntax of Python, etc., but the in-depth deconstruction of the financial business scenarios is insufficient. For example, when explaining the "Invoice Verification" module, only the technical process of invoice image recognition is demonstrated, but the integration of VAT deduction rules, invoice authenticity checking logic and other financial expertise is ignored, which leads to the students only mastering "how to operate the robot" but failing to understand "why the process is designed". As a result, students only know "how to operate the robot" but cannot understand "why the process is designed". This "technology and business two-skin" course design, making it difficult for students to form "based on financial logic to design automation programs" core competencies, and the demand for enterprise "know finance and fine technology There is a significant gap with the standard of "financial literacy and technology proficiency" demanded by enterprises. In addition, the goal of the course still remains at the level of "training accounting operators", lacking the training design of RPA process optimization, robot operation and maintenance management and other higher-order capabilities, which makes it difficult to adapt to the job requirements of "automation solution designers" in the era of intelligent finance.

3.2. Limited Teaching Methods and Lack of Authentic Practice

Traditional teaching is based on the lecture mode of "Teacher Demonstration-Student Imitation", in which the teacher demonstrates the construction of RPA process through screen sharing in the classroom, and the students follow the operation to complete the set tasks, lacking the space for active thinking and innovation. For example, in the teaching of "expense reimbursement automation", the teacher pre-designed the complete process logic, students only need to reproduce the process step by step, without analyzing the abnormal processing nodes in the process (e.g., cross-departmental approval conflicts, cost standard checking rules), which leads to the fact that students can only deal with the standardized scenarios, and are at

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202507_8(7).0027

a loss in the face of complex business needs. Although the practice session is equipped with RPA training platform, it is mostly a simulation environment, which is different from the real business systems of enterprises (such as Kingdee EAS and UFIDA NC), and lacks data docking with external systems such as banking and taxation, so it cannot restore the real working scenario of "multi-system collaborative automation". Although some colleges and universities have introduced enterprise cases, they are still lagging behind in updating the cases, which are still based on the traditional financial processes before 2020, and have not included the popularization of electronic invoices and the pilot of all-electric invoices and other emerging business scenarios, which has led to a disconnect between the students' practical achievements and the enterprises' current applications.

3.3. Result-Oriented Evaluation Lacking Process Competency Monitoring

The evaluation system of the course is generally characterized by the problem of "emphasizing the result but not the process" and "emphasizing technology but not literacy". The final assessment is based on "completing the development of the specified RPA process", which only evaluates the accuracy of the process operation, but ignores the compliance of the process design (e.g., whether it meets the requirements of the enterprise's internal control), and the standardization of the code writing (e.g., completeness of the annotation and the abnormality catching mechanism) and other key dimensions. Process evaluation is mostly based on class attendance and homework submission, and lacks systematic assessment of students' problem analysis ability and teamwork ability. For example, when the group cooperates to complete the project of "Bank Reconciliation Robot", it is difficult for teachers to track students' performance in demand analysis, process disassembly, conflict resolution and other aspects through the existing evaluation tools, resulting in the evaluation results not being able to comprehensively reflect the comprehensive vocational ability of students. In addition, the evaluation subject is single, led by teachers only, lacking the professional evaluation of practice results by enterprise tutors, and it is difficult to connect with the industry standard. This evaluation system leads students to aim at "passing the examination", neglecting the cultivation of vocational quality and innovation ability, and they need to experience a longer period of job adaptation after graduation.

4. RPA Financial Robotics Course Design Based on BOPPPS Modeling

4.1. BOP-based Pre-course Instructional Design

The core logic of the pre-course teaching is "introduction-objective-pre-test", which stimulates the learning motivation and accurately diagnoses the learning situation through real-life scenarios. Teachers release enterprise RPA financial robot application cases on the Super Star Learning Channel platform, such as a short video of a company realizing bank reconciliation automation through RPA, and guide students to review the manual reconciliation process in Basic Accounting in conjunction with questions such as "how does the robot identify abnormal water flow" to establish the connection between old and new knowledge. On this basis, the three-dimensional learning objectives are clearly defined: the knowledge level requires understanding of RPA process design principles and UiPath component functions; the skill level focuses on the development of automated processes for invoice verification and other scenarios; and the literacy level emphasizes the awareness of data security and process compliance. The pre-test session investigates the students' knowledge base of RPA technology and financial business through questionnaires, and collects pre-operation data of the "Data Entry Robot" using the virtual training platform to analyze the technical shortcomings and learning difficulties, and provides a basis for classroom teaching content and grouping strategy.

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202507_8(7).0027

4.2. PP-based in-class Instructional Design

Teaching in the class is based on the main line of "participatory learning - post-testing - summarizing", and the practical ability is improved through task-driven and in-depth interaction. Students are divided into groups to carry out the project of "travel expense reimbursement automation", using mind maps to disassemble the business process and mark the financial rules (e.g., blocking over-standard expenses), the teacher demonstrates the skills of calling UiPath components (e.g., extracting invoices by ImageScraping), and the students complete the code development and exception handling design synchronously. Students synchronize their code development and exception handling design. Introducing group mutual evaluation and Learning Channel voting mechanism to provide real-time feedback on the integrity of process logic and code standardization. In the post-test session, the knowledge transfer ability is examined through the on-site design task of "VAT Invoice Verification Robot", and each group shows the results and elaborates on the "Embedded Points of Financial Rules", and the teachers comment on the compliance and innovation in the light of the enterprise standards, so as to strengthen the "technical service business" and the "technical service business". Each group presented their results and explained the "financial rules embedding points".

4.3. S-based Design for after-school Instruction

The post-course session focuses on summarizing, expanding and personalized enhancement, and builds a closed loop of "knowledge consolidation-capability extension-continuous feedback". Students independently sort out the chain of "Scenario Analysis-Process Modeling-Technology Implementation-Test Optimization" and summarize the core knowledge points (e.g., the three elements of RPA process, exception handling logic) through the mind map, and the teacher adds The instructor will add "RPAandBig Language Model" and other cutting-edge industry trends to guide in-depth thinking about the direction of technology integration. The post-course task requires analyzing the RPA application case in the enterprise annual report and writing an optimization report to promote the transformation of knowledge into practice. Relying on the background data of the Learning Channel to generate a personal competency report, UiPath advanced tutorials, financial internal control cases and other personalized resources are pushed to the weak links, so as to achieve "accurate remediation" and continuous learning support.

4.4. Blended Online and Offline Teaching and Learning Implementation

The course adopts online and offline hybrid mode to integrate teaching resources and interactive scenes. Online through the learning pass to build an exclusive space, convergence of UiPath operation tutorials, invoice verification and other typical scenarios of the development of the actual record, raw data and automation of the enterprise program and other resources, to support students fragmented pre-study and review; the use of the discussion forum and the live function to carry out the "multi-system data interaction", "rules and conflict resolution" and other special Q&A. Using the discussion forum and live broadcast function to carry out "multi-system data interaction", "rules and regulations" and other special Q&A, responding to learning needs in real time. Offline focus on project practice and in-depth interaction, through group collaboration, results show, stress test and other links, online knowledge into "design-development-debugging-optimization" of the complete skills chain, forming a "theoretical knowledge-practical operation". The immersive learning experience of "theoretical cognition-practical operation-reflection and enhancement" comprehensively improves students' comprehensive application ability of RPA financial robotics.

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5. Course Learning Evaluation System

In the teaching reform of RPA financial robotics course, the construction of a perfect teaching evaluation system is a key element to ensure the quality of teaching and promote the overall development of students. In order to achieve a comprehensive and objective evaluation of students' learning achievements and comprehensive quality, we need to focus on the diversification of evaluation indexes and the dynamization of evaluation methods, so as to ensure that the evaluation is scientific, fair and effective. The structure of the curriculum evaluation system is shown in Fig. 1.

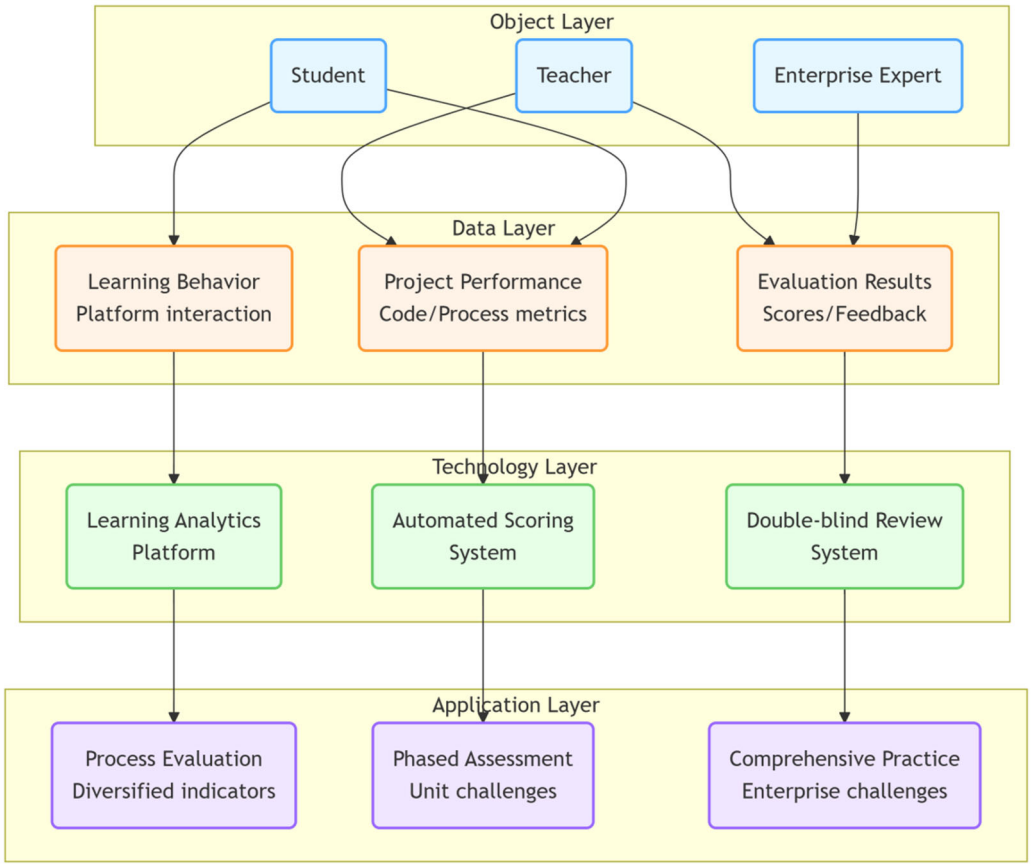

Figure 1. Program Evaluation System Architecture

On the one hand, diversification of evaluation indexes is realized. When building the teaching evaluation system, a three-dimensional evaluation index structure covering knowledge, ability and professionalism should be constructed. The knowledge dimension focuses on examining the depth of students' mastery of RPA technical principles (such as UiPath component functions and process design logic) and financial business rules (such as invoice verification standards and budgetary control processes), and is assessed in a hierarchical manner through online tests (such as the Study Pass question bank), classroom quizzes, and post-course assignments. Competency dimension focuses on practical application and innovation ability, with "project-based" assessment throughout the teaching cycle: students need to complete the whole chain of tasks from demand analysis (such as travel reimbursement process deconstruction), technical implementation (code development and debugging) to stress testing (high concurrency scenario simulation), and process compliance, technical innovation, system stability, and other dimensions of the RPA Project Score Sheet, The RPA Project Score Sheet quantifies the scoring in terms of process compliance, technical innovation, system stability,

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and other dimensions. The dimension of professionalism is comprehensively evaluated through implicit indicators such as the division of roles in group collaboration, expression logic in program reporting, and risk awareness in exception handling, so as to strengthen the professional orientation of "integration of business, finance and technology".

On the other hand, the implementation of the evaluation method is dynamic. A three-dimensional dynamic evaluation mechanism of "process evaluation and stage assessment and comprehensive practice" has been established. Process evaluation relies on the real-time collection of data from the Learning Channel platform, including the length of resource browsing, the quality of speeches in the discussion forum, and the operation track of the virtual training platform, etc., to generate a personalized learning portrait, accurately identify weaknesses (such as a high error rate in the invocation of components) and push customized learning resources. Stage assessment adopts the "unit break-in" mode, each completed knowledge module (such as invoice identification, budget validation) that is, time-limited practical assessment, those who do not meet the standard automatically trigger the remedial examination mechanism, to ensure that the knowledge chain is seamless. Comprehensive practice is carried out in the form of "Enterprise Real Scenario Challenge", in which students are required to form a team to complete the RPA application optimization plan in the annual report of a listed company, and corporate finance experts and teachers are invited to form a judging panel to carry out "double-blind evaluation" in terms of the business value (such as efficiency enhancement rate), technical feasibility, and compliance. "Double-blind evaluation" to realize the deep docking between teaching evaluation and industry demand. By dynamically adjusting the center of gravity of evaluation, a closed-loop feedback system of "learning-practice-evaluation-correction" is formed to continuously improve the relevance and effectiveness of teaching.

6. Conclusion

This study focuses on the urgent needs of the teaching reform of RPA financial robotics course in higher vocational colleges, takes BOPPPS model as the theoretical framework, and systematically constructs a new teaching mode of "competency-based and scenario-driven" through the action research path of "teaching reconstruction - practice verification - evaluation optimization". The new teaching mode of "competence-based and scenario-driven" is systematically constructed through the action research path of "teaching reconstruction - practice verification - evaluation optimization". Aiming at the core problems of traditional teaching, such as ambiguous curriculum orientation, rigid teaching methods, lack of practical resources and single evaluation system, relying on the closed-loop structure of BOPPPS (introduction-objectives-pre-test-participatory learning-post-test-summary), three major breakthroughs have been realized. Summarize), three major breakthroughs have been achieved: first, through the introduction of real cases in enterprises and three-dimensional goal setting (knowledge, skills, literacy), the positioning of complex talent cultivation of "financial literacy and technical literacy" has been accurately anchored; second, with scenario-based projects such as "travel reimbursement automation" as the main theme of the program, the program is designed to provide a comprehensive training platform for the students. Secondly, we take "travel expense reimbursement automation" and other scenario-based projects as task-driven, combined with online and offline blended teaching, to promote students to actively construct knowledge and technology integration ability in the whole chain practice of "demand analysis-process design-development and debugging"; thirdly, we innovatively design the "processandprocessandtechnology" training program. Innovatively designing a three-dimensional dynamic evaluation system of "process and stage and comprehensive", relying on platform data to track the development trajectory of competence, and introducing a double-

ISSN: 2637-6067 DOI: 10.6918/IJOSSER.202507_8(7).0027

blind evaluation mechanism from enterprises to ensure that the teaching evaluation is deeply aligned with the industry standards.

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