Research on Adaptive Optimization of Computer Basic Courses for Vocational Undergraduates in the Context of Hainan Free Trade Port Construction

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Abstract: This study selects certain majors enrolled in the computer fundamentals course at Hainan Vocational University of Science and Technology as the research objects, with a focus on the demands for cultivating technically skilled talents in the context of the construction of the Hainan Free Trade Port. By leveraging big data technology, it conducts an in - depth analysis of the current teaching status of the course. The research uncovers several core issues: substantial disparities in students' foundational knowledge and learning needs, course content that lags behind industry requirements, a complex faculty composition, and monotonous teaching approaches.

Taking four majors—Artificial Intelligence Engineering Technology, Marine Engineering Technology, Computer Network Technology, and Tourism Management—as case studies, this research analyzes mid - term and final exam scores as well as teaching behavior logs. The findings reveal significant differences among students from different majors in terms of learning motivation and skill proficiency levels. Based on these findings, the study proposes a five - dimensional reform pathway, namely "tiered teaching - curriculum restructuring - faculty enhancement - method innovation - diversified assessment". The research conclusions provide a data - driven decision - making model for the reform of computer fundamentals courses in vocational undergraduate institutions. Moreover, they offer a demonstrative example for addressing the issue of the "disconnect between curriculum and job requirements".

Keywords: Network pharmacology; Stroke, Mechanism; Yujin

1. Introduction

1.1 Research Background

With the advancement of the construction of the Hainan Free Trade Port, the demand for technically skilled talents in the regional economy has witnessed explosive growth. According to the announcement by the Human Resources and Social Security Department of Hainan Province and the Talent Development Bureau of the CPC Hainan Provincial Committee on the release of the Talent Demand Catalog for the "4+3+3" Key Industries in the Hainan Free Trade Port (2025 - 2027), the demand for computer-related talents in the Hainan Free Trade Port focuses on high-tech, Internet, and telecommunications fields. The job positions cover software engineers, AI algorithm engineers, cybersecurity experts, etc., requiring capabilities in programming, data analysis, cloud computing,

and more. There is a severe shortage of high-end technical (blockchain, AI) and compound talents. The policies provide support such as individual income tax incentives and housing subsidies. Key areas of layout include Haikou Fuxing City and Sanya Science and Technology City. Driven by projects such as the International Data Center and Satellite Big Data, there are significant career development opportunities [1].

Given the shortage of relevant computer-related talents, the computer fundamentals course serves as an introductory course for learning about computers. Laying a solid foundation can provide better conditions and convenience for subsequent learning of languages such as Java, C, and Python, as well as for advanced studies in machine learning.

Against this backdrop, the computer fundamentals course is a core pillar of vocational undergraduate education. The Ministry of Education has designated it as a public compulsory course, aligning with the technical and skill-based training objectives of vocational undergraduate programs. In regions like the Hainan Free Trade Port, there is a strong demand for skills in programming and data analysis, and the course directly aligns with job competency requirements. Enhancing students' professional competitiveness and supporting interdisciplinary integration through practical projects to strengthen practical combat capabilities are of utmost importance. However, computer fundamentals courses in colleges and universities face a prominent contradiction of "disconnect between curriculum and job requirements" [2]. Traditional teaching models focus on the operation of Office software, while the actual needs of enterprises have long surpassed simple requirements for office software proficiency.

1.2 Research Significance

This study takes the construction needs of the Hainan Free Trade Port as the background. By analyzing the situations of certain majors in the computer fundamentals course at Hainan Vocational University of Science and Technology and through the analysis of exam score data and teaching behavior logs, it reveals significant differences in learning motivation and skill mastery levels among students from different majors. Thus, it identifies direct problems and provides countermeasure suggestions.

2. Current Teaching Situation and Problem Analysis

2.1 Current Teaching Situation

This course was previously called "Computer Fundamentals" in our university a few years ago and was renamed "Computer Intelligent Application Fundamentals" in the last two years. From a university-wide perspective, the Basic Teaching and Research Section has approximately over 90 teachers, but they are mainly composed of teachers from other colleges (departments) and external hired teachers. Teachers specifically dedicated to the Basic Teaching and Research Section account for only one-third. Another one-third are teachers with bachelor's degrees who have been retained by the university in the past three years. These teachers are mostly part-time as they hold administrative positions in other colleges (departments) and only teach part-time. However, the teaching quality of this group of teachers is relatively good because most of them are graduates from the School of Information Engineering of our university, majoring in Big Data Engineering Technology, Internet of Things Engineering Technology, Software Engineering Technology, etc. They have a certain foundation. As long as they pass the trial lecture at the university and subsequently obtain the teacher qualification certificate for higher education institutions, they can choose to teach the "Computer

Intelligent Application Fundamentals" course in our college.

The course duration for junior college programs is 66 class hours per semester with 3.5 credits, while for undergraduate programs, it is 58 class hours per semester with 3.0 credits.

2.2 Problem Analysis

Taking four classes that I have taught as examples, namely undergraduate majors in Artificial Intelligence Engineering Technology and Marine Engineering Technology, and junior college majors in Computer Network Technology and Tourism Management, an analysis is conducted respectively.

2.2.1 Artificial Intelligence Engineering Technology

This is a vocational undergraduate major offered by our university. Taking Class 1 of Artificial Intelligence Engineering Technology, Grade 2024, as an example, this class has 49 students, including 41 males and 8 females. In the first semester of the 2024 - 2025 academic year for the "Computer Intelligent Application" course, the overall class attendance rate has been good. All practical training sessions and assignments have been submitted at a rate of 100%, and students have shown high enthusiasm in class. They have also actively completed the self-installed software exercises assigned as homework. However, a few individual students have not been conscientious and have shown low enthusiasm for the course. Graduation requires passing the Computer Level 1 or Computer Level 2 examination.

The student score Excel sheet was exported from the Huben Education System. After simple data cleaning, the required relevant libraries were installed in Jupyter Notebook, and the data was imported, as shown in Figure 1 Data Import. Subsequent data processing and model building were carried out using the Python language in Jupyter Notebook.

```
[26]: import numpy as np
      import pandas as pd
      data = pd.read_excel('scores.xlsx')
      scores = data['Final Exam Score'].tolist()
      print(data)
```

	Serial No	Name	Routine Score	Final Exam Score
0	1	Ruolin Liu	86	81.10
1	2	Wushen Yuan	92	84.00
2	3	Yinxiang Wu	81	60.40
3	4	Dinrong Li	78	63.60
4	5	Xiao Luo	88	62.60
5	6	Qiang Zeng	89	64.50
6	7	Yifan Zhang	90	79.90

Figure 1: Data Import.

In the final exam (out of 100 points), the average score was 69.38, the pass rate was 93.88%, the standard deviation was 10.37, the highest score was 100 points, and the lowest was 46.3 points, as shown in Figure 2 Performance Overview.

```
[27]: # Class 1, Artificial Intelligence Engineering Technology, Grade 2024
average_score = np.mean(scores)
passing_score = 60
passing_count = sum(1 for score in scores if score >= passing_score)
passing_rate = (passing_count / len(scores)) * 100
std_deviation = np.std(scores)
max_score = max(scores)
min_score = min(scores)

print(f"average_score: {average_score:.2f}")
print(f"passing_rate: {passing_rate:.2f}%")
print(f"std_deviation: {std_deviation:.2f}")
print(f"max_score: {max_score}")
print(f"min_score: {min_score}")
```

```
average_score: 69.38
passing_rate: 93.88%
std_deviation: 10.37
max_score: 100.0
min_score: 46.3
```

Figure 2: Performance Overview.

2.2.2 *Marine Engineering Technology*

This is a vocational undergraduate major offered by our university. Taking Class 1 of Marine Engineering Technology (Undergraduate), Grade 2024, as an example, this class has 28 students, including 23 males and 5 females. For the Computer Intelligent Application course in the second semester of the 2024 - 2025 academic year, the overall class attendance rate has been good. Similarly, practical training sessions and assignments have been mostly submitted, and students have shown relatively high enthusiasm in class. However, a small number of students have not been conscientious and have shown low enthusiasm for the course. Depending on the number of certificates they obtain, students will choose to take the Computer Level 1 or Computer Level 2 examination for graduation.

The final exam scores of Class 1 of Marine Engineering Technology (Undergraduate), Grade 2024, are imported. In the final exam (out of 100 points), the average score was 60.56, the pass rate was 75%, the standard deviation was 14.55, the highest score was 91.6 points, and the lowest was 25.6 points, as shown in Figure 3 Performance Overview.

```
[29]: # Class 1, Marine Engineering Technology (Undergraduate), Grade 2024
average_score = np.mean(scores)
passing_score = 60
passing_count = sum(1 for score in scores if score >= passing_score)
passing_rate = (passing_count / len(scores)) * 100
std_deviation = np.std(scores)
max_score = max(scores)
min_score = min(scores)

print(f"average_score: {average_score:.2f}")
print(f"passing_rate: {passing_rate:.2f}%")
print(f"std_deviation: {std_deviation:.2f}")
print(f"max_score: {max_score}")
print(f"min_score: {min_score}")
```

```
average_score: 60.56
passing_rate: 75.00%
std_deviation: 14.55
max_score: 91.6
min_score: 25.6
```

Figure 3: Performance Overview

2.2.3 Computer Network Technology

This is a vocational junior college major offered by our university. Taking Class 1 of Computer Network Technology, Grade 2024, as an example, this class has 38 students, including 34 males and 4 females. For the Computer Intelligent Application course in the first semester of the 2024 - 2025 academic year, the overall class attendance rate has been good. Similarly, practical training sessions and assignments have been mostly submitted, and students have shown relatively high enthusiasm in class. However, a small number of students have not been conscientious and have shown low enthusiasm for the course. Students are required to obtain the Computer Level 1 or Computer Level 2 certificate for graduation.

The final exam scores of Class 1 of Computer Network Technology, Grade 2024, are imported. In the final exam (out of 100 points), the average score was 63.65, the pass rate was 76.32%, the standard deviation was 11.90, the highest score was 87.4 points, and the lowest was 32.8 points, as shown in Figure 2-4 Performance Overview.

```
[17]: # Class 1, Computer Network Technology, Grade 2024
average_score = np.mean(scores)
passing_score = 60
passing_count = sum(1 for score in scores if score >= passing_score)
passing_rate = (passing_count / len(scores)) * 100
std_deviation = np.std(scores)
max_score = max(scores)
min_score = min(scores)

print(f"average_score: {average_score:.2f}")
print(f"passing_rate: {passing_rate:.2f}%")
print(f"std_deviation: {std_deviation:.2f}")
print(f"max_score: {max_score}")
print(f"min_score: {min_score}")
```

```
average_score: 63.65
passing_rate: 76.32%
std_deviation: 11.90
max_score: 87.4
min_score: 32.8
```

Figure 4: Performance Overview.

2.2.4 Tourism Management

This is a vocational junior college major offered by our university. Taking Class 1 of Tourism Management, Grade 2024, as an example, this class has 24 students, including 11 males and 13 females. For the Computer Intelligent Application course in the second semester of the 2024 - 2025 academic year, the overall class attendance rate has not been ideal. Only the female students have almost full attendance, while most male students are often absent. Similarly, only the female students submit practical training assignments and homework, with a small number of male students doing so. The enthusiasm of female students in class has been acceptable, but male students have not been conscientious and have shown low enthusiasm for the course. This is because they are not required to obtain computer-related certificates for graduation.

In the final exam (out of 100 points), the average score was 52.98, the pass rate was 60.87%, the standard deviation was 28.94, the highest score was 96.8 points, and the lowest was 0 points (absent from the exam), as shown in Figure 5 Performance Overview.

```
[32]: # Class 1, Tourism Management, Grade 2024
average_score = np.mean(scores)
passing_score = 60
passing_count = sum(1 for score in scores if score >= passing_score)
passing_rate = (passing_count / len(scores)) * 100
std_deviation = np.std(scores)
max_score = max(scores)
min_score = min(scores)

print(f"average_score: {average_score:.2f}")
print(f"passing_rate: {passing_rate:.2f}%")
print(f"std_deviation: {std_deviation:.2f}")
print(f"max_score: {max_score}")
print(f"min_score: {min_score}")
```

```
average_score: 52.98
passing_rate: 60.87%
std_deviation: 28.94
max_score: 96.8
min_score: 0.0
```

Figure 5: Performance Overview.

3. Analysis Of Typical Application Cases

Taking the mid-term test as an example, with the same teacher, the same teaching method, and the same teaching pace, let's examine the performance of these classes. The scores are exported from the Huben Education System, which was jointly developed by our school. Students take simulated exams through the simulator exam system in the Huben Education System, which is similar to the National Computer Rank Examination.

3.1 Class 1 of Artificial Intelligence Engineering Technology, Grade 2024

Table 1: Mid-term Exam Performance of Class 1 of Artificial Intelligence Engineering Technology, Grade 2024.

Serial Number	Name	Total Score (55)	multiple-choice question (20)	Windows Basic Operations (10)	Word processing (25)
1	Gengtong Xu	47	17	10	20
2	Yonglin Chen	47	16	10	21
3	Yumeng Xue	45.2	13	10	22.2
4	Wusheng Yuan	45	13	10	22
5	Baishan Peng	45	13	10	22
6	Chuang Cui	44.6	14	10	20.6
7	Jiahui Wang	44.6	12	10	22.6
8	Yifan Zhang	44.3	15	10	19.3
9	Yujiang Li	43.05	14	10	19.05

10	Xinxia Xu	41.8	11	8	22.8
11	Qiang Zeng	41	14	10	17
12	Jiayu Gu	40.7	11	8	21.7
13	Xiao Luo	40.2	12	10	18.2
14	Mengdie Zhang	40	13	8	19
15	Haoran Li	39.4	9	6	24.4
16	Lei Cao	39.3	11	8	20.3
17	Zexin Zhao	37.7	15	6	16.7
18	Chengyu Lao	36.6	8	10	18.6
19	Huatao Yang	35.8	10	10	15.8
20	Xuanming Liu	35.6	10	10	15.6
21	Chengwei Wu	35.5	11	10	14.5
22	Zhongyu Wang	35.5	15	10	10.5
23	Junhan Zhou	35.4	5	10	20.4
24	Luxiang Ren	35	9	10	16
25	Xingzhi Qiu	34.95	13	8	13.95
26	Xinyue Xu	34.8	13	8	13.8
27	Xiang Li	34	12	10	12
28	Weikang Deng	33.8	14	8	11.8
29	Jie Chen	33.3	12	10	11.3
30	Junxian Nie	32.2	10	10	12.2
31	Duocheng Luo	32	8	10	14
32	Zihan Xu	32	10	10	12
33	Siyuan Shu	31.2	10	10	11.2
34	Hongye Liu	30.55	11	6	13.55
35	Wenjian Zou	30.4	12	6	12.4
36	Yucheng Wu	30.2	12	10	8.2
37	Gongchang Zhou	30	10	10	10
38	Xifa Yang	30	13	8	9
39	Yingxiang Wu	29.6	9	10	10.6
40	Rongding Li	29.5	9	10	10.5

41	Yuxuan Shang	29.5	12	10	7.5
42	Yunsheng Zhang	28.6	8	10	10.6
43	Lingling Jiang	27.4	9	10	8.4
44	Shiyu Li	27.4	10	8	9.4
45	Ruolin Liu	27	14	4	9
46	Zhen Liu	24.7	13	6	5.7
47	Chenhao Wang	24.6	0	8	16.6
48	Junsheng Xu	16.8	8	6	2.8

Mid-term Exam Performance,as shown in Table 1 above, which presents the mid-term exam performance of Class 1 of Artificial Intelligence Engineering Technology, Grade 2024, the full score was 55 points, and the exam duration was fixed at 90 minutes. A score of 39 points or above was considered a pass. Among the 48 students in the class, 16 passed, while 32 failed. Specifically, 22 students scored between 30 and 39 points (below the passing mark). The highest score was 47 points, and the lowest was 16.8 points.

For the multiple-choice section, which was worth 20 points, 25 students in our class scored 12 points or above. The highest score was 17 points, and the lowest was 0 points. The student who scored 0 points admitted that he did not attempt this section at all, as he spent most of his time on the word processing part.

In the Windows basic operations section, which was worth 10 points, 47 students in our class scored 6 points or above, with only one student scoring 4 points. Overall, students performed well in this section.

For the word processing section, which was worth 25 points, 23 students in our class scored 15 points or above. The highest score was 24.4 points, and the lowest was 2.8 points.

3.2 Class 1 of Computer Network Technology, Grade 2024

Table 2: Mid-term Exam Performance of Class 1 of Computer Network Technology, Grade 2024.

Serial Number	Name	Total Score (55)	multiple-choice question (20)	Windows Basic Operations (10)	Word processing (25)
1	Siyuan He	48.3	17	8	23.3
2	Fanghao Zhang	47.9	14	10	23.9
3	Chaohui Wang	45.6	13	10	22.6
4	Wente Dong	44.4	17	10	17.4
5	Youfa Chen	44	14	10	20
6	Zechan Liu	43.8	20	10	13.8
7	Jiafeng Yin	43.8	15	10	18.8

8	Junkai Tang	42.7	19	8	15.7
9	Jiaxu Huang	42.45	10	10	22.45
10	Zihao Zhang	42.4	10	10	22.4
11	Zihang Wang	41.6	17	10	14.6
12	Yongchao Shi	41.5	11	8	22.5
13	Xiaxuan Zhang	41.2	15	6	20.2
14	Yutong Hao	41	6	10	25
15	Yabin Wang	40.9	10	8	22.9
16	Jinzhen Chen	40.8	9	10	21.8
17	Weiyu Yun	40.2	6	10	24.2
18	Jiahui Shen	39.4	12	10	17.4
19	Fengsheng Lv	38.4	9	10	19.4
20	Qianwei Li	37	13	6	18
21	Jianhong Ou	34.6	18	10	6.6
22	Xiaomei Wang	34.4	8	8	18.4
23	Yutao Dong	34.3	13	8	13.3
24	Sen Chen	32.8	7	6	19.8
25	Qiming Chen	32.7	9	8	15.7
26	Changjin Yang	31.2	10	10	11.2
27	Changbin Liang	30.6	11	8	11.6
28	Bo Liu	30.3	17	6	7.3
29	Jiadong He	29.2	5	8	16.2
30	Tao Li	27.5	5	10	12.5
31	Chengzhi Su	23.2	5	10	8.2
32	Rikai Wu	20	10	5	5
33	Zeshe Hu	20	11	5	4
34	Hao Li	20	12	3	5
35	Wanzhong Wen	19	11	8	0

36	Zihao Feng	17.4	7	4	6.4
37	Hengwei Zhu	17	7	10	0
38	Jie Chen	13	7	6	0

Mid-term Exam Performance,as shown in Table 2 above, which details the mid-term exam performance of Class 1 of Computer Network Technology, Grade 2024, the full score was 55 points, and the exam duration was set at 90 minutes. A score of 39 points or above was considered passing. Among the 38 students in the class, 18 passed, while 20 did not. Specifically, 10 students scored between 30 and 39 points (below the passing mark). The highest score was 48.3 points, and the lowest was 13 points.

For the multiple-choice section, which was worth 20 points, 16 students in our class scored 12 points or above. The highest score was a perfect 20 points, and the lowest was 5 points.

In the Windows basic operations section, which was worth 10 points, 34 students in our class scored 6 points or above, with the lowest score being 3 points. Overall, students performed relatively well in this section.

For the word processing section, which was worth 25 points, 22 students in our class scored 15 points or above. The highest score was a perfect 25 points, and the lowest was 0 points, which was due to either failing to save and submit the file or not attempting the section at all.

3.3 Class 1 of Marine Engineering Technology, Grade 2024

Table 3: Mid-term Exam Performance of Class 1 of Marine Engineering Technology, Grade 2024.

Serial Number	Name	Total Score (55)	multiple-choice question (20)	Windows Basic Operations (10)	Word processing (25)
1	Jiahao Li	50.4	18	10	22.4
2	Xinfang Wei	48	20	10	18
3	Yaxuan Hu	47.8	16	10	21.8
4	Ziyi Liu	46.2	19	8	19.2
5	Xinyuan Xu	46	19	10	17
6	Shiyan Weng	45	20	10	15
7	Huimin Lou	44.2	15	10	19.2
8	Zhaozhuo He	44	17	10	17
9	Lingyao Zhang	43	18	10	15
10	Mingxuan Li	42.2	13	10	19.2
11	Zhi'en Xu	42.2	13	10	19.2
12	Yuchang Zhang	41.2	12	10	19.2
13	Bin Wu	38	20	6	12
14	Junde Fu	37	19	10	8
15	Hairong Yang	37	20	8	9
16	Rui Huang	37	20	10	7
17	Zhihao Wang	36	19	10	7

18	Kangping Chen	36	16	10	10
19	Xiaoshan Wang	34	18	10	6
20	Li Yang	33	18	10	5
21	Dejiang Long	32	19	8	5
22	Junheng Yang	31	17	8	6
23	Hongru Wu	31	16	10	5
24	Liyun Zeng	29	2	10	17
25	Jiantao Yun	28	13	8	7
26	Lin Chen	28	14	6	8
27	Qingkai Wu	27	14	10	3
28	Guanhao Wu	25	12	8	5

Mid-term Exam Performance,as shown in Table 3 above, which presents the mid-term exam performance of Class 1 of Marine Engineering Technology, Grade 2024, the full score was 55 points, and the exam duration was fixed at 90 minutes. A score of 39 points or above was considered passing. Among the 28 students in the class, 12 passed, while 16 failed. Specifically, 11 students scored between 30 and 39 points (below the passing mark). The highest score was 50.4 points, and the lowest was 25 points.

For the multiple-choice section, which was worth 20 points, 27 students in our class scored 12 points or above. The highest score was a perfect 20 points, and the lowest was 2 points. The class performed well in this section, as they had a certain foundation from high school, making the learning process akin to revision.

In the Windows basic operations section, which was worth 10 points, all 28 students in our class scored 6 points or above, with the lowest score being 6 points. Overall, students performed excellently in this section.

For the word processing section, which was worth 25 points, 13 students in our class scored 15 points or above. The highest score was 22.4 points, and the lowest was 3 points, indicating that some students barely put in any effort.

3.4 Class 1 of Tourism Management, Grade 2024

Table 4: Mid-term Exam Performance of Class 1 of Tourism Management, Grade 2024.

Serial Number	Name	Total Score (55)	multiple-choice question (20)	Windows Basic Operations (10)	Word processing (25)
1	Jiahao Li	52.2	19	10	23.2
2	Xinfang Wei	52.1	19	10	23.1
3	Yaxuan Hu	51.9	20	8	23.9
4	Ziyi Liu	48.7	18	10	20.7
5	Xinyuan Xu	48.5	19	10	19.5
6	Shiyan Weng	47.8	19	8	20.8
7	Huimin Lou	46.6	19	8	19.6
8	Zhaozhuo He	46.2	20	6	20.2

9	Lingyao Zhang	43.8	20	8	15.8
10	Mingxuan Li	43.6	18	10	15.6
11	Zhi'en Xu	40	18	10	12
12	Yuchang Zhang	40	18	8	14
13	Bin Wu	39.6	14	10	15.6
14	Junde Fu	39.3	18	10	11.3
15	Hairong Yang	31.2	18	10	3.2
16	Rui Huang	27.75	11	8	8.75
17	Zhihao Wang	27	19	8	0
18	Kangping Chen	27	19	8	0
19	Xiaoshan Wang	26	16	10	0
20	Li Yang	25.8	17	8	0.8

Mid-term Exam Performance, as shown in Table 4 above, detailing the mid-term exam performance of Class 1 of Tourism Management, Grade 2024, the full score was 55 points, and the exam duration was fixed at 90 minutes. A score of 39 points or above was considered passing. Among the 20 students in the class (with some absent), 14 passed, while 6 failed. Specifically, 2 students scored between 30 and 39 points (below the passing mark). The highest score was 52.2 points, and the lowest was 25.8 points.

For the multiple-choice section, which was worth 20 points, 19 students in our class scored 12 points or above. The highest score was a perfect 20 points, and the lowest was 1 point, equivalent to randomly selecting a few options without completing the section. However, overall, the class performed well in the multiple-choice section.

In the Windows basic operations section, which was worth 10 points, all 20 students in our class scored 6 points or above, with the lowest score being 6 points. The class also performed well in this section.

For the word processing section, which was worth 25 points, 11 students in our class scored 15 points or above. The highest score was 23.9 points, and the lowest was 0 points, due to reasons such as running out of time, forgetting to save, inability to complete, or lack of motivation.

4. Implementation Challenges and Countermeasure Suggestions

4.1 Implementation Challenges

As a teacher of the Fundamentals of Computer Intelligent Applications, based on my experience teaching five classes (including assisting my supervisor with one class during my internship), I have observed that students from different majors have varying learning situations and needs. For students in the School of Information Engineering, both undergraduate and junior college students are required to obtain a Computer Rank Certificate (Level 1 or Level 2) for graduation. Consequently, they generally study diligently and aim to pass the National Computer Rank Examination held in March or September each year to obtain the certificate. In contrast, students from non-information engineering majors are not mandated to obtain such certificates for graduation. Their primary

learning objectives are to become proficient in computer use, master the creation of PPT presentations and personal resumes for future employment, and understand basic computer assembly principles, computer maintenance, and network cable crimping. The implementation challenges are summarized as follows:

4.1.1 Significant Differences in Student Foundations and Needs

Students from different majors exhibit significant differences in their needs and learning motivations for computer foundation courses. Students in the School of Information Engineering are highly motivated to learn due to graduation requirements, resulting in better learning outcomes. In contrast, students from non-information engineering majors have relatively lower learning enthusiasm and unclear learning objectives due to the lack of mandatory requirements, leading to inconsistent teaching effects.

4.1.2 Disconnection Between Course Content and Actual Needs

Traditional computer foundation courses primarily focus on Office software operations. However, enterprise demands are concentrated in high-tech, internet, and telecommunications fields, with positions such as software engineers, AI algorithm engineers, and cybersecurity experts requiring advanced skills in programming, data analysis, and cloud computing [1]. The lag in course content results in a mismatch between what students learn and enterprise needs, affecting students' employability.

4.1.3 Insufficient Faculty Strength

The faculty in the basic teaching and research section is diverse, with few teachers specializing solely in this area. Most teachers are part-time or externally hired, with varying teaching experience and professional backgrounds, making it challenging to ensure consistent and stable teaching quality.

4.1.4 Single Teaching Method

Current teaching methods primarily rely on classroom lectures and practical training, lacking innovation and interactivity, and failing to stimulate students' learning interest and initiative. This is particularly true for students from non-information engineering majors, for whom traditional teaching methods are insufficient to meet their learning needs.

4.1.5 Single Assessment Method

Final and mid-term exams mainly focus on computer-based operations, with a single assessment method that fails to comprehensively evaluate students' comprehensive abilities. For practical computer courses, a single assessment method cannot accurately reflect students' practical operational and application skills.

4.2 Countermeasures and Suggestions

4.2.1 Tiered Teaching and Tailored Instruction

Develop differentiated teaching plans and objectives for students from different majors. For students in the School of Information Engineering, incorporate advanced skill training such as basic programming, data collection, data analysis, and visualization analysis. For students from non-information engineering majors, focus on cultivating basic computer skills and practical

application abilities, such as PPT creation, resume writing, and basic computer maintenance.

4.2.2 Update Course Content to Meet Actual Needs

Timely update course content based on enterprise demands, incorporating training in relevant advanced technologies. Introduce real-world cases and projects to enhance the practicality and relevance of the course.

4.2.3 Strengthen Faculty Development

Increase the proportion of teachers specializing solely in the basic teaching and research section, enhancing their professional backgrounds and teaching experience. Regularly organize teacher training and exchanges to improve their teaching abilities and professional levels. Establish a management mechanism for part-time and externally hired teachers to ensure consistent and stable teaching quality.

4.2.4 Innovate Teaching Methods to Improve Teaching Effects

Introduce innovative teaching methods such as project-driven learning, case-based teaching, and flipped classrooms to enhance course interactivity and interest [3]. Utilize online education platforms and virtual laboratories to provide rich teaching resources and practical training environments, stimulating students' learning interest and initiative.

4.2.5 Diversify Assessment Methods to Comprehensively Evaluate Student Abilities

In addition to traditional computer-based operations, incorporate diversified assessment methods such as project assignments, group discussions, and oral presentations [4] to comprehensively evaluate students' comprehensive abilities. For practical computer courses, assess students' practical operational and application skills through real-world projects and cases.

5.Conclusion and Outlook

5.1 Conclusion

Through an analysis of the current teaching situation and issues in computer foundation courses at Hainan Vocational University of Science and Technology, we have found significant differences in the needs and learning motivations of students from different majors for computer foundation courses. Students in the School of Information Engineering are highly motivated to learn due to graduation requirements, resulting in better learning outcomes. In contrast, students from non-information engineering majors have relatively lower learning enthusiasm and unclear learning objectives due to the lack of mandatory requirements, leading to inconsistent teaching effects.

Meanwhile, traditional computer foundation courses suffer from a disconnection between content and actual needs, single teaching methods [5], and single assessment methods, making it difficult to meet students' actual needs and enterprise employment standards. Therefore, we need to improve the teaching quality of computer foundation courses and students' comprehensive abilities through tiered teaching, updating course content, strengthening faculty development, innovating teaching methods, and diversifying assessment methods.

5.2 Outlook

In the future, with the in-depth advancement of the Hainan Free Trade Port construction, the

demand for technical and skilled talents in the regional economy will continue to grow [6]. As a crucial component of cultivating technical and skilled talents, computer foundation courses in higher education institutions need to continuously adapt to changes in market demands, timely update course content, innovate teaching methods, and improve teaching quality.

We suggest that higher education institutions strengthen cooperation with enterprises [7], establish an industry-academia-research integrated teaching model, introduce real-world enterprise projects and cases, and enhance the practicality and relevance of courses. Meanwhile, strengthen faculty development to improve teachers' professional backgrounds and teaching experience, ensuring consistent and stable teaching quality.

Furthermore, with the continuous development of information technology, teaching methods and assessment methods for computer foundation courses should also continuously innovate. Utilize online education platforms and virtual laboratories [8] to provide rich teaching resources and practical training environments, stimulating students' learning interest and initiative. Through diversified assessment methods, comprehensively evaluate students' comprehensive abilities, providing strong support for their employment and career development.

In conclusion, the reform and innovation of computer foundation courses in higher education institutions are ongoing processes that require continuous exploration and practice. We believe that through unremitting efforts, computer foundation courses in higher education institutions will better adapt to changes in market demands and contribute to cultivating more outstanding technical and skilled talents.

Acknowledgments

This paper was supported by the Hainan University of Science and Technology School-level Scientific Research Funding Project + Path Research on Big Data Technology Empowering Rural Revitalization in the Context of Hainan Free Trade Port: HKKY2024-47.

This research has received support from a provincial-level project of the 2025 College Students' Innovation and Entrepreneurship Program at Hainan Technology and Business University: Design and Implementation of an Intelligent Monitoring and Management System for Used Clothing Recycling Bins Based on STM32 and WeChat Mini Program.

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