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Research on Timetable Conflicts and Solution Approaches in Course Scheduling at Private Colleges

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Abstract:
Course scheduling is one of the core tasks of academic administration in colleges and universities, and its accuracy and rationality play a critical role in teaching operation and teaching quality. With the scale of private colleges expanding yearly, under the condition of limited teaching staff and teaching resources, the increase in new programs and the number of students has intensified the complexity of scheduling work. Timetable conflicts occurring in the course scheduling process constitute the major dilemma that needs to be urgently resolved in scheduling work. Based on the specific conflict problems in the course scheduling process of private colleges, this paper categorizes such problems, identifies the root causes of conflicts, and explores solutions, so as to provide references for improving scheduling quality and efficiency.

Keywords:
Private colleges; Course scheduling; Timetable conflicts; Solution approaches

The core requirement of course scheduling is to reasonably assign teachers and classrooms and scientifically plan teaching hours for each semester's courses according to the curriculum settings of each program's talent cultivation plan. As the final output of scheduling work, timetables can be divided into three types according to the scheduling subject: teacher timetables, student timetables, and classroom timetables. Among these, teacher timetable conflicts can be effectively avoided by the scheduling system displaying the teacher's available time slots, preventing the same teacher from teaching multiple courses at the same time. Although classroom timetable conflicts can be avoided by the scheduling system to prevent the same classroom from being assigned different courses at the same time, it cannot fully meet the demand of specific courses for dedicated teaching venues. In comparison, student timetable conflicts are the most difficult to resolve, and effective solutions must be explored to effectively improve the quality of scheduling work and the efficiency of teaching operation.

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1 Main Types of Timetable Conflicts in Course Scheduling in Private Colleges

1.1 Student Timetable Conflicts Caused by Public Compulsory Courses

When public compulsory courses (such as College English) and specialized courses are scheduled by program class, student timetable conflicts generally do not occur. In recent years, talent cultivation plans have been continuously optimized. On the basis of the original College English, a series of courses including College Japanese and Japanese Audio-Visual and Speaking Training have been added, forming a course selection mode of "either College English or College Japanese". Students who took Japanese as their foreign language in the National College Entrance Examination are assigned College Japanese by default, while non-Japanese-speaking students are assigned to College English. Since the number of students taking College English is relatively large, it is still suitable to split or combine classes by program class; whereas the number of students taking College Japanese is relatively small, usually only 1-2 teaching classes are offered campus-wide, requiring the integration of students from multiple programs for combined class teaching. Some programs have only one program class due to their small total enrollment, with fixed and unique time slots for their specialized courses, which makes it highly likely for College Japanese scheduling to conflict with these specialized courses in terms of time. During scheduling, multiple specialized course teachers and the College Japanese teacher's available time must be considered simultaneously, significantly increasing the difficulty. In addition, some specialized courses may be taught by part-time teachers from other institutions, whose available hours are extremely limited. Meanwhile, College Japanese teachers generally undertake the teaching of College Japanese and Japanese Audio-Visual and Speaking Training for both freshmen and sophomores, leaving limited room for time adjustment. In some cases, individual students' specialized courses conflict with College Japanese and cannot be resolved, posing a great challenge to scheduling work.

1.2 Student Timetable Conflicts Caused by Open Elective Courses

According to the nature and credit requirements of open elective courses in each program's talent cultivation plan, the Academic Affairs Office organizes course offering and selection each semester and completes scheduling based on the actual number of students selecting courses. Students taking the same elective course often come from different grades and different programs. Since the arrangement of teachers and class hours for public courses, specialized courses, retake courses, and makeup courses is a dynamic process, and the scheduling results can only be finalized before the timetable is officially released close to the start of the semester, open elective courses cannot be arranged in advance based on the time slots of the above courses, and students cannot determine conflict-free time slots by themselves when selecting courses. Even after resolving timetable conflicts through system and manual coordination, some students still face uncoordinated time conflicts between their elective courses and compulsory courses, retake courses, or makeup courses. Such students have to give up taking the conflicting elective courses, resulting in invalid course selection and affecting students' planned completion of elective course credits. The sharp drop in actual attendance for some elective courses not only increases teaching costs but also undermines the results of teaching quality evaluation.

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1.3 Student Timetable Conflicts Caused by Specialized Direction Course Selection

The talent cultivation plans of some programs set specialized direction courses in semesters 3-6. After students choose a specialized direction based on their own preferences, they are taught in separate classes. Since different specialized direction courses have different requirements for class size, and the number of students selecting courses is unevenly distributed among direction courses, scheduling cannot comprehensively arrange all courses based on specialized direction teaching classes, leading to time conflicts between direction courses and other compulsory or specialized courses. Such timetable conflicts are more difficult to resolve when the total number of students in the program is large.

1.4 Student Timetable Conflicts Caused by Innovation Class Courses

Innovation classes established by secondary colleges offer exclusive innovation courses in addition to students' original program courses. Each college solicits students' willingness to join or withdraw from innovation classes, selects students based on their comprehensive academic performance, and sets up one innovation class with a maximum planned enrollment. As students' semester-end performance rankings change each term, colleges cannot confirm the latest student roster of innovation classes until near the start of the semester, resulting in frequent time conflicts between innovation class courses and students' original program courses. The time adjustment of teachers for innovation class courses must coordinate with the arrangement of original program compulsory courses, forcing some innovation class courses to be offered intensively on weekends, which not only puts scheduling work in a passive position but also imposes considerable pressure on the teaching arrangements of both teachers and students.

1.5 Specific Classroom Timetable Conflicts Caused by Course Teaching Demands

More than 80% of the specialized courses in some secondary colleges require the use of dedicated classrooms (such as training labs, specific computer rooms, etc.), and the demand is fixed. Due to the different numbers of students in each grade, the number of teaching classes varies by grade; at the same time, the curriculum settings of talent cultivation plans are updated each year, further increasing scheduling difficulty. When academic administrators schedule courses according to the "dedicated classroom" remarks in the teacher assignment form submitted by the college, it often happens that "after resolving time conflicts between teachers and classes, classroom conflicts cannot be avoided," forcing some specialized courses to be rescheduled to evening hours. This may result in some class timetables being full all day, with students even having 12-13 classes per day, seriously affecting the teaching status of teachers and students and the quality of course teaching.

2 Principles for Solving Timetable Conflicts in Course Scheduling in Private Colleges

2.1 Holistic Principle

When solving timetable conflicts, it is necessary to comprehensively consider the three core elements of teachers, classrooms, and students, while also taking into account the scientificity and rationality of course

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teaching time. For example, language courses such as College English that are adjusted to resolve conflicts should be prioritized in early morning time slots, aligning with students' higher learning efficiency in the morning. College Physical Education courses, involving swimming in the spring semester, should avoid early morning time slots to prevent the impact of low water temperature on students' health. Difficult specialized courses should try to avoid evening hours to ensure teaching effectiveness. Public courses involve multiple programs across the campus, and teachers' teaching time slots should be evenly distributed between the first and second half of the week. For courses with limited dedicated classroom resources, the principle of "evenly distributing teaching time slots within the effective teaching hours of each day" should be followed to improve resource utilization.

2.2 Targeted Principle

Solutions to timetable conflicts shall be based on the core causes of various types of conflicts, combined with specific conditions such as course nature, class size and classroom conditions, adopting differentiated measures to avoid a one-size-fits-all approach. For public compulsory course conflicts, priority should be given to considering the combined class size of minority language courses (such as College Japanese) and the alignment of specialized course times for students from multiple programs, ensuring the teaching needs of core public courses are prioritized. For open elective course conflicts, it is necessary to optimize class division and time slot arrangement based on the number of students selecting courses and their grade and program distribution, reducing conflicts with core courses. For specialized direction course selection conflicts, reasonable class sizes for each direction teaching class should be set, and the time slots of direction courses and compulsory courses should be coordinated. For innovation class course conflicts, the time for determining the student list should be optimized, teaching time slots flexibly adjusted, and the arrangement of innovative class courses and original program courses balanced. For dedicated classroom conflicts, it is necessary to accurately count the capacity and usage requirements of dedicated classrooms, prioritize the dedicated classroom needs of core specialized courses, and reasonably allocate general classrooms as supplements.

2.3 People-Oriented Approach

For teacher timetables, it is necessary to avoid teachers teaching more than 9 classes per day due to conflict resolution, prevent teachers from overworking, and ensure teachers' physical and mental health and teaching effectiveness. For senior teachers with heavy family burdens or poor health, their special needs should be taken into account in scheduling conflict coordination, optimizing time arrangements. For student timetables, it is necessary to avoid students having full-day classes due to conflict coordination, while ensuring a reasonable connection between the end of morning classes and the first class in the afternoon, reserving sufficient lunch and break time to avoid affecting students' learning status in the afternoon, effectively protecting students' learning experience and physical and mental health.

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3 Solution Approaches to Timetable Conflicts in Course Scheduling in Private Colleges

3.1 Solutions to Student Timetable Conflicts Caused by Public Compulsory Courses

For conflicts in public compulsory courses (focusing on minority language courses such as College Japanese), the core lies in optimizing the combined-class scheduling mode and teacher time coordination. First, advance investigation and statistics shall be conducted. Before the start of course scheduling, the Academic Affairs Office, in conjunction with secondary colleges and the Admissions Office, shall collect data on the program distribution and enrollment of students who took Japanese as their foreign language in the National College Entrance Examination across the campus, as well as the scheduling plans for specialized courses in relevant programs and the available time slots of teachers (including part-time teachers), to prepare basic data and identify potential conflicts. Second, combined-class strategies shall be flexibly adjusted and a flexible scheduling mechanism adopted. If College Japanese students are from multiple programs and some programs have fixed time slots for specialized courses, split 1-2 small teaching classes (within 30 students) and prioritize arranging them in the gaps of specialized course time slots to avoid conflicts with core specialized courses. For cases with very few students (less than 20), if conflicts for only 1–2 students cannot be coordinated, a "online + offline" hybrid teaching mode may be implemented: offline intensive teaching shall be arranged in time slots without specialized course conflicts, while online supplementary teaching shall resolve conflicts for individual students. Third, teacher allocation shall be optimized. To address the time limitations of part-time specialized course teachers, communicate with part-time teachers from other institutions in advance, lock in available time slots, and prioritize arranging specialized courses around those time slots. For College Japanese teachers, the teaching hours of freshmen and sophomore courses shall be reasonably distributed, with 1–2 flexible slots reserved specifically for coordinating conflicts with specialized courses. If necessary, other qualified Japanese teachers on campus shall be coordinated to undertake part of the courses to alleviate time pressure on teachers.

3.2 Solutions to Student Timetable Conflicts Caused by Open Elective Courses

Based on the dynamic nature of course scheduling in private colleges, and taking feasibility and efficiency into account to minimize scheduling conflicts between open elective courses and compulsory courses, retake courses, and makeup courses: first, fixed elective slots shall be designated. 2-3 fixed weekly time slots (such as evenings and weekends) shall be reserved in advance as exclusive time for open elective courses, avoiding regular teaching slots of public courses and specialized courses to reduce the probability of conflicts at the source; no compulsory courses, retake courses, or makeup courses shall be arranged in these slots. Second, system and manual coordination shall be optimized. A conflict early warning function shall be added to the course scheduling system. After the finalization of compulsory courses, retake courses, or makeup courses, the system shall automatically match the teachers and time slots of elective courses, screen out conflict-free combinations and prioritize scheduling. During manual verification, focus shall be placed on high-frequency conflict slots and popular courses, with priority given to adjusting elective courses with concentrated conflicts. Third, a conflict remedy mechanism shall be established. For students still facing conflicts in the end, a supplementary selection channel shall be opened with a small number of alternative elective courses in differ-

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ent time slots, allowing students to select courses for a second time within the specified period to reduce the impact of conflicts and enhance students' course selection experience and scheduling efficiency.

3.3 Solutions to Student Timetable Conflicts Caused by Specialized Direction Course Selection

For conflicts in specialized direction course selection, the core is to balance class size and scheduling flexibility and clarify the foundation of course scheduling. First, scheduling priorities shall be defined in advance. Program classes shall serve as the core scheduling foundation, with public compulsory courses and core specialized courses of each program arranged preferentially, followed by direction courses based on specialized direction course selection results to ensure no conflicts among core courses. Second, direction course class division strategies shall be optimized. Before scheduling starts, the number of students selecting each specialized direction shall be counted and matched with the program class of each student. In accordance with class size requirements, students from the same program class shall be assigned to the same direction course class. For direction courses with unbalanced enrollment distribution, a "cross-direction combined class" (for similar direction courses) or "small-class teaching" mode shall be adopted, with teaching slots flexibly adjusted to avoid core course slots. Third, college coordination shall be strengthened. Each secondary college shall designate a dedicated person responsible for scheduling coordination of specialized direction courses, communicating scheduling needs for direction courses with the Academic Affairs Office in advance. If conflicts occur, priority shall be given to adjusting the teaching time slots of direction courses or coordinating with direction course teachers to adjust their available scheduling time, ensuring that students' specialized direction learning is not affected.

3.4 Solutions to Student Timetable Conflicts Caused by Innovation Class Courses

For innovation class course conflicts, the focus is on solving the problem of lagging student information and teacher time coordination, improving scheduling proactivity. First, the innovation class student statistics process shall be optimized. Final exam results are usually released within one week before the official start of winter and summer vacations. Secondary colleges shall accelerate the progress of comprehensive statistics on students' academic performance to avoid confirming student information close to the start of the semester, reserving sufficient time for scheduling. Second, the time arrangement of innovation class courses shall be optimized. Based on the course schedules of innovation class students' original programs, common free time slots for all students shall be screened and prioritized for innovation class courses to avoid conflicts with original program core courses. For time slots that cannot be coordinated, innovation class courses may be arranged in evening hours, avoiding intensive weekend teaching and reducing the burden on teachers and students. Third, teachers shall be flexibly allocated. Full-time on-campus teachers shall be preferentially selected for innovation class courses, with their available hours confirmed in advance to match the free slots of innovation classes. If external teachers are needed, their available hours shall be locked in advance and the time slots of innovation class courses adjusted accordingly to minimize conflicts.

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3.5 Solutions to Specific Classroom Timetable Conflicts Caused by Course Teaching Demands

For conflicts in specific classrooms (training labs, computer rooms, etc.), the core is to optimize classroom resource allocation while taking into account the rigid demands of courses and the teaching status of teachers and students. First, a dedicated classroom resource ledger shall be established. The Academic Affairs Office, in collaboration with secondary colleges, shall count the quantity, capacity, teaching facilities and available hours of all dedicated classrooms, clarify the usage demand for dedicated classrooms of each college and program, and implement "allocation based on demand and dynamic adjustment". Second, priority shall be given to meeting the demand of core courses. Core specialized courses requiring dedicated classrooms shall be preferentially arranged in effective daytime teaching hours, while non-core courses may be appropriately rescheduled for evenings, provided that evening courses for a single class do not exceed 3 class hours and the arrangement of 12–13 class hours in a single day is prohibited. Third, the scheduling order shall be optimized. A scheduling order of "courses requiring dedicated classrooms first, followed by courses in general classrooms" shall be adopted: courses needing dedicated classrooms shall be arranged in place before scheduling courses in general classrooms to reduce classroom conflicts. For the same dedicated classroom, usage slots for different grades and programs shall be reasonably distributed to avoid conflicts caused by concentrated time slots. Fourth, resource potential shall be explored. For some replaceable dedicated classroom needs, coordinate similar classroom resources to alleviate resource tension. In case of a severe shortage of dedicated classroom resources, applications may be filed for phased addition of dedicated classroom equipment, and the same course arranged in different time slots to reduce conflicts and ensure the fulfillment of teaching demands.

4 Conclusion

Timetable conflict is a core pain point in course scheduling for private colleges, closely related to curriculum setup, resource allocation and process linkage. The five categories of conflicts and targeted solutions summarized in this paper, in line with the principles of holisticity, targetedness and people-oriented approach, can effectively alleviate scheduling conflicts. In the future, we can continue to optimize scheduling system functions and improve process mechanisms based on the actual situation of each school, further enhancing scheduling efficiency and quality, providing support for the stability of teaching order in private colleges.

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