

Exploration on the Construction of Professional Elective Courses Based on Undergraduates' Course-Selection Motivations: A Case Study of Oil and Gas Resource Evaluation

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Abstract: Professional elective courses allow students to freely choose courses based on their interests, career plans, or academic preferences, significantly stimulating their learning motivation and enhancing classroom participation. However, some students select courses merely to accumulate credits, follow their peers' choices, or be lured by "popular courses," which in turn undermines the cultivation of their core professional competencies. The results of the questionnaire indicate that students have diverse motivations for course selection. Further statistical analysis reveals that externally driven and goal-oriented motivations account for a high proportion, while purely interest-driven motivation is relatively low. Moreover, different motivations significantly affect classroom participation and engagement levels.

Keywords: Professional elective courses; Course-selection motivations; Course construction

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1. Analysis of course-selection motivations

1.1. Questionnaire survey results

A questionnaire survey was distributed to more than 300 students who took this course in recent years, and 309 valid sample responses were collected. The survey results are shown in **Figure 1**. The survey finds that "only to earn enough credits" ranks as the top motivation, accounting for 22.01%. This demonstrates that a considerable number of students select courses just to meet credit requirements rather than valuing the intrinsic worth of the courses. "Following other students" takes up 15.86%, reflecting blindness in students' course choices. The proportion of students choosing courses to "learn professional knowledge" is 13.27%, which means some students take the course out of a desire to improve their professional literacy. The share of students selecting courses for "employment development" reaches 11.97, equal to the proportion of "teachers' recommendation". The former shows some students consider the course's value for future employment, while

the latter represents passive course selection following teachers' advice. The percentage of students choosing courses for postgraduate entrance exam preparation is 8.41%, indicating a small group takes the course to boost their competitiveness in postgraduate admission^[1-4]. The proportions of choices including "recommended by senior students", "personal interest" and "no clear idea" are relatively low, standing at 4.21%, 4.21% and 4.53% respectively, which suggests senior students' suggestions, personal hobbies and ambiguous motives have weak influence on students' decision-making. The motivation of "recommended by parents and friends" accounts for the lowest ratio of merely 3.56%, showing that advice from family and friends barely affects students' course selection decisions. Overall, students' course-selection motivations are diversified and dominated by external factors, while students fail to fully take the initiative to consider their own interests and career plans.

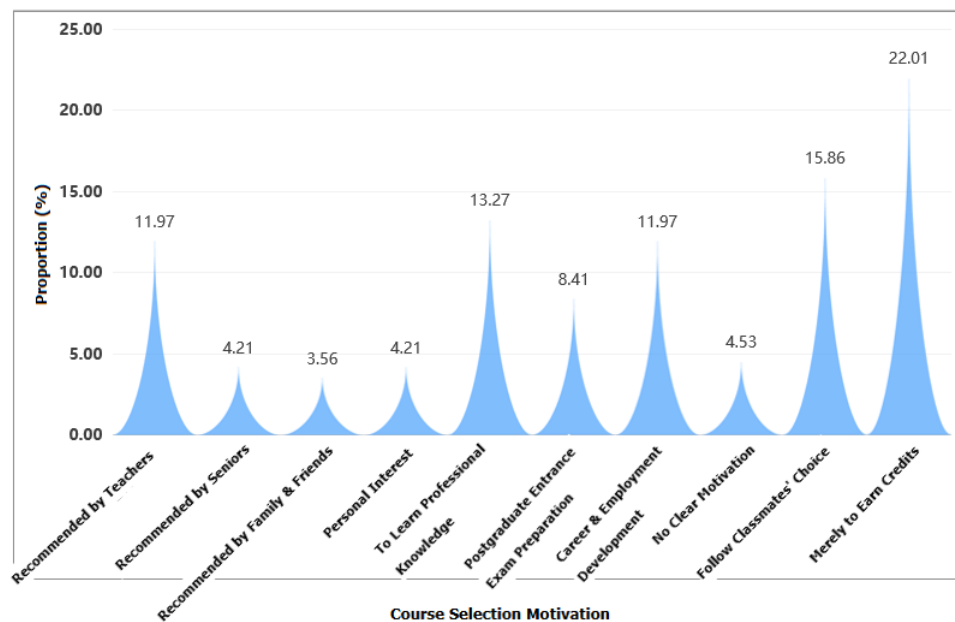


Figure 1. Distribution Diagram of Course-Selection Motivations for Oil and Gas Resource Evaluation.

1.2. Classification of course-selection motivations

The ten motivations obtained from the survey can be categorized into four types, as shown in **Figure 2**.

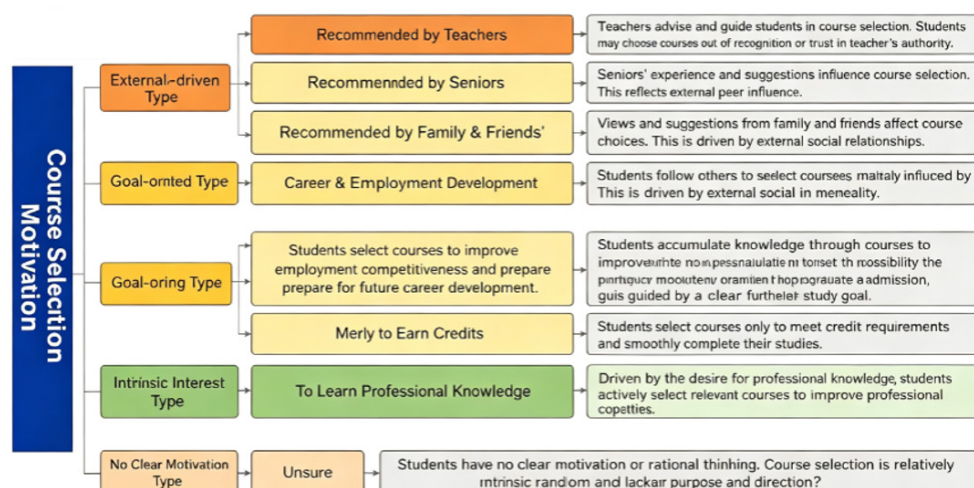


Figure 2. Classification Diagram of Course-Selection Motivations for Oil and Gas Resource Evaluation.

When classified by course selection motivations, externally driven students account for 35.60%, goal-oriented students make up 42.39%, intrinsically interested students take 17.48%, and students with no clear motivations constitute 4.53%. This indicates that the vast majority of students weigh their options and think carefully before choosing courses instead of acting completely blindly, yet a tiny minority lack clear direction and are more likely to feel lost. Students driven by intrinsic interest select courses out of genuine passion for the course content; they enjoy the learning process and gain joy and a sense of fulfillment from it. Nevertheless, this group accounts for a relatively low proportion, which suggests that under the current educational context, few students pick courses purely out of personal interest. Externally driven students are mainly influenced by parents, teachers, social recognition, or career prospects. On one hand, this reflects the high value families and society place on education; on the other hand, it reveals that some students lack independent judgment and tend to make decisions based on external guidance. Goal-oriented students have clear demands: to upgrade their skills, raise their grade point averages for admission to ideal majors, or align their studies with future career needs in advance. They demonstrate strong self-motivation and planning awareness, and this proactive attitude usually leads to better academic performance while laying a solid foundation for their future development. Admittedly, quite a few students select courses merely to earn enough credits. Although they have definite goals, they are highly unlikely to engage actively in coursework and hold the mindset of “just passing is enough” ^[5-7].

2. Current course situation and problem diagnosis

Oil and Gas Resource Evaluation is a core course for majors such as Oil and Gas Engineering, Geology and Geological Engineering. It focuses on resource evaluation in oil and gas exploration and development, covering geological, geophysical, geochemical and economic evaluation modules. Its teaching objective is to equip students with systematic methods for resource estimation, reserve assessment and development potential analysis. This course features strong comprehensiveness and professionalism, involving multiple disciplines including advanced mathematics and probability theory, which requires students to master prerequisite knowledge solidly. In practice, many students have weak command of prior courses, leading to difficulties in understanding lessons and low willingness to listen, which is reflected in four main aspects:

(1) Overloaded Course Contents Bring Difficulties to Knowledge Absorption

As an extension and deepening of Petroleum Geology, this course requires solid foundational knowledge of petroleum geology. Yet students' prerequisite courses are mismatched, resulting in incomplete petroleum geology knowledge systems. Some students whose prior studies focus on solid minerals struggle to keep up with classroom progress.

(2) Sluggish Learning Attitudes Among Students

Students' slack learning attitudes appear in stages. At the beginning of the semester, many students select courses merely for credits and hold casual attitudes, creating a loose classroom atmosphere. In the middle stage, some originally earnest students give up as they fall behind learning schedules. In the mid-to-late period, students motivated by postgraduate or employment development start to engage actively. Besides, a small number of students choose courses blindly without clear purposes; their herd mentality makes them easily influenced by slack peers.

(3) Insufficient Practical and Innovative Competence

The first eight weeks of the semester focus on theoretical lectures, while the latter eight weeks shift to practical training with greatly increased difficulty. Students motivated by employment or postgraduate preparation perform actively in practical sessions, whereas other students often resist real case studies with low participation.

(4) Low Learning Interest

Traditional classroom teaching centers on teachers with one-way knowledge delivery, making learning tedious. The evaluation system mainly relies on attendance and final exam papers with single dimensions, which fails to measure professional literacy and practical ability, thus weakening students' learning interest.

From the perspective of course-selection motivations, the above problems can be better interpreted as different motivations leading to distinct classroom performances.

Students who take courses on teachers' recommendations highly recognize teachers' professional authority and regard teachers as sole knowledge providers, tending to receive knowledge passively with weak willingness to explore independently. They stay focused at the beginning of classes, yet feel greatly disappointed if teaching content or styles fail to meet expectations. They respond actively to teachers' direct questions and submit assignments steadily, but rarely produce innovative outputs.

Students following senior students' advice regard seniors' experience as reliable references to reduce trial-and-error costs and seek group belonging. They stay positive if actual classes match seniors' descriptions, but lose enthusiasm when discrepancies appear.

Social relations and obedience psychology drive students recommended by parents or friends, treating course selection as a way to satisfy others' expectations rather than fulfilling personal needs, creating internal conflicts of "studying for others". Though they maintain high attendance, their classroom participation is passive and they hesitate to finish independent exploration tasks.

Students with intrinsic interest motivations align with the autonomy demand in Self-Determination Theory. They view classes as channels to satisfy curiosity and extend hobbies, take initiative to raise questions and expand discussions, conduct in-depth assignment research, and maintain critical thinking towards course content.

Students motivated by professional knowledge acquisition hold clear cognitive demands and achievement motivation, valuing systematic, cutting-edge knowledge. They actively construct knowledge frameworks and set high standards for theories and practical application, and easily feel anxious if courses are overly abstract with insufficient practical cases.

Students aiming for postgraduate admission or career development are typical goal-oriented learners. Those preparing for postgraduate exams treat the course as a knowledge reserve and competency certification, dealing with weakly related content perfunctorily. Job-oriented students attach great importance to the market value of courses, actively participate in practical modules yet feel impatient with pure theoretical parts, focusing on immediate application skills.

Students following peers hold a herd mentality to gain group identity with vague self-awareness and lack proactive responsibility; they often cluster in class and disturb classroom order.

Students who only aim to earn credits regard courses as mandatory graduation requirements. Driven by time anxiety, they only care about passing exams with little attention to course quality. Despite decent attendance, they get distracted frequently and engage in invisible absenteeism. Such students often take numerous elective courses in lower grades to accumulate credits rapidly, leading to scattered energy for each

subject and idleness after meeting credit standards in later academic years.

Generally speaking, students' course-selection motivations largely determine their subsequent classroom performances. Learners with intrinsic interest show stronger resilience and critical thinking with greater long-term development potential, while those relying on external incentives easily suffer motivation drift. Therefore, curriculum design and construction should convert external motivations into internal driving forces to fully mobilize students' initiative.

3. Curriculum construction strategies guided by course-selection motivations

For the construction of professional elective courses, full consideration should be given to students' course selection demands, and improvements shall be realized from four dimensions: course contents, teaching methods, evaluation mechanism and resource integration, taking Oil and Gas Resource Evaluation as an example.

3.1. Optimization of course contents

The course is divided into three parts: Basic Theory, Professional Expansion and Practical Application. The basic theory module centers on core petroleum geology knowledge to make up for students' insufficient prerequisite foundation^[8]. Supporting virtual simulation experimental platforms convert abstract stratum relations into visual 3D geological models. The professional expansion module adopts thematic teaching by sub-directions of oil and gas resource evaluation: Basin Simulation & Resource Prediction for geological evaluation, Seismic Inversion & Reservoir Prediction for geophysical evaluation, and Economic Analysis of Oil and Gas Projects for economic evaluation.

3.2. Innovation of teaching methods

Design the three-stage teaching method of "Motivation Activation - Knowledge Construction - Competence Transfer". In the motivation activation stage, a "course selection motivation questionnaire" is adopted to identify students' curriculum demands, and a "course value decoding" session is arranged in the first class to strengthen their recognition of learning objectives. In the knowledge construction stage, the integrated mode of "flipped classroom + case workshop" is applied. Micro-lesson videos covering theoretical content are produced for students to learn independently before class, while in-class time is reserved for case discussions. For practical content, a dual-teacher classroom featuring both enterprise mentors and university instructors is established, with industry experts invited to teach on campus. Through analysis of real-world data, students can master the latest industrial technical specifications. In the competence transfer stage, a "motivation-task matching" mechanism is developed. Students preparing for postgraduate entrance examinations are required to construct mind maps of problem-solving logic based on exam questions from the past five years; students targeting employment need to submit solution reports for real corporate projects; students with research interests conduct cutting-edge research topics such as "Applications of Artificial Intelligence in Geological Modeling".

3.3. Reform of evaluation mechanism

Construct a three-dimensional evaluation system consisting of "process evaluation, outcome evaluation

and motivation achievement evaluation”. Process evaluation: Record learning engagement from multiple dimensions such as classroom interaction data and contribution to group projects. Outcome evaluation: Establish three tiers of outcomes covering “foundation, specialty and innovation”. The foundation tier corresponds to compulsory knowledge points; the specialty tier matches abilities related to course selection motivations (such as analysis of postgraduate entrance examination real exam questions and corporate case reports); the innovation tier encourages cutting-edge interdisciplinary innovation projects. Motivation achievement evaluation: Quantitatively assess the extent to which the course satisfies students’ course selection motivations via the “Self-Assessment Scale for Learning Motivation Achievement” at the end of the semester, which serves as the core basis for subsequent course improvement ^[9].

3.4. Empowerment by industrial resources

Build a collaborative practice platform integrating schools, enterprises and research institutions. For career-oriented students, invite enterprise specialists or university teachers undertaking real corporate projects to share project progress and on-site practical experience. For students preparing for postgraduate entrance exams, arrange online lectures delivered by university scholars of relevant majors and invite outstanding postgraduates to share their experience of taking the exams and pursuing postgraduate studies. For students with academic interests, launch a “Student Lecture Hall” program that allows students to conduct independent research on self-selected topics and present their research findings. For students who initially select courses merely to earn credits, develop “learning motivation activation courses”. A series of activities including lectures by industry experts and on-site corporate visits will be organized to arouse their interest in their majors ^[10].

4. Conclusion

Starting from students’ course-selection motivations, this paper systematically analyzes the Oil and Gas Resource Evaluation course. It finds most students select electives to earn credits or follow external suggestions, while few choose courses out of genuine interest, which reduces classroom efficiency and hinders professional growth.

Targeted improvement strategies centered on learning motivations are proposed: simplify complicated content, arouse learning enthusiasm, and integrate practical innovation into core teaching links. These measures solve problems including students’ slack attitudes and mediocre academic outputs, and simultaneously improve students’ professional literacy and practical capabilities to cultivate innovative talents meeting future industrial demands.

Specifically, optimized content modules consolidate foundations and keep pace with industrial frontiers; innovative teaching methods transform passive listening into active exploration; adjusted evaluation systems fully record learning trajectories and phased achievements; introduced industrial resources bring real work scenarios into classrooms and enrich vocational experience.

Therefore, universities shall prioritize students’ actual demands in the construction of professional elective courses, form a closed loop of “Demand Identification — System Restructuring — Dynamic Feedback”, and realize precise supply and high-quality talent cultivation.

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