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PAPER

Influences of Anchored Instruction on Fragmented Learning Outcomes of University Students

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ABSTRACT

With the rapid development of information technology (IT), the traditional knowledge media can no longer meet the needs of students to acquire knowledge and instant messages quickly in the information era. Various online learning platforms have been developed accordingly to provide continuous access to fragmented knowledge and information. IT has been extensively applied in the field of education, offering extensive development spaces and technological supports to establish an "anchored" teaching mode based on the constructivism theory. This has made fragmented learning outcomes, which extensively use IT technology, a salient topic in anchored instruction. The present study draws data from 252 Traffic Engineering students to analyze the influence of anchored instruction on the fragmented learning outcomes of university students. The results indicate the good reliability and validity of the questionnaire, with the five aspects of anchored instruction—context setup, problem identification, independent study, cooperative learning and effectiveness evaluation—all capable of significantly improve the fragmented learning outcomes of university students. Different course types, such as practice courses and theory courses, yield different learning outcomes. The research conclusions provide important references to construct a knowledge network of fragmented knowledge based on anchored instruction, facilitate students to extend existing research contents in fragmented deep learning, and discuss the convenient information environment for anchored instruction based on information technology.

KEYWORDS

anchored instruction, fragmented learning, learning outcomes, questionnaire technology, analysis of variance

1 INTRODUCTION

With the rapid development of information technology (IT), traditional knowledge media can no longer either meet the needs of students to acquire knowledge or send instant communication. As a result, various platforms such as Micro-course, MicroBlog, WeChat, and Zhihu have developed, accordingly providing fragmented

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knowledge and information on a constant basis. The number of students engaged in fragmented learning through mobile devices is continuously increasing, thereby unconsciously stepping into an era of fragmented learning. Nowadays, with the rapid development and applications of IT, said discipline has also become represented by multimedia technology, and network technology has been gradually integrated into various aspects of teaching. Recently, some Chinese and foreign scholars have carried out deep studies on online learning. Because fragmented online knowledge generally lacks systematic approaches and integrity, it is disadvantageous for students to establish a complete knowledge system. To get high click rates, many students merely learn superficial fragmented knowledge but have relatively few works with high ideological contents and scientific basis, which are disadvantageous for deep learning. Due to the inertia formed by long-term exam-oriented education, most students are inept at fragmented deep thinking and thus cannot capture inspiration from fragmented information and propose deep creative problems. Fragmented learning defects in online learning have instead become a great bottleneck against the deep learning and thinking of students. Therefore, it is urgent to establish a new teaching mode to adapt to the fragmented learning environment, guide students to focus on real problems, and foster deep learning and deep thinking by solving these real problems.

Fragmented learning has become an essential development trend in the current learning mode. Its advantages can be fully developed, and it can be used as an important supplement to traditional classroom teaching. A new teaching mode shall be established to adapt to the fragmented learning environment, guide students to focus on real problems, and conduct deep learning and thinking by solving real problems. Anchored instruction is established based on the learning theory of constructivism. Students realize the whole process of goal-setting through mosaic teaching and the cooperative learning of students in real-world problem contexts. After the anchored instruction is proposed, learners are then required to build knowledge positively, with constructivism used as the theoretical basis. Anchored instruction mainly believes that students may come up with various ideas to solve practical problems and subsequently develop a series of learning behaviors and activities. Clearly, teachers may not impart knowledge to students during anchored instruction. Instead, they may provide them with opportunities for practices and help them acquire practical knowledge so that students can apply the learned knowledge in practical life. During anchored instruction, teaching content shall be combined with practical context, and students can only cooperate to realize meaningful construction of knowledge as long as they have opportunities to engage in independent thinking and learning. Therefore, anchored instruction overcomes the insufficient depth of fragmented learning to some extent, guides students to focus on real problems, and promotes deep learning and deep thinking by solving real problems, thus making it an important supplement to traditional teaching modes.

2 THEORETICAL BASIS AND HYPOTHESES DEVELOPMENT

2.1 Theoretical basis

Bransford, J. D. et al. [1], believe that anchored instruction, also known as "problem-based teaching" or "case-based teaching," is a teaching mode based on constructivism learning theory. Vye, N. S. et al. [2] point out that anchored instruction emphasizes a problem-oriented core, helps students discover problems in a relatively

real teaching context, produces various learning needs, and lets them experience the entire process from problem discovery to problem solving through independent study and cooperative learning. Anchored instruction creates a problem context in class and divides students into several groups to solve various practical problems through independent and cooperative learning. In anchored instruction, students are encouraged to make learning activities around problems or events, independently explore after a series of organizational activities, and ultimately discover and solve problems by themselves. During this process, teachers and students have equal relationships and cooperate mutually. Teachers thus complete the transformation of identity from "indoctrinators" to "guiders," and fully listen to the individual opinions of students. Many studies have proved that it is easier to realize the program objective and facilitate students in solving problems through anchored instruction. Moreover, anchored instruction can encourage students to communicate, cooperate, and make self-assessments and self-surveys carefully.

2.2 Hypotheses development

Anchored instruction is different from traditional teaching. In anchored instruction, the teaching activities are initiated the moment teachers ask questions and guide students to deep learning and deep thinking. Teachers learn with students as instructors or learning partners. The problem to be solved often has multiple schemes. Teachers encourage students to discover new problems during teaching, thus extending their new learning. Anchored instruction can be divided into five links, each explained below. The research hypotheses for these five aspects will be proposed herein.

Context setup: The primary task of teachers is to create real context. As context comes from the teaching topic of the class, teaching activities can take place in environments close to lives of students, thus stimulating their interest in exploring knowledge. Shyu, H. Y. C. [3] strengthened learning in several universities in Taiwan by using video-anchored instruction and analyzed the influences of the learning environment on learning outcomes by creating a relatively advanced video program context. Günbaş, N. [4] disclosed how pre-service mathematics teachers designed the mathematics learning environment of anchored instruction and found that their design method conformed to the advantages suggested by anchored instruction theory. Their technological beliefs were influenced positively, and their judgment on technical textbook design was supported by relevant studies, which were conducive to students' learning. Love, M. S. [5] offered students in the literacy education curriculum an opportunity to have multimodal learning through multimedia fixed cases on the Internet. Results showed that anchored instruction in the field of education had a positive effect on project-based teaching. Rieth, H. J. et al. [6] investigated the effects of instruction on the behaviors of students and teachers in two language arts courses for the 9th Grade and showed that students might give higher-level and longer answers to questions and propose higher-level and longer questions if teachers improved the level and length of the questions during context setup. Kariuki, M. et al. [7] studied 22 pre-service teachers from a typical teacher education institution in southeast Ohio and found that anchored instruction was effective for pre-service teachers to learn advanced technological tools and use them in future practices. Given these discussions, this study proposes the first research hypothesis:

H1: Context setup of anchored instruction can improve fragmented learning outcomes significantly.

Problem identification: The chosen event or problem is the "anchor," and asking a question is to "cast an anchor," wherein the problem is related to the research topic of the class. During this process, students are encouraged to participate positively in classroom activities; hence, teachers have to ask questions appropriate for most students. Based on constructivism theory, Tam, M. [8] discussed the characteristics and values of design teaching and believed that remote learning provided a unique environment. Results showed that the problem identification in anchored instruction was in its teaching design and practices through conformation to the constructivism perspective, which changed remote education from a highly industrialized large-scale production mode to a subjective construction mode that emphasizes learning knowledge and significance from individual experiences. Surry, D. W. et al. [9] described how university managers view technologies as essential tools to solve many problems in higher education and discussed strategies to strengthen teachers' motivation to use these technologies. Results demonstrated that problem identification was needed during anchored instruction, which should also consider the basic qualities of learners. Roy, A. [10] argued that the key to determining a teaching problem was to consider the learning needs of learners. Thomas, C. N. et al. [11] pointed out that determining teaching problems in anchored instruction was a process wherein teachers determined the range of teaching topics according to their knowledge systems for different types of courses. Zydney, J. M. et al. [12] analyzed the influences of different problem identification methods of anchored instruction on the mathematics performances of students and compared the performances of two types of students with different iterations in solving problems using analysis of covariance parameters. Anchored instruction was found to be strengthened by structured guidance in problem solving, if necessary. This greatly allows for the opportunity to improve students' ability to solve simple conceptual problems. Hence, this study proposed the second research hypothesis.

H2: Problem identification of anchored instruction can improve fragmented learning outcomes significantly.

Independent study: This link independently trains the studying abilities of students. During this process, teachers only remind students about ideas for solving problems rather than directly providing solutions, and students explore said solutions by themselves. Davis, A. [13] discussed the applications of the concept of student agency in a "New Zealand Curriculum." When teaching was "anchored" at these core aspects, students had the opportunity to master and control their learning. It was also very important to develop the independent study mode of the curriculum by cooperating with students, which was conducive to their successes. D'souza, F. et al. [14] discussed the major influences and interactions of cooperative technology-enhanced anchored instruction (CTEAI) and learning styles on the social skills of students. Results demonstrated that CTEAI was clearly more effective than traditional teaching methods in training social skills in students, which could improve the independent study ability of learners to assist educators and positively adopt appropriate innovative teaching strategies, thereby further improving their social skills. Foster, A. [15] pointed out that game-based learning and design could train the interests of science learners. Bottge, B. A. et al. [16] found that the mathematics performances of students who accepted enhanced anchored instruction (EAI) and typical teaching were both improved, with the mathematics performances of students accepting EAI showing a stark increase in said improvement, accompanied by a greater improvement in independent studying ability. Elekaei, A. et al. [17] investigated the influences of audio blogs with static pictures and audio blogs

with cartoon pictures on the vocabulary acquisition and memory of learners using the process-oriented method. Results showed that participants who accepted audio blogs and cartoon pictures had a higher vocabulary level, better memory, and improved independent study levels. Hence, this study proposes the third research hypothesis:

H3: Independent study of anchored instruction can improve fragmented learning outcomes significantly.

Cooperative learning: To deepen students understanding of problems and offset the shortcomings of independent study, teaching provides students with opportunities for cooperative learning. The learning quality and cooperative learning abilities of students can be improved through common discussion and mutual correction. Serafino, K. et al. [18] believed that cooperative learning through anchored instruction could facilitate mutual discussion among learners, mutually study deeper learning knowledge, and strengthen learning motivation. Kurz, T. L. et al. [19] analyzed the influence of student-student cooperative learning of anchored instruction on the mathematics performances of learners and concluded that anchored instruction was more appropriate for courses such as mathematics. Student-student discussion of skills in solving mathematical problems was beneficial to improving the academic performances of students. Elcin, M. et al. [20] discussed the influences of anchored instruction on mathematics teaching in middle school using a quasi-experimental design and found that students of the experimental group (anchored instruction) were more successful than students of the control group (traditional teaching mode). The anchored instruction turned into an interesting and effective cooperative learning mode. Dyson, B. et al. [21] analyzed how cooperative learning influenced the learning ability of students and used five methodological steps laid out in Shulruf as the basis of process screening. Results showed that cooperative learning could significantly improve the academic performances of learners. Hence, this study proposes the fourth research hypothesis:

H4: Cooperative learning of anchored instruction can improve fragmented learning outcomes significantly.

Effectiveness evaluation: After cooperative learning, students must show their learning process to classmates and teachers, and teachers will then assess their learning outcomes and help them offset shortages. The entire learning process cannot be completed without self-evaluation, peer evaluation, and teachers' evaluation. Scharnhorst, U. [22], believed that anchored instruction is an American constructivism method. Results showed that it is necessary to strengthen learning effectiveness evaluation as the last link in an anchored instruction environment, thus forming a closed loop in the teaching process. Indriani, R. Y. [23] applied a quasi-experimental design and found that anchored instruction could improve the reading comprehension performances of students in the 8th Grade, especially on narrative paragraphs. Moreover, the enthusiasm of learners to participate in learning evaluation was also significantly strengthened. Riyanto, R. et al. [24] found that constructing a genetic flipping learning model interacting with anchored instruction in Aurora 3D cartoons could improve the critical thinking of university students. Hence, this study proposes the fifth research hypothesis:

H5: Effectiveness evaluation of anchored instruction can improve fragmented learning outcomes significantly.

3 METHODOLOGY

3.1 Questionnaire design

Following this study's research needs, a questionnaire on the influences of anchored instruction on fragmented learning outcomes of students in engineering and technological universities was designed based on a literature review, consultation with relevant educational and technological experts, and the basic principles and standards for common relevant design scales. The questionnaire observed the format and requirements in the questionnaire design and coincided with the characteristics of anchored instruction. First, following Shyu, H. Y. [25] and Chen, Y. T. [26], the questionnaire contained five aspects, namely context setup, problem identification, independent study, cooperative learning, and effectiveness evaluation. These five aspects had 4, 4, 3, 4, and 3 measuring questions, respectively. Second, learning outcomes were measured by five questions in the study of Sharif Nia, H. et al. [27]. Third, general information about learners was investigated, including gender, age, and course type. All questions were measured using a 7-point Likert scale.

3.2 Research objects

Henan Province is a major education province in central China with numerous higher education institutions. Due to the COVID-19 pandemic, Huanghe Jiaotong University in Henan Province comprehensively launched its online teaching mode and achieved remarkable results. In this study, a questionnaire survey was given to students majoring in Traffic Engineering at Huanghe Jiaotong University. The influences of anchored instruction on the fragmented learning outcomes of university students were therein analyzed. The research team encoded the questionnaire into the system using the Wenjuanxing Survey System (www.wjx.cn), and a QR code was produced and sent to respondents. The online teaching effect in the autumn semester of 2021–2022 was the term investigated. In the 5-day survey proper, a total of 296 questionnaires were collected. After the deletion of invalid ones, 252 questionnaires were ultimately valid, showing an effective recovery rate of 85.14%. The detailed survey information is shown in Table 1.

Table 1. General information about respondents

Name	Options	Frequency	Percentage (%)
Gender	Male	210	83.33
	Female	42	16.67
Course type	Practice course	106	42.06
	Theory course	146	57.94
Grade	Freshman	44	17.46
	Sophomore	88	34.92
	Junior	73	28.97
	Senior	47	18.65
Total		252	100

Table 1 shows that the proportion of male students in Traffic Engineering is relatively high (83.33%), which conforms to practical situations due to the low proportion of female students in engineering majors in China. There's a high proportion of theory courses (57.94%), and the proportion of credit hours for practice courses must be further increased to improve their operational ability. The distribution of respondents among different grades is relatively balanced.

4 RESULT ANALYSIS

4.1 Reliability and validity

Reliability explores and tests whether results are agreed upon, stable, and reliable, and is usually expressed through internal consistency. With a higher reliability coefficient, the test results are more consistent, stable, and reliable. Validity thus refers to effectiveness, that is, the scope of measuring tools or tools that can accurately measure the testing object. Validity is also the reflection of testing results on the investigating thing. If the measuring results conform better to the investigation scope, the validity is higher; otherwise, the validity is lower. Here, the reliability and validity of the questionnaire were first tested. Results are shown in Table 2.

Table 2. Reliability test results

Variable Types	Name of Variables	Number of Measuring Questions	Quantity of Measuring Questions	Cronbach α	Cronbach α
Independent variables	Context setup	A1–A4	4	0.938	0.881
	Problem identification	B1–B4	4	0.935	
	Independent study	C1–C3	3	0.924	
	Cooperative learning	D1–D4	4	0.904	
	Effectiveness evaluation	E1–E3	3	0.927	
Dependent variable	Learning outcomes	Y1–Y5	5	0.889	

Table 2 shows that Cronbach α of all independent variables is higher than 0.9, indicating that the reliability quality of research data is very high. The Cronbach α of dependent variable is between 0.7–0.8, indicating good reliability.

Table 3. KMO and Bartlett tests

KMO Value		0.854
Bartlett sphericity test	Approximate Chi-square	4500.599
	df	253
	p-value	0

Table 3 shows that the KMO value is 0.854 (>0.8), indicating that the research data is very appropriate for information extraction (it reflects the good validity indirectly). The validity analysis passed the Bartlett test (the corresponding p-value is lower than 0.05).

The confirmatory factor analysis (CFA) is applicable to the study's convergent validity, discrimination validity, and common method variance (CMV), thus explaining Tables 4 and 5.

Table 4. AVE value and CR value

Variables	AVE Value Extracted from Variance of Mean	Composite Reliability (CR)
Context setup	0.792	0.938
Problem identification	0.783	0.935
Independent study	0.803	0.925
Cooperative learning	0.709	0.907
Effectiveness evaluation	0.810	0.928
Learning outcomes	0.625	0.892

Table 4 shows that the AVE values of all six factors herein are all higher than 0.5 and that CR values are all higher than 0.7. This ultimately reflects that the analysis data has good convergent validity.

Table 5. Discrimination validity: Pearson correlation and square root of AVE

	Context Setup	Problem Identification	Independent Study	Cooperative Learning	Effectiveness Evaluation	Learning Outcomes
Context setup	0.89	–	–	–	–	–
Independent study	0.285	0.24	0.896	–	–	–
Cooperative learning	0.202	0.34	0.13	0.842	–	–
Effectiveness evaluation	0.3	0.294	0.262	0.252	0.9	–
Learning outcomes	0.162	0.064	0.023	0.167	0.126	0.79

Note: Clinodiagonal numbers are square roots of AVE.

Table 5 shows that the square roots of the AVE of six variables are all higher than the maximum absolute value of factor correlation factors, indicating good discrimination validity.

4.2 Linear regression

Table 6. Linear regression results

	Standardization Coefficient	T-Value	P-Value	95% CI	VIF	R^2	F
Constant	–	7.467	0.000**	0.975–1.670	–	–	–
Context setup	0.185	4.286	0.000**	0.061–0.164	1.247	0.632	F (5,246) = 84.354, $p = 0.000$
Problem identification	0.56	13.853	0.000**	0.292–0.389	1.093		
Independent study	0.1	2.199	0.029*	0.007–0.123	1.392		
Cooperative learning	0.136	3.148	0.002**	0.031–0.132	1.242		
Effectiveness evaluation	0.209	4.791	0.000**	0.089–0.212	1.274		

* $p < 0.05$, ** $p < 0.01$

Notes: *Significance under the 5% significance level. **significance under the 1% significance level.

Table 6 shows that R^2 of the model is 0.632, indicating that five independent variables can interpret 63.2% changes of the dependent variable. The model passes the F-test ($F = 84.354$, $p = 0.000 < 0.05$), which means, that at least one of the five independent variables can influence the dependent variable.

(1) H1 is true: The context setup of anchored instruction can significantly improve fragmented learning outcomes. This is mainly because in online learning of Traffic Engineering, the premise of anchored instruction is that teachers create context by designing "anchors," the first step of teaching activities, and the framework supporting the whole teaching activity. Using a series of teaching resources, such as multimedia technology, students are guided into a relatively real and effective context, which might be a story, a video, a song, or an episode. Context thus stimulates the learning desire of students and lays the foundations for subsequent learning. During the practice teaching of Traffic Engineering, teachers reproduce various contexts of transportation through a series of means, thereby considering the uniqueness of Chinese learners. With consideration to the rapid development of the transportation industry in China in the past two decades, adding in advanced panorama projection means such as VR and 3D traffic facilities is suggested during context setup based on current cognitive background and level of courses (e.g., Introduction to Transportation Engineering). This aims to promote understanding, arouse emotional resonance in learners, and facilitate their entry into the new environment quickly. It is better to set background contents that can reflect cultural differences, which trigger curiosity and novelty in students.

(2) H2 is true: The problem identification aspect of anchored instruction can improve fragmented learning outcomes significantly. Determining problems is the basis of anchored instruction. Teachers determine the research problem in a specific teaching process according to the background contents of different traffic engineering courses. The entire teaching activity revolves around the problem. Particularly, determining problems is both the starting point and the impetus for learners to make engage in exploration activities. After determining the research problem, the teaching contents and directions are then determined. Questions shall then have appropriate difficulty, reflect exploratory and extending features, and assure learners of the exploration of knowledge based on understanding. By proposing various learning problems, students put forward their doubts and begin to explore. Teachers then establish a scaffold to help students deepen exploration and lay the foundations for subsequent activities.

(3) H3 is true: The independent study of anchored instruction can improve fragmented learning outcomes significantly. Independent study is the core of anchored instruction and is also an important means. The ultimate goal of teaching is to help learners enrich cognitive structure through continuous exploration and thereby draw conclusions or opinions rather than make teachers successfully impart knowledge to learners. Therefore, if teachers ask learners to directly master knowledge in books, they will then lose their yearning for knowledge. In this case, independent study is a good way to circumvent the difficult and boring classroom atmosphere and improve the learning attitude of students. After recognizing various complicated problems in traffic engineering, learners can make independent decisions based on previous knowledge, experiences, and resources such as books and dictionaries. Teachers then assist them in inspiration and induction, implant essential knowledge to solve problems, develop learners' subjective initiatives to the maximum extent, and ultimately encourage learners to explore knowledge.

(4) H4 is true: The cooperative learning of anchored instruction can significantly improve fragmented learning outcomes. Cooperative learning is an important form of anchored instruction. Cooperative exploration among teams starts after an independent study is finished. The goal of cooperation is to solve problems that cannot be solved comprehensively alone and thus enrich learning outcomes. For cooperative learning, teachers can participate with students. First, it stimulates more inspiration and improves the enthusiasm and participation of learners through emotional communication and the collision of ideas. Second, teachers can build scaffolding for students in time to support smooth cooperation. Third, it can make learners understand better and deepen the emotional connection between teachers and students. The goal of learning language is communication. In Chinese teaching, cooperative learning is the best chance to improve learners' communicative competence. Following the previous independent study, learners do communicate with each other, which is conducive to relieving their psychological pressure.

(5) H5 is true: The evaluation of the effectiveness of anchored instruction can significantly improve fragmented learning outcomes. Each team presents the agreed-upon and relatively perfect discussion results after independent study and cooperative learning for the following three reasons: First, it gives students an opportunity for self-presentation. Second, it provides other teams with references to further perfect and reflect on their learning outcomes. Third, it also provides important references for summary, evaluation, and content supplementation for teachers. In course teaching for traffic engineering, another goal of showing "anchor," except for the above three points, is to increase opportunities for improving the technological skills of students in traffic engineering. This link is different from cooperative communication. It requires students to elaborate on complicated traffic problems using their professional knowledge of traffic engineering independently. The contents integrate the wisdom of every member of the group. This is a great challenge for the learner who gives the speech. Hence, the attitudes of teachers play a very important role in this process: they encourage learners and also tolerate their biased errors and mistakes appropriately. Completing the effectiveness evaluation effectively makes the teaching process more complete.

4.3 Analysis of variance

Because Traffic Engineering is a typical engineering major, differences in learning outcomes in different types of courses were analyzed in the following text.

Table 7. Course types on the differences of learning outcomes

Learning Outcomes	Course Type (Mean ± Standard Deviation)		F	P
	Practice Course (n = 106)	Theory Course (n = 146)		
	4.76 ± 1.29	4.36 ± 1.34	5.881	0.016*

Note: *significance under the 5% significance level.

Table 7 shows that different course type samples all achieve significantly different learning outcomes ($p < 0.05$), indicating the differences in learning outcomes in different course types ($p = 0.016$). The mean learning outcome of the practice course (4.76) is far higher than that of the theory course (4.36). This is mainly because the

roles of teachers and students are transformed by anchored instruction. Teachers are not simply the indoctrinators of knowledge but are instructors or the "learning partners" of students, who are also, in a sense, "learners" themselves. In the classroom, teachers do not implement the preset classroom plan by observing all rules and regulations but instead handle different situations that students "create" in the classroom. Of course, this proposes a relatively high requirement on teachers. Teachers thus adapt to different classroom environments, experience these courses by standing in the shoes of learners, and understand the knowledge that students have to learn deeply. Students are not passive acceptors of knowledge and will complete complicated tasks in real context with complicated cognition. They also have to adopt new learning cognitive strategies, explore knowledge, and construct meaning from knowledge independently under the guidance of teachers. Hence, teachers shall encourage students during guidance, give them autonomous rights in solving problems, stimulate their thinking, and help them become independent learners. Such a teaching mode is more suitable for practice teaching courses for undergraduates. As a result, adopting anchored instruction in practice courses can improve the fragmented learning outcomes of learners.

5 CONCLUSIONS

More university students learn irrespective of time or place by using mobile terminals such as smart phones, tablets, and laptops. They learn knowledge by making full use of fragmented time. Fragmented learning has thus become an essential development trend in the current learning mode and can be used as an important supplement to traditional classroom teaching by making full use of its advantages. In this study, the influences of anchored instruction on fragmented learning outcomes of university students were analyzed through a questionnaire survey of 252 students majoring in Traffic Engineering at Huanghe Jiaotong University in Henan Province. Two major conclusions were found: (1) All five aspects of anchored instruction, namely context setup, problem identification, independent study, cooperative learning, and effectiveness evaluation, can significantly improve the fragmented learning outcomes of university students; and (2) Anchored instruction is more appropriate for practice courses in universities. The mean learning outcome of the practice course (4.76) is far higher than that of the theory course (4.36). It is therefore suggested to further study the research and development of personalized, information-based, and open practice platforms for anchored instruction, the "degree" of using anchored instruction technology, the reasonability of context setup, and the dynamic relations of optimal teaching effect.

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