

Analysis of the Impact of Instruction Sheets on Contemporary College Students

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Abstract: As a structured learning aid designed by educators to facilitate instruction sheets, the instruction sheets have demonstrated its effectiveness in enhancing student interest and academic achievement within basic education, supported by case studies and experiments. However, its application and scholarly investigation in the context of higher education remain notably limited. This scarcity highlights a research gap regarding its potential value and mechanism of action in university settings. This research addresses this gap through a comprehensive questionnaire survey administered to university students in Tianjin, China. The survey captured data across several dimensions: respondent demographics, patterns of instruction sheet usage, evaluations of its effectiveness, content-specific feedback, future expectations, and insights from non-users. Employing SPSS software for statistical analysis, the dataset underwent rigorous reliability and validity testing, followed by descriptive statistics, difference analysis, correlation analysis, and multiple linear regression. The analysis yielded several key findings. It identified distinct patterns in how university students utilize instruction sheets, along with preferences and critiques regarding their design. The study confirmed significant advantages associated with their use, particularly in fostering specific competencies. Furthermore, the results surfaced core challenges impeding optimal effectiveness, including issues related to content adaptability to diverse learning needs, deficiencies in teacher guidance mechanisms following sheet deployment, and a prevalent lack of intrinsic student motivation to engage with the material. Crucially, statistical models established a clear, indirect pathway through which instruction sheets enhance grades by

first improving students' autonomous learning abilities.

Keywords: The Instruction Sheet; Autonomic Learning; Correlation Analysis; Multiple Linear Regression; College Students

1. Introduction and Literature Review

With the popularization, reform, development, and deepening of higher education, the improvement of students' academic performance and comprehensive quality is both a key focus and a challenge in teaching development. How to more effectively help students improve their learning level and outcomes has become a focal point for educators.

1.1 Research Background and Significance

University courses differ from the fixed curricula of middle and high school, as university students have many opportunities for independent choice. When facing courses with broad and difficult knowledge, contemporary university students often hesitate to proceed. These courses also place certain demands on students' knowledge comprehension and self-directed learning abilities. Conventional classroom instruction frequently fails to accommodate the unique learning preferences of each student. Before or after learning, students may develop fear, lack sufficient learning interest and motivation, ultimately leading to a decline in academic performance. The instruction sheets, as a structured preview material designed by teachers based on course content to assist students in previewing, have emerged accordingly. As a teaching aid, it has been continuously promoted in teaching fields such as primary school, secondary school, and university. It guides students to purposefully and rhythmically learn and analyze course content from shallow to deep, from easy to difficult before class, thereby improving students' classroom learning

efficiency and teachers' classroom teaching quality. Teachers can distribute instruction sheets through teaching assistant software like Xuexitong or Rain Classroom, or directly distribute paper versions. Instruction sheets come in various forms, including instructional videos, knowledge framework diagrams, electronic documents, etc., some requiring group collaboration or individual completion. After receiving feedback on the effectiveness of students' use of instruction sheets, teachers promptly adjust teaching strategies and methods based on the problems exposed by students, promoting mutual growth in teaching and learning. For knowledge difficulties revealed in the instruction sheets, targeted explanations are provided in classroom teaching, and for questions raised by students in class, personalized guidance is offered. This cooperative learning model, led by instruction sheets, promotes interaction between students and teachers, shortens the distance between them, continuously improves students' learning interest and ability, creates a better class learning atmosphere, forms a virtuous cycle of learning, and ultimately indirectly improves academic performance. Research on the design of instruction sheets and their application in basic education fields such as primary and secondary schools has yielded some results. Comparative classroom teaching practices have found that instruction sheets help guide students in pre-learning before class, improving their learning interest and initiative, thereby enhancing academic performance. However, the popularity and research on instruction sheets in universities are relatively limited, which restricts their application and optimization in university classroom teaching practices.

1.2 Domestic and International Research Status

Regarding "instruction sheets" and their corresponding international educational practices and research, the domestic status primarily focuses on localized instructional design and application reflection, while the international status presents a deeper theoretical foundation in cognitive science and more diversified tool application models. International research started earlier, for example, the "Discovery Learning Model" proposed by American educational psychologist Bruner: "Teachers create problem situations, students think and explore

independently, verify ideas, and finally integrate knowledge."

1.2.1 Domestic research and practice status: tool-oriented exploration centered on "instruction sheets"

Under the current domestic educational reform background of "Double Reduction" and core literacy orientation, the instruction sheet, as a specific teaching innovation tool, has its research and discussion mainly concentrated on two levels:

(1) The construction of innovative classroom models—researchers are striving to upgrade the instruction sheet from an isolated pre-learning task to a core teaching component driving deep learning;

(2) Practice and reflection in specific subject applications. Some studies clearly point out that poorly designed instruction sheets can easily become formalistic, devolving into mechanical copying of learning content, which not only fails to stimulate students' higher-order thinking but may also increase the burden on teachers and students. Therefore, another important concern in domestic research is how to design high-quality instruction sheets that are guiding, open, and developmental based on learning situations, avoiding counterproductive effects due to misuse. In summary, the domestic status reflects the coexistence of active exploration "from scratch" and deep thinking "from having to excellence." Its value lies in providing highly localized and context-specific teaching tools, but the theoretical foundation, especially discussions at the cognitive level, still needs deepening.

1.2.2 International related research and status: scientific support from "cognitive mechanisms" to "learning tools".

(1) Cognitive Neuroscience Foundation: Research has found that "anticipatory preparation" is an inherent and efficient cognitive control mechanism in the human brain. Research in this field has also revealed factors affecting this mechanism. For instance, Luo WY et al. [1] found that even brief exposure to short videos might weaken the brain's cue-based preparatory ability, leading individuals' cognitive strategies to lean more towards passive immediate reactions. This suggests that the modern digital environment may pose potential challenges to the active cognitive control abilities required for pre-learning. In short, effective "Anticipatory Set" can coordinate working memory, influence perceptual priming,

and regulate emotional responses. These findings explain “why” pre-learning can improve learning outcomes from a neural mechanism perspective: early cognitive preparation helps the brain optimize resource allocation, laying the foundation for subsequent information processing and task execution. Lavric et al. [2] and Manzi et al. [3] identified the neurophysiological characteristics of anticipated task reconfiguration from both adult and adolescent developmental perspectives in an ERP study; Yen Yu et al. [4] revealed the key role of the midbrain and striatum in anticipatory task sets through fMRI research; Steinhäuser et al. [5] explored how stress alters individual task reconfiguration strategies; Jamadar et al. [6] focused on how to influence this process through experimental manipulation. Karayanidis et al. [7] studied possible anticipatory reconfiguration deficits in schizophrenia patients. Düzél et al. [8] researched perceptual stimuli affecting long-term memory ability.

(2) Educational Application Tools: Structured strategies represented by the KWL chart have been extensively and deeply researched and applied in international teaching. Research also continuously promotes the comparison and integration of the KWL chart with other teaching tools. Met [9] found that combining “Learning Languages” with the KWL chart can effectively enhance students’ inferential reading skills and improve their learning attitudes; Katemba et al. [10] compared the application of the KWL chart and Venn diagram strategies in improving reading comprehension; Yavuz [11] and Rahmasari et al. [12] provided technical applications in English teaching. In summary, compared to the domestic focus on the design and application of specific teaching tools, international research and practice present a clear trajectory “from theory to tools.” It not only reveals the intrinsic value and physiological basis of pre-learning from a cognitive science perspective but also repeatedly validates and refines a series of efficient pre-learning tools (such as the KWL chart) through evidence-based research, providing support for pre-learning that combines scientific depth and practical breadth.

2. Survey Plan and Implementation

Aiming at the current domestic research status where instruction sheets are concentrated in the basic education fields of middle and high school, this study verifies the promoting effect of

instruction sheets on students’ academic performance in university classrooms and clarifies the application value of instruction sheets in the higher education stage through questionnaire surveys and data analysis, filling the theoretical gap in this field. Based on the characteristics of the university student population in Tianjin, it analyzes the differential impact of instruction sheets on students’ grades across different grades and majors, providing specific data support for the design of personalized teaching tools. It explores how instruction sheets indirectly or directly affect academic performance by enhancing intermediary variables such as university students’ self-directed learning ability and study habits, providing a theoretical basis for university teaching reform. This paper surveyed 30 universities in Tianjin, China, using SPSS software and related statistical models for reliability and validity testing and data analysis, drawing certain conclusions and recommendations regarding the impact of instruction sheets on university students’ grades. A quota sampling method for online questionnaires was used, with a pre-survey sample size of 100. The questionnaire design was reasonable: Cronbach’s Alpha coefficient (Alpha=0.848), Bartlett’s sphericity test (KMO=0.908). Out of 407 distributed questionnaires, 356 were valid, yielding a valid response rate of 87.5% (comprising 300 users and 56 non-users).

3. Data Processing, Testing, and Analysis

3.1 Data analysis

(1) Reliability Test

Table 1. Reliability Analysis

Reliability Statistics	
Cronbach’s Alpha	Number of Items
.920	22

The reliability test results from this questionnaire show a Cronbach’s α coefficient of 0.920, involving 22 measurement items in Table 1. The items in this questionnaire have strong correlations, and the measurement results are stable and reliable, indicating that the questionnaire design is reasonable, the data collection quality is high, and it is suitable for subsequent statistical analysis.

(2) Validity Test

The validity test results yielded a KMO value of

0.930 (exceeding 0.9) in Table 2, confirming the data's suitability for factor analysis. Bartlett's test of sphericity achieved a significance level of 0.000 ($p < 0.01$), indicating strong evidence against the null hypothesis, rejecting the null hypothesis of "no correlation between variables", further supporting the applicability of factor analysis.

Table 2. Validity Analysis

KMO and Bartlett's Test		
KMO Measure of Sampling Adequacy		.930
Bartlett's Test of Sphericity	Approx. Chi-Square	3225.327
	df	231
	Sig.	.000

3.2 Descriptive Analysis

This study collected a total of 300 valid samples. Among them, 160 were male participants (53.3%), and 140 were female participants (46.7%); Senior students had the highest proportion at 95 people, accounting for 31.7%, followed by Junior at 58 people (19.3%), Freshman at 84 people (28.0%), and Sophomore at 63 people (21.0%); Students from liberal arts

majors were the most numerous at 94 people (31.3%), followed by economics and management at 66 people (22.0%), science and engineering at 65 people (21.7%), medical at 46 people (15.3%), and arts at 29 people (9.7%). Students primarily obtained instruction sheets through course teaching platform downloads (55.0%) and self-creation (43.0%), reflecting the popularity of digital teaching tools and the enhancement of students' self-directed learning awareness. Teacher-distributed paper versions (35.7%) still account for a certain proportion, indicating that traditional teaching methods remain influential in practical teaching. Instruction sheets are mainly applicable to professional core courses (57.7%) and public compulsory courses (55.3%), suggesting that the difficulty of these courses necessitates a pre-learning component. The usage rate of instruction sheets for professional elective courses (44.7%) and public elective courses (42.3%) is relatively low, reflecting that elective course teaching design places more emphasis on interest expansion or practical operation, with a tendency to weaken the pre-learning component.

Table 3. Descriptive Statistics of Ability Improvement

Various Abilities	Mean Score	Std. Deviation	Variance
Self-directed Learning	3.58	.969	.940
Knowledge Comprehension	3.58	1.081	1.167
Problem Analysis	3.62	1.052	1.106
Time Management	3.58	1.071	1.147
Information Integration	3.60	1.057	1.118
Classroom Participation	3.61	1.018	1.035
Team Collaboration	3.71	.872	.760

As shown in Table 3, instruction sheets show more noticeable improvement in cultivating students' team collaboration ability (3.71) and problem analysis ability (3.62). The improvement in other abilities is relatively average, but overall, each ability improvement score is greater than 3.5, indicating the diverse helpful effects of instruction sheets.

From Table 4, F -value = 54.215, $p = 0.000$ (< 0.01), indicating that frequency of use has a highly significant impact on grade improvement.

Then $\eta^2 = 120.924 / 340.997 \approx 0.355$,

meaning frequency of use explains 35.5% of the variance in grade improvement, representing a medium to large effect size.

From Table 5, significant differences exist between all adjacent groups ($p < 0.05$): Always use > Often use > Occasionally use > Rarely use. Frequency of use is positively correlated with grade improvement; the higher the frequency of use, the more significant the grade improvement. Significant differences between adjacent frequency groups indicate that increased frequency of instruction sheet use has a cumulative effect on grade improvement.

Table 4. One-way ANOVA analysis

Grade Improvement					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	120.924	3	40.308	54.215	.000
Within Groups	220.073	296	.743		

Total	340.997	299		
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Table 5. Multiple Comparisons

	(I) Q10	(J) Q10	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
LSD	1	2	-1.028*	.204	.000	-1.43	-.63
		3	-1.785*	.187	.000	-2.15	-1.42
		4	-2.166*	.190	.000	-2.54	-1.79
	2	1	1.028*	.204	.000	.63	1.43
		3	-.757*	.139	.000	-1.03	-.48
		4	-1.138*	.143	.000	-1.42	-.86
	3	1	1.785*	.187	.000	1.42	2.15
		2	.757*	.139	.000	.48	1.03
		4	-.381*	.118	.001	-.61	-.15
	4	1	2.166*	.190	.000	1.79	2.54
		2	1.138*	.143	.000	.86	1.42
		3	.381*	.118	.001	.15	.61
Tamhane	1	2	-1.028*	.208	.000	-1.60	-.46
		3	-1.785*	.189	.000	-2.31	-1.26
		4	-2.166*	.186	.000	-2.68	-1.65
	2	1	1.028*	.208	.000	.46	1.60
		3	-.757*	.147	.000	-1.15	-.36
		4	-1.138*	.143	.000	-1.52	-.75
	3	1	1.785*	.189	.000	1.26	2.31
		2	.757*	.147	.000	.36	1.15
		4	-.381*	.114	.006	-.68	-.08
	4	1	2.166*	.186	.000	1.65	2.68
		2	1.138*	.143	.000	.75	1.52
		3	.381*	.114	.006	.08	.68

Dependent Variable: Q20

*.The mean difference is significant at the 0.05 level.

4. Analysis of the Impact of Basic Behavioral Characteristics on Grades

Correlation Analysis: Frequency of use Q10,

weekly time spent Q11, advance use time Q12, reduced review time Q18, and grade improvement Q20 were selected for Pearson analysis.

Table 6. Correlations

		Q10	Q11	Q12	Q18
Q20	Pearson Correlation	.578**	.373**	.050	-.132*
	Sig. (2-tailed)	.000	.000	.387	.022
	N	300	300	300	300

** . Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

From Table 6, it can be seen that frequency of use is strongly positively correlated with grade improvement, with a correlation coefficient $r=0.578$ ($p<0.01$), indicating that students who use the instruction sheet 5-7 times or more per week show significantly greater grade improvement than low-frequency users; time spent is moderately positively correlated with grade improvement, $r=0.373$ ($p<0.01$), with

students investing 1-2 hours or more per week showing more obvious grade improvement; reduced review time is weakly negatively correlated with grade improvement, $r=-0.132$ ($p<0.05$), meaning that although review time was significantly shortened after using the instruction sheet, grades actually declined, suggesting that review of course knowledge must ensure both quality and quantity, with

sufficient time allocated; our analysis reveals that advanced use time is not significantly correlated with grade improvement, $r=0.050$ ($p=0.377$), indicating that students focus more on the quality of preview rather than how early it is done.

Therefore, it is recommended to prioritize encouraging students to use the instruction sheet frequently and ensure sufficient time spent. The timing of preparation before class has no practical effect on grade improvement, so focus can be placed on increasing frequency and duration, with particular attention to the quality of completion.

5. Conclusions and Recommendations

(1) Integrate existing resources to reduce promotion costs: Collect excellent instruction sheet cases from various departments, such as “case analysis templates” for economics and management majors and “experiment preview templates” for engineering majors, and upload them to the university’s teaching platform for teacher reference. Teachers should simultaneously release electronic versions of instruction sheets and a limited number of paper copies for students to download and annotate or provide to students who prefer handwritten notes. Add relevant course QR codes on paper instruction sheets linking to video explanations or extended materials to avoid outdated content.

(2) Optimize the content design of instruction sheets: Limit instruction sheet content to within one A4 page (approximately 30 minutes to complete), design by knowledge module to avoid overly complex content. Label each question with “basic” or “advanced” tags, allowing students to choose based on their own level, reducing anxiety. Reserve blank space at the end of the instruction sheet, requiring students to list 1-2 questions from their preview for teachers to prioritize answering in class. Annotate practice questions with “related exam topics from the past 3 years” to help students understand the application context of the knowledge.

(3) Ability cultivation: Design phased instruction tasks, such as “pre-learning preview, in-class practice, post-class consolidation,” to guide students in planning their time independently; provide time management tools, such as study schedule templates, to help students balance preview needs across multiple courses; add interdisciplinary case analyses to instruction

sheets to train students’ information integration skills; design group projects and incorporate them into assessments, such as group reports and joint defenses, transforming collaboration skills into grade advantages; adopt “problem-based learning,” requiring students to raise questions from their preview during class and participate in discussions, combined with flipped classroom models to transform passive listening into active inquiry; increase open-ended questions, such as essay questions and case analyses, to strengthen the cultivation and enhancement of basic abilities. Provide detailed answer explanations for instruction sheets to help students deepen their understanding.

(4) Improve teacher guidance mechanisms: After class, teachers randomly check 20% of students’ instruction sheets, annotate common problems, and explain them collectively in class; class representatives compile student questions weekly and send them to teachers before class for adjusting teaching focus; design instruction sheets as group collaboration activities, such as “dividing tasks to find materials + in-class presentations,” and include them in regular grades; add an “instruction sheet discussion area” on platforms like Rain Classroom or Xuexitong, where teachers post 1-2 open-ended questions to guide pre-learning interaction.

(5) Build a lightweight incentive mechanism: Incorporate instruction sheet completion into regular grades: accounting for 10%-15%, with full marks awarded for completing over 80% of the content to avoid increasing burden. Design simplified versions of instruction sheets for students with limited time and push them daily through class groups. One week before midterm exams, require all courses to provide instruction sheets, allowing students to directly experience their value.

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References

- [1] Luo W, Zhao X, Jiang B, Fu Q, Zheng J. Swiping Disrupts Switching: Preliminary Evidence for Reduced Cue-Based Preparation Following Short-Form Video Exposure. *Behavioral Sciences* (2076-328X). 2025; 15(8):1070.

- [2] Lavric A, Mizon GA, Monsell S. Neurophysiological signature of effective anticipatory task-set control: a task-switching investigation. *European Journal of Neuroscience*. 2008; 28(5):1016-1029.
- [3] Manzi A, Nessler D, Czernochowski D, Friedman D. The development of anticipatory cognitive control processes in task-switching: An ERP study in children, adolescents, and young adults. *Psychophysiology*. 2011; 48(9):1258-1275.
- [4] Yen Yu, FitzGerald THB, Friston KJ. Working Memory and Anticipatory Set Modulate Midbrain and Putamen Activity. *Journal of Neuroscience*. 2013; 33(35):14040-14047.
- [5] Steinhauser M, Maier M, Hübner R. Cognitive Control Under Stress: How Stress Affects Strategies of Task-Set Reconfiguration. *Psychological Science* (0956-7976). 2007; 18(6):540-545.
- [6] Jamadar S, Karayanidis F, Sanday D, Loder R. Manipulations affecting activation of anticipatory task-set reconfiguration. *International Journal of Psychophysiology*. 2008; 69(3):217-218.
- [7] Karayanidis F, Nicholson R, Schall U, Meem L, Fulham R, Michie PT. Switching between univalent task-sets in schizophrenia: ERP evidence of an anticipatory task-set reconfiguration deficit. *Clinical Neurophysiology*. 2006; 117(10):2172-2190.
- [8] Düzel E, Richardson-Klavehn A, Neufang M, Schott BH, Scholz M, Heinze H-J. Early, partly anticipatory, neural oscillations during identification set the stage for priming. *NeuroImage*. 2005; 25(3):690-700.
- [9] Met M. Learning Languages: A KWL Chart. *Learning Languages*. 2005; 11(1):22-23. Accessed February 2, 2026.
- [10] Katemba CV, Sihombing NM. Enhancing Students' Reading Comprehension through Venn Diagram Strategy and KWL (Know, Want, Learn) Strategy. *Acuity: Journal of English Language Pedagogy, Literature and Culture*. 2023; 8(1):87-100. Accessed February 2, 2026.
- [11] Yavuz F. Adaptation of Kwl Charts to the Internet and the Use of Web Pages in English Language Teaching. *Balikesir University Journal of Social Sciences Institute*. 2012; 15(27):403-411. Accessed February 2, 2026.
- [12] Brigitta Septarini Rahmasari, Ahmad Munir, Himmawan Adi Nugroho. The Role of Peer Tutoring Integrated with KWL Charts in the Development of Students' Inferential Skills. *Cogent Education*. 2024; 11(1).