Supplementary Files

Supplementary File 1 In-depth interview outline of nursing undergraduates

Dear fellow students：

Thank you for your participation. I would like to interview you about some problems in nursing learning to learn the current status of learning motivation, learning attitude, learning methods and strategies, learning environment and satisfaction, and learning changes under self-monitoring learning to explore the real learning process of nursing undergraduates. This interview would last for about 20~30 minutes with high confidentiality.

(1) Cognition and views on the process of mastering nursing knowledge:

- What is your attitude towards nursing?
- What do you think of nursing professional knowledge learning?
- How do you usually acquire nursing-related knowledge?

……

(2) Experience and changes after staged professional learning:

- What will you do before you study nursing? (target / time / place arrangement)
- Will you use some learning skills or strategies in the nursing study? Can you quote an example?
- Have you ever encountered any difficulties or problems in the nursing study? How do you deal with them? What kind of learning effect has been achieved? Can you quote an example?

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(3) Main factors affecting learning initiative.

- What factors do you think will affect your learning effect?
- Part of the professional nursing-related study needs to be completed in the hospital, can you talk about your experience of clinical practice?
- Have you ever studied with other majors? If so, how do you feel?

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Supplemental material

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29   **Supplementary File 2** Criterion for judgment and scoring system

Judgment Criterion	The Degree of Impact on Experts' Judgement		
	Large Impact	Medium Impact	Small Impact
Experience	0.50	0.40	0.30
Theoretical analysis	0.30	0.20	0.10
Knowledge of literature	0.10	0.08	0.05
Instinct	0.10	0.07	0.05

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31   **Supplementary File 3** Item analysis of the Learning Behavior Questionnaire in nursing

32   undergraduates

Item	Cronbach's alpha	Good-poor Analysis	Item-total correlation (r)	*P*-values	Exclusion
1.I hope others will find out how excellent I am in my studies	0.924	<0.001	0.493	<0.001	√
2.I study nursing to help people improve their lives	0.922	<0.001	0.630	<0.001	√
3.I can make a comparative analysis of the main points of my knowledge	0.921	<0.001	0.648	<0.001	√
4.I think that study is my first task in college	0.923	<0.001	0.531	<0.001	√
5.I like actively participate in every nursing activity	0.922	<0.001	0.624	<0.001	√
6.Usually, I will review in a planned way according to my situation	0.921	<0.001	0.658	<0.001	√
7.It makes me happy to solve some health problems in my life with the knowledge of nursing	0.921	<0.001	0.647	<0.001	√
8.I derive a sense of achievement when I care for patients properly	0.921	<0.001	0.663	<0.001	√
9.I am optimistic about the future of the nursing profession, so I study hard	0.921	<0.001	0.641	<0.001	√
10.I think I should take the initiative to ask the teacher or others for advice when I have problems in nursing study	0.921	<0.001	0.652	<0.001	√
11.I think my current learning method is very suitable for my current situation	0.922	<0.001	0.621	<0.001	√
12.I think learning is not only for examination but also for mastering nursing-related knowledge and skills	0.922	<0.001	0.624	<0.001	√
13.I can recognize my strengths and weaknesses in nursing learning	0.921	<0.001	0.651	<0.001	√
14.My ability to decision-making, analysis, and thinking has been greatly improved in school, which makes me very satisfied	0.922	<0.001	0.633	<0.001	√
15.I often take various methods to obtain new progress in nursing	0.923	<0.001	0.556	<0.001	√
16.I like to associate nursing knowledge with daily life	0.922	<0.001	0.590	<0.001	√
17.I can choose my learning methods according to different learning contents	0.922	<0.001	0.632	<0.001	√
18.After completing the					

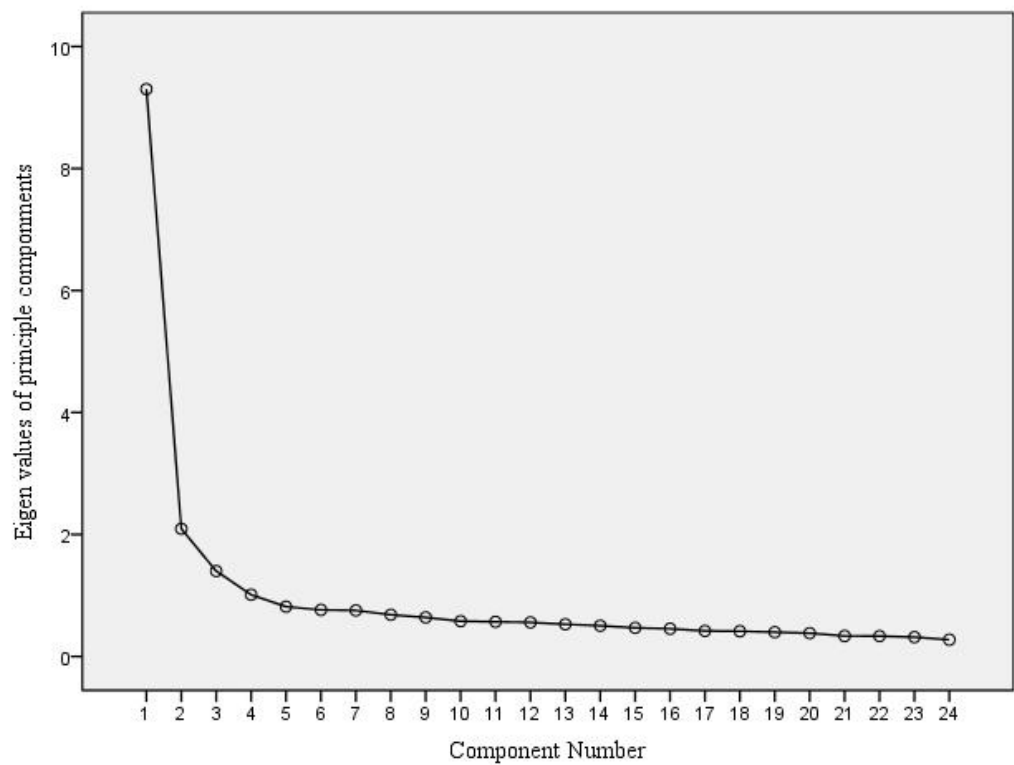|					
learning objectives I set, I can better master what I have learned	0.922	<0.001	0.582	<0.001	√
19.I can choose suitable learning places or take appropriate measures to eliminate all distractions	0.922	<0.001	0.602	<0.001	√
20.I have a sense of achievement in taking care of patients and making them recover	0.922	<0.001	0.611	<0.001	√
21.I want to devote myself to nursing-related work	0.924	<0.001	0.451	<0.001	√
22.I'm satisfied with my great progress after my nursing study	0.922	<0.001	0.614	<0.001	√
23.I think it's helpful to exchange learning experiences with other major students to enrich my knowledge content	0.921	<0.001	0.656	<0.001	√
24.I know very well that the purpose of my study is to improve my ability	0.921	<0.001	0.645	<0.001	√
25.I think the knowledge and skills learned now are of great significance to my future work	0.922	<0.001	0.633	<0.001	√
26.I often feel anxious and lost in study	**0.931**	<0.001	**0.094**	0.032	×
27.Winning the recognition and appreciation of others is the main driving force for me to work hard	0.925	<0.001	0.401	<0.001	√
28.I can adjust my learning method according to the learning effect or clinical events	0.925	<0.001	0.381	<0.001	√
29.I have a comprehensive ability to summarize a wide range of nursing related readings into a systematic knowledge	0.922	<0.001	0.608	<0.001	√
30.I think when I don't understand an important point, I should relearn until understand it	0.921	<0.001	0.678	<0.001	√
31.I don't think there are many interesting things in the learning process	**0.929**	<0.001	**0.232**	<0.001	×

Exclusion criteria for the item analyses: The values which fit the exclusion criteria were written in bold.

(1)The Cronbach's alpha of each item was smaller than the overall alpha of the questionnaire.

(2)The significance test of the difference between the high and low groups in the average score of each item. $p \leq 0.05$ indicated a significant difference.

(3)The correlation coefficient between the item and the total score of all the items: less than 0.3. $p \leq 0.05$ indicated a significant difference.

(4)"√" indicated the items that had been reserved, while "×" indicated excluded by using a reverse scoring.

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46 **Supplementary File 4** A four-factor solution of EFA was used based upon the results of

47 the eigenvalues of principle components

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Supplementary File 5 The Learning Behavior Questionnaire (English version)

	Item	Fully disagree	Partly disagree	Neither agree nor disagree	Partly agree	Fully agree
Strategy	1.Usually, I will make study plans to acquire knowledge according to my study progress and efficiency	1	2	3	4	5
	2.I have a comprehensive ability to summarize a wide range of nursing related readings into a systematic knowledge	1	2	3	4	5
	3.I can recognize my strengths and weaknesses in nursing learning	1	2	3	4	5
	4.I can choose my learning methods according to different learning contents	1	2	3	4	5
	5.I think my current learning method is very suitable for my current situation	1	2	3	4	5
Attitude	6.I think I should take the initiative to ask the teacher or others for advice when I have problems in nursing study	1	2	3	4	5
	7.I think learning is not only for examination but also for mastering nursing-related knowledge and skills	1	2	3	4	5
	8.I think communicating with other majors is helpful to enrich my learning experience	1	2	3	4	5
	9.I think when I don't understand an important point, I should relearn until understand it	1	2	3	4	5
	10.I think that study is my first task in college	1	2	3	4	5
Motivation	11.I want to devote myself to nursing-related work	1	2	3	4	5
	12.I often take various methods to obtain new progress in nursing	1	2	3	4	5
	13.I like to associate nursing knowledge with daily life	1	2	3	4	5
	14.I think the nursing profession will have a good salary and social status in the future, so I study hard	1	2	3	4	5
	15.I like actively participate in every nursing activity	1	2	3	4	5
Degree of satisfaction	16.I derive a sense of achievement when I care for patients properly	1	2	3	4	5
	17.I'm satisfied with my great progress after my nursing study	1	2	3	4	5
	18.I have a sense of achievement in taking care of patients and making them recover	1	2	3	4	5
	19.My ability to decision-making, analysis, and thinking has been greatly improved in school, which makes me very satisfied	1	2	3	4	5

51 **Supplementary File 6** The Learning Behavior Questionnaire (Chinese version)

52 <div align="center">护理本科生学习行为问卷</div>

	题目	完全不符合	基本不符合	基本符合	符合	完全符合
策略	1.我通常依据自身的学习进度和学习效率制定计划，从而获取知识	1	2	3	4	5
	2.我有一定的综合概括能力，能把广泛的阅读内容归纳为系统知识	1	2	3	4	5
	3.我清楚的知道自己在护理专业学习中的长处和短处	1	2	3	4	5
	4.我能根据不同的学习内容选择合适的学习方法	1	2	3	4	5
	5.我认为我目前的学习方法非常适合于我目前的学习状况	1	2	3	4	5
态度	6.我认为在护理专业学习中遇到问题时，应该主动向老师或他人征求意见	1	2	3	4	5
	7.我认为学习不仅仅是为了考试，更是为了掌握护理相关的知识和技能	1	2	3	4	5
	8.我认为与其他专业的学生交流有助于丰富自身学习经验	1	2	3	4	5
	9.我认为在没有弄懂某个知识点时，应重新学习直到弄懂为止	1	2	3	4	5
	10.我认为学习是我在大学里的首要任务	1	2	3	4	5
动机	11.我想全身心地投入到护理工作中	1	2	3	4	5
	12.我经常采取各种方法来获取护理方面的新进展	1	2	3	4	5
	13.我喜欢把护理知识与日常生活联系起来	1	2	3	4	5
	14.我认为未来护理专业的薪水和社会地位很好，所以我努力学习	1	2	3	4	5
	15.我喜欢积极参与每一项护理活动	1	2	3	4	5
满意度	16.当我恰到好处地照顾了病人时，我很有成就感	1	2	3	4	5
	17.我对自己在护理专业学习后取得的巨大进步感到满意	1	2	3	4	5
	18.照顾病人并使其康复，我很有成就感	1	2	3	4	5
	19.我的决策、分析和思考能力在学校得到了很大的提高，我很满意	1	2	3	4	5