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Autonomous Learning in Teacher Training Programs: Insights into Perception and Support Mechanisms

Yuwen Liang[1,a,*]

[1]*Library and Information Services Center, Lishui University, Lishui City, 323000, China*
[a]*771005703@qq.com*
[*]*Corresponding author*

Abstract: *This study investigated the impact of autonomous learning on pre-service students in teacher training programs. Findings indicated high levels of self-regulation and proactive problem-solving, with variations based on specialization rather than age. While autonomous learning effectively supported self-directed learning and collaboration, challenges such as curriculum rigidity and limited resources persisted. Recommendations such as creating flexible curricula and enhancing resources to better support autonomous learning were proposed.*

Keywords: *Autonomous Learning; Teacher Training Programs; Perception; Support Mechanisms*

1. Introduction

Autonomous learning is increasingly recognized as crucial in pre-service teacher education [1]. This shift reflects evolving educational methodologies aimed at enhancing training quality. However, understanding its impact on student outcomes in teacher training remains essential. The challenge lies in implementing effective strategies that resonate with pre-service students, leading to meaningful educational results and professional readiness. This research sought to explore how pre-service students perceive their learning autonomy—focusing on constructs like willingness to learn, goal setting, organization, collaboration, and reflection—while also examining demographic differences, such as age and specialization.

2. Literature Review

2.1 Theoretical Framework

Self-Regulated Learning (SRL) (Figure 1) is central to this study, providing a framework for pre-service teachers to manage their learning, essential for professional growth. Rooted in social cognitive psychology, SRL emphasizes metacognitive strategies, motivational beliefs, and behavioral actions [2]. This research analyzed cognitive (goal-setting), affective (motivation), and behavioral (learning strategies) dimensions to foster independence among pre-service teachers.

Figure 1: Self-Regulated Learning (SRL)

The tri-component attitude model (Figure 2) posits that attitudes consist of cognitive, affective, and behavioral components [3]. In this study, the cognitive component aligns with 'learning content,' emphasizing how learners engage with educational material. The affective component corresponds to 'learning autonomy,' exploring emotional responses like motivation and anxiety in autonomous environments. The behavioral component relates to 'social interactions,' examining student behaviors such as collaboration and communication.

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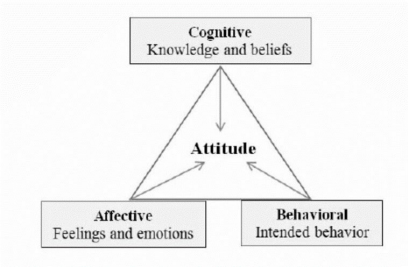

Figure 2: Tri-component Attitude Model

2.2 The Perceived Level of Autonomous Learning

Self-regulation is a core component of autonomous learning, encompassing learners' ability to set goals, monitor progress, and reflect on their performance. Research indicated that students who actively engage in self-regulation demonstrate higher levels of academic achievement and intrinsic motivation [4]. The capacity to direct one's own learning is a crucial aspect of perceived autonomy. Learners who feel empowered to choose their topics, learning methods, and pace tend to report higher satisfaction and engagement [5]. Growing independence reflects the evolution of learners from dependence on external guidance to self-sufficiency. Studies showed that as students' progress through their educational experiences, their perceived autonomy increases, fostering a sense of confidence and competence [6].

2.3 Practices of Support in Autonomous Learning

The choice and design of learning content significantly influence autonomous learning. Content that is relevant, engaging, and adaptable to learners' interests fosters deeper engagement [7]. Learning autonomy refers to the ability of learners to take charge of their educational journey. Research indicates that fostering autonomy leads to increased motivation and better learning outcomes. Techniques such as goal-setting, self-assessment, and reflective practices empower students to monitor their progress and make informed choices about their learning paths [8]. Social interactions play a vital role in supporting autonomous learning. Studies show that constructive feedback from peers can improve self-regulation and motivate learners to pursue their educational goals [9].

Despite existing literature on autonomous learning in teacher training programs, gaps remain in understanding how self-regulation, independence, and learning direction interact among diverse pre-service students. Additionally, empirical evidence on the effectiveness of institutional support practices is limited. This study addressed these gaps by exploring perceived levels of autonomous learning, supporting practices, and challenges in teacher training programs, aiming to optimize support through targeted research questions.

What is the perceived level of autonomous learning of pre-service students in teacher training programs:

- self-regulation;
- directing their own learning;
- growing independence?

Is there any significant difference in the impact of autonomous learning skills on pre-service students in the teacher training program when grouped in terms of:

- age;
- specialization?

How does the pre-service student assess the practices of support in autonomous learning in terms of:

- learning content;
- learning autonomy;
- social interactions?

Is there a significant difference in the pre-service student assessment of the practices of support in autonomous learning when grouped into:

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- age;
- specialization?

What challenges do pre-service students and teachers encounter regarding support for autonomous learning in teacher training programs?

3. Method

3.1 Population and Sample

The study targeted teacher training programs in three public universities, focusing on a population of 374 pre-service students, 31 teachers, and 15 administrators with Slovin's formula to calculate the appropriate sample size (margin error: 3%). (Table 1)

Table 1: Distribution of the Respondents

Name of the Schools	Pre-service Students		Teachers		Administrators	
	Population	Sample	Population	Sample	Population	Sample
Lishui University	182	125	11	10	5	5
Zhejiang Normal University	196	127	13	11	7	6
Hangzhou Normal University	185	122	10	10	4	4
Total	563	**374**	34	**31**	16	**15**

3.2 Method and Procedure

An explanatory sequential design guided the research, beginning with quantitative data collection and analysis to identify trends, followed by qualitative data collection to elaborate on findings. Research instruments, including a validated questionnaire, were developed for both students and teachers, comprising multiple-choice questions and a 4-point Likert scale assessing perceptions of autonomous learning support. After quantitative analysis, thematic analysis of interview data was conducted, identifying key themes related to challenges and experiences in autonomous learning. The analysis combined deductive and inductive coding to enrich findings, ensuring inter-coder reliability through team discussions.(Table 2)

Table 2: Likert Scale for Questionnaire Responses

Scale	Interval Scale Value	Verbal Interpretation
1	1.00-1.74	Very Low Autonomy/ Very Low Impact/ Very Low Support
2	1.75 - 2.49	Low Autonomy/ Low Impact/ Low Support
3	2.50 - 3.24	High Autonomy/High Impact/ High Support
4	3.25 - 4.00	Very High Autonomy/ Very High Impact/ Very High Support

3.3 Statistical Treatment

The researcher utilized both descriptive and inferential statistics to analyze questionnaire data and thematic analysis for qualitative interview data.

For problems 1 and 3, mean and standard deviation were used to analyze the pre-service students' perceptions and assessments of autonomous learning. These methods offered insights into educators' attitudes and demographic variations. The relevant formulas are as follows:

Mean ($\bar{X}$) formula: $\bar{X} = \Sigma x / N$

$$x = \frac{\sum_{i=1}^{n} (x_i * w_i)}{\sum_{i=1}^{n} w_i}$$

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Standard Deviations (σ):

$$\sigma = \sqrt{(\Sigma(xi - \mu)^2 / N)}$$

For research questions 2 and 4, different statistical tests were employed to analyze the data. A one-way ANOVA was used to assess significant differences in autonomous learning measures based on age and specialization. If significant results were found, post-hoc comparisons and Tukey's HSD test were conducted to identify specific group differences.

1) The formula for one-way ANOVA is:

$$F = \frac{MS_{\text{between}}}{MS_{\text{within}}}$$

$$MS_{\text{between}} = \frac{\sum_{i=1}^{k} n_i(\bar{X}_i - \bar{X})^2}{k-1}$$

2) The formula for the Tukey HSD tests itself involves multiple components; a simplified representation is:

For problem 5, a thematic analysis of responses to open-ended questions was conducted, complemented by a thematic analysis of interview data. This facilitated an in-depth exploration of suggestions for further improvement in the curriculum, ensuring a thorough examination of qualitative feedback.

$$Q = \frac{\bar{X}_i - \bar{X}_j}{\sqrt{\frac{MS_{\text{within}}}{n}}}$$

4. Result

4.1 Impact Level of Autonomous Learning for Pre-Service Students in Teacher Training Programs

This study examined the impact of autonomous learning on self-regulation, self-direction, and independence among pre-service students in a teacher training program, aiming to assess their influence on academic achievement and preparedness for teaching roles.

4.1.1 Self-regulation

Table 3: Impact Level of Autonomous Learning for Pre-Service Students in Terms of Self-Regulation

Indicators	Mean	SD	VI	Rank
1. I regularly evaluate my study habits and strategies to ensure they are effective in helping to meet my learning goals.	3.51	0.50	VHI	3.5
2. I am proactive in identifying and addressing any obstacles that may hinder my academic performance.	3.52	0.50	VHI	2
3. I consistently use specific goals to guide my learning process and maintain self-discipline.	3.59	0.49	VHI	1
4. I am aware of maintaining motivation and focus on my studies even during periods of low personal interest or external distractions.	3.51	0.50	VHI	3.5
5. I effectively manage my time and resources to balance my academic obligations with other aspects of my life.	3.48	0.50	VHI	5
Overall Results	3.52	0.50	VHI	

Table 3 revealed that all self-regulation behaviors among pre-service trainees were rated as Very High Impact (VHI). The top behavior was consistently using specific goals to guide learning (mean = 3.59, SD = 0.49), followed by proactively addressing obstacles (mean = 3.52, SD = 0.50). Regular evaluation of study habits and managing motivation both scored 3.51, while effective time and resource management ranked lowest at 3.48. Overall, the results (Mean = 3.52, SD = 0.50) indicated a strong commitment to self-regulatory practices, especially in goal setting and problem-solving.

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4.1.2 Directing One's Own Learning

Table 4: Impact Level of Autonomous Learning for Pre-Service Students in Terms of Directing Their Own Learning

Indicators	Mean	SD	VI	Rank
1. I choose what learning methods and techniques that best suit my learning style and objectives.	3.52	0.50	VHI	2
2. I frequently assess the relevance of my learning activities to ensure they align with my educational and career goals.	3.52	0.50	VHI	2
3. I take the initiative to explore topics in depth, beyond the basic curriculum requirements.	3.52	0.50	VHI	2
4. I am confident in making decisions about what, how, and when to study based on my personal and academic needs.	3.50	0.50	VHI	4
5. I seek out opportunities to learn autonomously, such as online courses or workshops, to supplement my formal education.	3.49	0.50	VHI	5
Overall Results	3.51	0.50	VHI	

Table 4 evaluated self-directed learning behaviors among pre-service trainees, showing strong agreement (VHI) with mean scores ranging from 3.49 to 3.52. The top behaviors, all scoring 3.52 (SD = 0.50), included choosing tailored learning methods, assessing relevance to personal goals, and exploring topics deeply. Confidence in decision-making and seeking autonomous learning followed closely with means of 3.50 and 3.49. The low SD indicated a strong consensus, emphasizing a proactive and goal-oriented approach to self-directed learning.

4.1.3 Growing Independence

Table 5: Impact Level of Autonomous Learning of Pre-Service Students in Terms of Growing Independence

Indicators	Mean	SD	VI	Rank
1. I am becoming more confident in my ability to learn independently.	3.55	0.50	VHI	1
2. I make my own decisions about my learning based on my personal and professional goals.	3.51	0.50	VHI	4
3. I can independently evaluate the feedback from my supervisors to enhance my learning and development.	3.49	0.50	VHI	5
4. I can independently evaluate the quality and relevance of the information I come across during pre-service training.	3.53	0.50	VHI	3
5. I can independently analyze both the opportunities and challenges presented during pre-service training.	3.54	0.50	VHI	2
Overall Results	3.52	0.50	VHI	

Table 5 shows the growing independence of pre-service trainees, with all five statements rated as "Very High Impact" (VHI). Mean scores ranged from 3.49 to 3.55, indicating a consistent perception of independence. The highest-rated behavior was confidence in independent learning (3.55), followed by analyzing opportunities and challenges (3.54) and evaluating information quality (3.53). Making personal learning decisions ranked fourth (3.51), while evaluating feedback from supervisors was fifth (3.49). The low SD of 0.50 suggested strong consensus and confidence in their autonomy, with an overall mean of 3.52.

4.2 Differences in the Impact of Autonomous Learning on Pre-Service Students in the Teacher Training Program

Understanding the impact of autonomous learning on pre-service students in teacher training programs is vital, as it can highlight demographic variations. This study explored how the effects of autonomous learning differ among pre-service students based on age and specialization.

4.2.1 Age

Table 6 revealed no significant differences in autonomous learning among pre-service students in teacher training programs based on age. The highest mean for self-regulation was 3.54 in the 20-21 age range ($F = 0.795$, $p = 0.474$). The 18-19 age group had a mean of 3.52 for direct own learning ($F = 0.507$, $p = 0.615$). Growing independence also showed no significant differences, with the highest mean for ages 18-21 ($F = 0.091$, $p = 0.914$). Overall, the mean age was 3.52 ($F = 0.136$, $p = 0.873$), and all p-values

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exceeded 0.05, indicating no significant differences in autonomous learning by age.

Table 6: Difference in the Impact of Autonomous Learning on Pre-Service Students in the Teacher Training Program When Grouped in Terms of Age

Indicators	Mean	F- value	P-value	Interpretation	Decision
Self- Regulation					
18-19	3.52	0.79537	0.473838	Not Significant	Accept Ho_2
20-21	3.54				
22-above	3.50				
Directing own learning					
18-19	3.52	0.50696	0.614663	Not Significant	Accept Ho_2
20-21	3.50				
22-above	3.51				
Growing Independence					
18-19	3.53	0.09091	0.913724	Not Significant	Accept Ho_2
20-21	3.53				
22-above	3.52				
Overall Results	3.52	0.136	0.873	Not significant	Accept Ho_2

Note: p>0.05 not significant, p<0.05 “significant

4.2.2 Specialization

Table 7: Difference in the Impact of Autonomous Learning on Pre-Service Students in the Teacher Training Program When Grouped in Terms of Specialization

Indicators	Mean	F- value	P-value	Interpretation	Decision
Self- Regulation					
Primary Education	3.39	56.14037	<0.00001	Significant	Reject Ho_2
Elementary Education	3.39				
Secondary Education	3.87				
Special Education	3.43				
Post-HocTukey		Q-value			
Primary vs Secondary Education		15.34	0.0000		
Elementary vs Secondary Education		15.34	0.0000		
Secondary vs Special Education		14.14	0.0000		
Directing own learning					
Primary Education	3.35	0.26266	0.851257	Not Significant	Accept Ho_2
Elementary Education	3.39				
Secondary Education	3.88				
Special Education	3.42				
Growing Independence					
Primary Education	3.43	74.82083	<0.00001	Significant	Reject Ho_2
Elementary Education	3.41				
Secondary Education	3.85				
Special Education	3.41				
Post-HocTukey		Q-value			
Primary vs Secondary Education		16.84	0.0000		
Elementary vs Secondary Education		17.63	0.0000		
Secondary vs Special Education		17.39	0.000		
Overall Results	3.53	457	<0.001	Significant	Reject Ho_2

Note: p>0.05 not significant, p<0.05 “significant”

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Table 7 examined the impact of autonomous learning by specialization among pre-service teacher trainees. Secondary education scored the highest in self-regulation (3.87, F = 56.14, p <0.00001) and growing independence (3.85, F = 74.82, p <0.0001), while direct own learning (3.88) was not significant (F = 0.26, p = 0.851). The overall mean was 3.53, with a significant F-value of 457 and p <0.001, highlighting significant differences based on specialization.

4.3 Assessment of the Pre-service Student on the Practices of Support in Autonomous Learning

Colleges and universities offer support for autonomous learning to pre-service students. It is essential to explore how these students evaluate the effectiveness of this support in three key areas: learning content, learning autonomy, and social interactions.

4.3.1 Learning Content

Table 8: Assessment of the Pre-service Student on the Practices of Support in Autonomous Learning in Terms of Learning Content

Indicators	Mean	SD	VI	Rank
1. The learning content provided in pre-service program is relevant to my future career as an educator.	3.46	0.90	VHS	3
2. The materials and resources available to encourage critical thinking skills and independent learning.	3.44	0.88	VHS	4
3. The learning content is engaging and effectively structured to facilitate self-directed study.	3.48	0.86	VHS	1.5
4. The curriculum is updated regularly to include new findings and practices in the field of education.	3.48	0.85	VHS	1,5
5. There is sufficient diversity in the learning content to cater to a wide range of learning styles and preferences.	3.40	0.93	VHS	5
Overall Results	3.45	0.88	VHS	

Table 8 assessed pre-service trainees' perceptions of their program's learning content, with all five statements rated as “Very High Support” (VHS). Mean scores ranged from 3.40 to 3.48, and low standard deviations (0.85 to 0.93) indicated strong consensus. The top statements emphasized engagement, effective content structuring, and regular curriculum updates (both at 3.48), followed by the relevance of content to future careers (3.46) and materials that promote critical thinking (3.44). The statement on diversity in learning content ranked fifth at 3.40. Overall, a mean of 3.45 (SD = 0.88) suggested strong support, though there is room for improvement in addressing diverse learning preferences.

4.3.2 Learning Autonomy

Table 9: Assessment of the Pre-service Student on the Practices of Support in Autonomous Learning in Terms of Learning Autonomy

Indicators	Mean	SD	VI	Rank
1. This program encourages and helps to set learning goals and design study plans.	3.42	0.87	VHS	4
2. The program provides opportunities for students to make choices about what, how, and when they learn.	3.46	0.90	VHS	1
3. You feel supported by the faculty in exploring learning methods that work best for your personal and professional development.	3.44	0.86	VHS	3
4. The educational environment promotes a sense of independence that allows you to take ownership of your learning process.	3.39	0.90	VHS	5
5. There are adequate mechanisms within the program to support you to have decision-making and problem-solving skills, enhancing your learning autonomy.	3.45	0.91	VHS	2
Overall Results	3.43	0.89	VHS	

Table 9 evaluated perceptions of learning autonomy among pre-service participants, with all five statements rated as “Very High Support” (VHS). Mean scores ranged from 3.39 to 3.46, and low standard deviations (0.86 to 0.91) indicated strong consensus. The top aspects included student choice in learning methods (3.46) and support for decision-making (3.45). Support from faculty ranked third (3.44), followed by goal-setting assistance (3.42) and promoting independence (3.39). The overall mean was 3.43 (SD = 0.89), suggesting strong support for autonomy, though there is room for improvement in fostering ownership.

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4.3.3 Social Interactions

Table 10: Assessment of the Pre-service Student on the Practices of Support in Autonomous Learning in Terms of Social Interactions

Indicators	Mean	SD	VI	Rank
1. The program fosters a collaborative environment where you can learn from and with peers.	3.44	0.83	VHS	3.5
2. There are ample opportunities for engaging in discussions and group activities that enhance your learning experience.	3.47	0.79	VHS	2
3. The faculty encourages interaction among students to build a supportive learning community.	3.40	0.84	VHS	5
4. Social interactions within the program are structured to facilitate the sharing of knowledge and experiences.	3.44	0.84	VHS	3.5
5. The educational setting supports the development of networks that contribute to your professional growth and learning autonomy.	3.48	0.79	VHS	1
Overall Results	3.45	0.82	VHS	

Table 10 evaluated perceptions of social interactions in a pre-service program, with all five statements rated as "Very High Support" (VHS). Mean scores ranged from 3.40 to 3.48, and low standard deviations (0.79 to 0.84) indicated strong consensus. The highest-rated aspect was support for developing professional networks (3.48), followed by opportunities for discussions and group activities (3.47). Collaborative environments for peer learning and structured interactions ranked third (3.44), while faculty encouragement of student interactions ranked fifth (3.40). The overall mean was 3.45 (SD = 0.82), indicating strong agreement on the program's collaborative environment for professional growth.

4.4 Differences in Pre-Service Student Assessment in the Practices of Support in Autonomous Learning

Analyzing pre-service students' assessments of support for autonomous learning is crucial for tailoring educational practices. This study explored how these assessments differ based on age and specialization.

4.4.1 Age

Table 11: Differences in Pre-Service Students Assessment in the Practices of Support in Autonomous Learning According to Age

Indicators	Mean	F- value	P-value	Interpretation	Decision
Learning Content					
18-19	3.17	375.07753	<0.00001	Significant	Reject Ho_3
20-21	3.23				
22-above	3.96				
Post-Hoc Tukey		Q-value			
18-19 vs 22-above		34.72	0.0000		
20-21 vs 22- above		32.23	0.0000		
Learning Autonomy					
18-19	3.23	158.89958	<0.00001	Significant	Reject Ho_3
20-21	3.13				
22-above	3.95				
Post-Hoc Tukey		Q-value			
18-19 vs 22-above		20.55	0.0000		
20-21 vs 22- above		22.92	0.0000		
Social Interaction					
18-19	3.46	0.40565	0.675347	Not Significant	Accept Ho_3
20-21	3.42				
22-above	3.45				
Overall results	3.45	282	<.001	Significant	Reject Ho_3

Note: p>0.05 not significant, p<0.05 "significant"

Table 11 analyzed pre-service students' assessments of support for autonomous learning by age. The highest mean for learning content was 3.96 for those aged 22 and above, with a significant F-value of

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375.08 and p <0.00001. For learning autonomy, this age group also scored high at 3.95 (F = 158.90, p <0.00001). In social interaction, the highest mean was 3.45 for ages 18-19, but this was not significant (p = 0.675). The overall mean age assessment was 3.45, with an F-value of 282 and a significant p <0.01, leading to the rejection of the null hypothesis.

4.4.2 Specialization

Table 12: Differences in Pre-Service Student Assessments in the Practices of Support in Autonomous Learning According to Specialization

Indicators	Mean	F- value	P-value	Interpretation	Decision
Learning Content					
Primary Education	3.43	0.62716	0.60789	Not Significant	Accept Ho_3
Elementary Education	3.50				
Secondary Education	3.45				
Special Education	3.43				
Learning Autonomy					
Primary Education	3.40	2.2989	0.116384	Not Significant	Accept Ho_3
Elementary Education	3.50				
Secondary Education	3.46				
Special Education	3.36				
Social Interaction					
Primary Education	3.43	0.21637	0.883593	Not Significant	Accept Ho_3
Elementary Education	3.45				
Secondary Education	3.44				
Special Education	3.46				
Overall Results	3.44	0.916	0.433	Not Significant	Accept Ho_3

Note: p>0.05 not significant, p<0.05 “significant”

Table 12 showed no significant differences in pre-service students' assessments of support for autonomous learning based on specialization. Elementary education had the highest mean for learning content at 3.50 (F = 0.063, p = 0.608), which was non-significant. The same mean was observed for learning autonomy (F = 2.30, p = 0.116). In social interactions, special education scored 3.46 (F = 0.216, p = 0.884), indicating no significance. The overall mean was 3.44, with an F-value of 0.916 and p = 0.433, leading to the acceptance of the null hypothesis.

4.5 The Challenges Pre-Service Students and Teachers Encounter Regarding Support for Autonomous Learning in the Teacher Training Program

The following shows the challenges encountered by pre-service student and teacher respondents regarding support for autonomous learning in teacher training programs.

4.5.1 Curriculum Rigidity

Participants highlighted significant challenges related to curriculum rigidity. Students expressed feeling constrained by a curriculum lacking flexibility, which limited their ability to tailor learning experiences to their interests. This rigidity, combined with predetermined themes, diminished their motivation and engagement. Teachers also emphasized that current policies prioritize standardized outcomes, negatively impacting personalized learning. This focus on standardization created tension between covering essential content and fostering self-directed learning.

4.5.2 Resource Limitations

Participants highlighted significant challenges related to resource limitations in teacher training programs. Respondents noted that many resources were outdated and inadequate for contemporary topics, raising concerns among both students and teachers about their effectiveness in meeting diverse learning needs. Additionally, there was a lack of advanced tools for creating interactive and multimedia content, indicating a gap in support for modern pedagogical approaches. While some resources were somewhat helpful, they often did not align with individual learning goals and lacked the variety necessary to promote independent learning.

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5. Result

Impact of Autonomous Learning

Autonomous learning significantly boosted pre-service students' self-regulation, independence, and ability to direct their learning in teacher training programs. Integrating these principles is crucial for academic institutions, fostering self-driven, adaptable educators skilled in continuous learning [10], highlighting autonomy's role in enhancing intrinsic motivation. Institutions should offer training workshops focused on developing autonomous learning strategies to empower students in their learning journeys.

Perceptions of Curriculum Effectiveness

There was a strong consensus on the effectiveness of educational materials, independent learning skills, and interpersonal relationships within the educator preparation curriculum. This consensus indicated that the curriculum successfully fosters an environment conducive to self-directed learning and peer collaboration [11]. To further enhance student engagement and support, curriculum designers should incorporate collaborative projects and peer learning opportunities.

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