E-ISSN: 2798-0472 **DOI:** 10.52562/biochephy.v6i1.1986

BIOCHEPHY: Journal of Science Education

http://journal.moripublishing.com/index.php/biochephy

Are Pre-Service Science Teachers Professionally Ready? Achievement Profile and Equity Analysis Across Class Types in a Teaching Profession Course

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Abstract: The Teaching Profession course serves as a foundational subject in developing professional competencies for pre-service science teacher students. This study aimed to analyze the profile of professional competency achievement of pre-service science teachers through this course and to compare achievement outcomes across Regular Class A, Regular Class B, and the International Class Program (ICP) in the even semester of the 2025–2026 academic year at State University Makassar. A comparative quantitative design (ex-post facto) was employed, involving 100 students from three classes (Reg A: n=37, Reg B: n=33, ICP: n=30). Final course scores were analyzed descriptively and inferentially using the Kruskal-Wallis test, with Mann-Whitney U tests applied as supplementary pairwise comparisons. Results showed an overall mean score of 84.45 (SD=9.04), with the majority of students categorized as Good to Excellent. No significant difference was found in professional competency achievement across the three classes (H=0.533; p=0.766), with very small effect sizes across all pairwise comparisons (r<0.10). These findings indicate that professional competency attainment is equitable across class types, suggesting consistent and fair implementation of the Teaching Profession course. The study recommends strengthening student-centered learning strategies and developing comprehensive authentic assessments, including reflective portfolios, performance rubrics, and case-based tasks, to produce more robust evidence of professional competency attainment.

Keywords: teaching profession course, professional competency, pre-service science teacher, comparative study, learning achievement

***Abstrak**: Mata Kuliah Profesi Kependidikan merupakan salah satu fondasi pembentukan kompetensi profesional bagi mahasiswa calon guru IPA. Penelitian ini bertujuan untuk menganalisis profil ketercapaian kompetensi profesional mahasiswa calon guru IPA melalui mata kuliah Profesi Kependidikan dan membandingkan capaian tersebut antara kelas Reguler A, Reguler B, dan Kelas Internasional (ICP) pada Semester Genap Tahun Akademik 2025-2026 di Universitas Negeri Makassar. Penelitian menggunakan pendekatan kuantitatif komparatif dengan melibatkan 100 mahasiswa dari tiga kelas (Reg A: n=37, Reg B: n=33, ICP: n=30). Data berupa nilai akhir mata kuliah dianalisis secara deskriptif dan inferensial menggunakan uji Kruskal-Wallis serta uji Mann-Whitney sebagai informasi perbandingan pasangan kelas. Hasil penelitian menunjukkan bahwa secara keseluruhan mahasiswa memperoleh nilai rata-rata sebesar 84,45 (SD=9,04) dengan mayoritas berada pada kategori Baik hingga Sangat Baik. Tidak terdapat perbedaan yang signifikan pada capaian kompetensi profesional antara ketiga kelas (H=0,533; p=0,766). Temuan ini mengindikasikan bahwa ketercapaian kompetensi profesional mahasiswa calon guru IPA relatif setara lintas jenis kelas, sehingga implementasi mata kuliah Profesi Kependidikan telah berlangsung secara konsisten dan berkeadilan. Implikasi penelitian ini mendorong penguatan strategi pembelajaran yang berpusat pada mahasiswa serta pengembangan asesmen autentik yang lebih komprehensif dalam mata kuliah Profesi Kependidikan.*

***Kata Kunci:** profesi kependidikan, kompetensi profesional, calon guru IPA, studi komparatif, ketercapaian belajar*

INTRODUCTION

Professional competency is one of four core competencies required of teachers under Law No. 14 of 2005 on Teachers and Lecturers and the Regulation of the Minister of National Education No. 16 of 2007 on Academic Qualification Standards and Teacher Competencies. This competency encompasses a deep and broad mastery of subject matter, the ability to guide students in meeting established competency standards, and the capacity for continuous professional development (Mulyasa, 2013). In the context of teacher education in higher education, the development of professional competency is inseparable from the role of education-related courses systematically embedded within the study program curriculum.

The Teaching Profession Course (Profesi Kependidikan) is a compulsory subject in the science education study program curriculum, specifically designed to equip pre-service teachers with a comprehensive understanding of the nature of the teaching profession, teaching ethics, professional development, and the challenges and opportunities in contemporary education. This course is not purely theoretical; it also emphasizes the development of students' professional attitudes, values, and identity as future educators (Suparlan, 2019).

In its implementation at Universitas Negeri Makassar (UNM), the Teaching Profession Course is offered across three separate classes: Regular Class A, Regular Class B, and the International Class Program (ICP). This class differentiation raises a relevant scientific question: does professional competency achievement differ significantly among these classes? The question is important to address, given that each class possesses distinct student characteristics, academic backgrounds, and curricular orientations that may differentially affect learning outcomes.

Previous studies have investigated the factors influencing professional competency achievement among pre-service teachers. Sharma et al. (2024) found that reflection-based learning in teacher education courses significantly contributes to students' understanding of the teaching profession. Jarauta et al. (2019) emphasized the importance of integrating content knowledge and pedagogy in shaping pre-service teachers' professional identity. Meanwhile, comparative studies on achievement outcomes between regular and international classes in Indonesian higher education remain limited, particularly in the context of the Teaching Profession Course.

Recent literature reinforces the urgency of this study. Susantini et al. (2022) developed a competency evaluation instrument for pre-service science teachers and affirmed that professional competency must be measured through structured, validated indicators capable of distinguishing pedagogical and professional dimensions. Villalba-Condori et al. (2020) further demonstrated that pre-service science teacher competency encompasses teaching knowledge, teaching skills, and professional attitudes, meaning that academic achievement should be interpreted as one component of a broader competency profile rather than its sole measure. In addition, Suarez and McGrath (2022) emphasized that teacher professional identity develops through interactions among beliefs, educational experiences, institutional support, and self-reflection. In the current landscape of teacher education, professional competency is increasingly linked to digital readiness; Dolezal et al. (2025) underscored the need to strengthen pre-service teachers' digital competencies as part of future-oriented professionalism.

Professional competency for science teachers refers to the capacity to master science content in depth, integrate knowledge across disciplines, and continuously develop oneself as an educator (Darling-Hammond, 2017). Within the framework of KKNI (Indonesian National Qualifications Framework), pre-service science teachers are required to possess higher-order thinking skills, an understanding of the nature of science, and the ability to design and implement innovative science-based learning (Kemendikbud, 2020). The development of this competency is a continuous process that begins during undergraduate education.

The comparison of learning outcomes across classes with differing characteristics has become a growing area of inquiry in higher education research. Sejdiu Shala et al. (2024) found that differences in students' academic backgrounds and learning motivation influence learning outcomes, although this influence is not always linear and depends on the quality of instructional

implementation. Similarly, Kuh et al. (2018) highlighted student engagement as a primary predictor of academic achievement, regardless of the type of class attended.

The Teaching Profession Course plays a strategic role in building pre-service teachers' professional competency. Through engagement with topics such as the nature of the teaching profession, teacher ethics and responsibilities, the legal foundations of education, and reflection-based professional development, students are guided to construct a solid professional foundation (Suparlan, 2019). Furthermore, Zeichner and Conklin (2016) affirmed that meaningful academic experiences within teacher education courses make a substantial contribution to the development of a strong and adaptive professional teacher identity.

In the context of international programs (ICP) at Indonesian universities, Win et al., (2015) found that international class students tend to show more variable achievement than their regular class counterparts, influenced by factors such as adaptation to the language of instruction and higher academic demands. This underscores the empirical importance of examining competency achievement differences between regular and international classes, particularly within teacher education courses.

Assessment of professional competency in pre-service teachers encompasses not only cognitive knowledge but also affective and psychomotor dimensions reflected in professional attitudes, values, and practices (Stiggins, 2014). Final course scores, as one indicator of learning achievement, represent an integrative reflection of multiple assessment components designed in accordance with the Course Learning Outcomes (CLO). In the context of this study, final scores are used as a proxy for professional competency achievement that can be analyzed comparatively across classes.

Recent assessment literature underscores the importance of authentic assessment in higher education and teacher preparation. Ajjawi et al. (2024) proposed a shift from mere "authentic assessment" toward "authenticity in assessment" an approach that foregrounds the connection between academic tasks, practical contexts, student participation, and the application of knowledge in real-world situations. Vlachopoulos and Makri (2024), through a systematic review, demonstrated that authentic assessment supports the development of 21st-century skills including problem-solving, critical thinking, communication, and professional readiness. Therefore, the use of final scores in this study should be understood as baseline data capturing academic achievement, while comprehensive professional competency measurement still requires portfolios, reflection, performance observation, and authentic assessment rubrics.

Based on this background, the study aims to: (1) describe the profile of professional competency achievement of pre-service science teachers through the Teaching Profession Course in each class, and (2) test whether there is a significant difference in professional competency achievement among Regular Class A, Regular Class B, and the ICP. The findings are expected to provide empirical contributions toward the development of a higher-quality, more equitable, and adaptive Teaching Profession Course tailored to the future needs of pre-service science teachers.

METHODS

Research Design

This study employed a quantitative approach with a comparative design (ex-post facto). This approach was selected because no experimental treatment was administered; instead, the study analyzed existing grade data that arose naturally from completed learning processes (Creswell, 2014). The comparative design allowed the researchers to examine whether differences in professional competency achievement existed among class groups that had been formed based on institutional policy.

Research Participants

The research participants comprised all students enrolled in the Science Education Study Program at State University of Makassar who took the Teaching Profession Course in the even semester of the 2025–2026 academic year. A total of 100 students participated, distributed across

three classes: Regular Class A (n=37), Regular Class B (n=33), and the International Class Program (ICP) (n=30). A total sampling technique was applied, meaning all registered students in the three classes were included as research participants.

Instrument and Data Collection

Research data consisted of the final scores for the Teaching Profession Course, obtained from academic assessment records. Final scores were treated as indicators of learning achievement rather than as a singular measure of professional competency. Score components reflected the cumulative assessment of both process and learning outcomes over one semester. Grade categories followed the UNM grade conversion system: A (>90), A− (>85), B+ (>80), B (>75), B− (>70), C+ (>65), C (>60), C− (>55), D+ (>50), D (>45), D− (>40), and E (≤40).

Data Analysis

Data were analyzed in two stages. First, descriptive analysis was conducted to calculate the mean, median, standard deviation (SD), minimum and maximum values, and grade distribution frequency for each class. Second, inferential analysis using the Kruskal-Wallis test was performed to simultaneously test achievement differences across the three classes. The Kruskal-Wallis test was selected because the data did not meet the normality assumption, as verified by the Shapiro-Wilk test. When significant differences were found, the Mann-Whitney U test was applied as a post-hoc analysis with Bonferroni correction to identify which specific pairs of classes differed significantly. Effect size was calculated using the formula $r = |Z|/\sqrt{N}$ to measure the magnitude of differences (Field, 2013). All analyses were conducted at a significance level of $\alpha = 0.05$.

RESULTS AND DISCUSSION

Professional Competency Achievement Profile by Class

Overall, the 100 students across three classes demonstrated good professional competency achievement in the Teaching Profession Course during the even semester of 2025–2026. Descriptive statistics are summarized in Table 1.

Table 1. Descriptive Statistics of Final Scores for the Teaching Profession Course

Statistic	Reg A (n=37)	Reg B (n=33)	ICP (n=30)	Total (N=100)
Mean	84,70	83,76	84,93	84,45
Median	85,00	85,00	85,00	85,00
SD	8,49	10,31	8,38	9,04
Minimum	65	30	60	30
Maximum	95	96	96	96

Source: UNM Academic Grade Records, Even Semester 2025

Table 1 shows that all three classes achieved relatively comparable mean scores: Reg A (M=84.70; SD=8.49), Reg B (M=83.76; SD=10.31), and ICP (M=84.93; SD=8.38). The median was identical across all three classes at 85.00, indicating that score distributions tended to be symmetric around this value. The grand mean across all classes was 84.45 (SD=9.04), which corresponds to a B+ or Good category under the UNM grade conversion system. Regular Class B had the highest standard deviation (10.31), reflecting greater variability in achievement compared to the other classes, as evidenced by its wider score range (30–96).

Table 2. Grade Distribution of Students by Class

Grade	Range	Reg A (n=37)	%	Reg B (n=33)	%	ICP (n=30)	%
A	>90	11	29,7	3	9,1	8	26,7
A-	>85	1	2,7	1	3,0	4	13,3
B+	>80	18	48,6	24	72,7	7	23,3
B	>75	2	5,4	4	12,1	6	20,0
B-	>70	1	2,7	0	0,0	2	6,7
C	>60	4	10,8	0	0,0	3	10,0
E	≤40	0	0,0	1	3,0	0	0,0

Source: UNM Academic Grade Records, Even Semester 2025–2026

Table 2 presents the grade distribution for each class. The B+ grade dominated across all classes, most notably in Regular Class B (72.7%). In Regular Class A, 11 students (29.7%) achieved an A grade, higher than Regular Class B (9.1%) and slightly higher than ICP (26.7%). ICP demonstrated the most diverse distribution, with the combined proportion of A and A− grades reaching 40.0%, and no ICP student receiving an E grade. One student with an E grade was recorded in Regular Class B (3.0%).

Table 3. Competency Category Profile of Students by Class

Competency Category	Reg A	%	Reg B	%	ICP	%
Excellent (A/A−)	12	32,4	4	12,1	12	40,0
Good (B+/B/B−)	21	56,8	28	84,8	15	50,0
Satisfactory (C+/C/C−)	4	10,8	0	0,0	3	10,0
Poor/Fail (D/E)	0	0,0	1	3,0	0	0,0

Source: UNM Academic Grade Records, Even Semester 2025–2026

Table 3 shows that the majority of students across all three classes fell within the Good to Excellent categories. ICP had the highest proportion in the Excellent category (40.0%), followed by Regular Class A (32.4%) and Regular Class B (12.1%). Conversely, in the Good category, Regular Class B dominated with 84.8%, while ICP had the lowest proportion (50.0%). No students in Regular Class A or ICP were in the Poor/Fail category, while Regular Class B had one student (3.0%) in that category.

Comparative Analysis of Competency Achievement Across Classes

Prior to the comparative test, data normality was assessed using the Shapiro-Wilk test. Results indicated that the score distribution of Regular Class B did not meet the normality assumption ($W=0.873$; $p<0.05$), and the analysis therefore proceeded with the non-parametric Kruskal-Wallis test. The complete comparative test results are presented in Table 4.

Table 4. Results of Kruskal-Wallis and Mann-Whitney Tests Across Classes

Comparison	Test Statistic	p-value	Effect Size (r)	Remark
Kruskal-Wallis (3 classes)	H = 0,533	p = 0,766	-	Not Significant
Reg A vs Reg B	U = 665,0	p = 0,477	r = 0,085	Not Significant
Reg A vs ICP	U = 506,0	p = 0,876	r = 0,019	Not Significant
Reg B vs ICP	U = 426,0	p = 0,581	r = 0,071	Not Significant

Source: Research data analysis results, 2026

The Kruskal-Wallis test results in Table 4 indicate no significant difference in professional competency achievement across the three classes ($H=0.533$; $p=0.766$). This finding is reinforced by the Mann-Whitney pairwise tests, which also found no significant difference between any pair of classes: Reg A vs Reg B ($U=665.0$; $p=0.477$), Reg A vs ICP ($U=506.0$; $p=0.876$), and Reg B vs ICP ($U=426.0$; $p=0.581$). The very small effect sizes across all pairwise comparisons ($r<0.10$) confirm that the observed differences are practically negligible.

Discussion

The findings of this study indicate that pre-service science teachers' learning achievement in the Teaching Profession Course was categorized as Good, with a grand mean of 84.45. Nevertheless, the results must be interpreted proportionally, as final course scores serve as indicators of academic achievement rather than a comprehensive measure of professional competency. Professional competency encompasses knowledge, skills, attitudes, professional identity, and the ability to apply knowledge within the context of teaching practice (Darling-Hammond, 2017; Suarez & McGrath, 2022; Zeichner & Conklin, 2016).

This interpretation must be situated within the framework of recent literature. Susantini et al. (2022) remind us that pre-service science teacher competency is multidimensional; final scores can depict academic achievement, but do not fully represent professional practice. Accordingly, the high mean scores in this study may be read as a positive indication of course learning achievement, yet they are insufficient to conclude full mastery of professional competency without authentic assessment and performance data.

This limitation must be explicitly acknowledged. Final course scores, while integrative in nature, fundamentally represent only one dimension of the multidimensional construct of professional competency. As Stiggins (2014) emphasized, valid assessment of professional competency requires measurement across cognitive, affective, and psychomotor dimensions that cannot be fully captured through a single score. Therefore, the findings of this study are more appropriately read as a baseline portrait of students' academic achievement rather than a definitive conclusion about their professional readiness as pre-service science teachers. This interpretation also aligns with the call by Ajjawi et al. (2024) for higher education to move toward "authenticity in assessment" assessment that not only measures knowledge, but also reflects student engagement in real professional situations and practices.

The absence of significant differences among Regular Class A, Regular Class B, and ICP is a finding that is both interesting and pedagogically meaningful. This equivalence of achievement indicates that the Teaching Profession Course at UNM has been implemented consistently across all three classes, regardless of differences in student characteristics and the language of instruction. This uniformity of outcomes may be interpreted as evidence of robust curriculum alignment between learning objectives, instructional processes, and the assessment system applied.

Theoretically, this finding supports the view of Kuh et al. (2018) that the quality of learning experiences and student engagement are stronger predictors of achievement than mere class grouping. When lecturers succeed in creating a conducive learning climate and implementing authentic assessment, differences in students' backgrounds tend not to produce significant achievement disparities. This also aligns with the findings of Dagunduro et al. (2024), who showed that adaptive learning management can minimize achievement gaps between regular and international classes.

Nonetheless, several aspects warrant further attention. The ICP class showed the highest proportion of Excellent category students (40.0%), while Regular Class B exhibited greater achievement variability as indicated by its highest standard deviation. This variability suggests the need for more differentiated instructional strategies, particularly for students who require conceptual reinforcement, academic mentoring, and more structured formative feedback. The phenomenon of achievement variability can be understood through the lens of self-regulated learning theory. Zimmerman and Schunk (2013) explain that students with strong self-regulation tend to respond to academic demands with more adaptive learning strategies, while those lacking adequate independent learning strategies are more susceptible to learning difficulties. These findings suggest that strengthening learning orientation, progress monitoring, and academic reflection should be integrated into the instructional design of the Teaching Profession Course.

These findings carry important implications for the development of the Teaching Profession Course. First, lecturers need to develop more differentiated assessments to accommodate the diversity of student achievement, particularly in the ICP. Second, more structured mentoring or remedial programs should be designed for students at risk of not meeting competency standards. Third, the achieved consistency across classes must be maintained through standardized materials, assessment rubrics, and shared instructional strategies among all lecturers involved. More operationally, strengthening inter-class consistency can be achieved through three concrete steps: (1) standardizing competency-based assessment rubrics agreed upon collectively by all lecturers, so that achievement interpretation does not rely on individual subjectivity; (2) implementing peer observation among lecturer groups to ensure equivalent instructional quality; and (3) developing a shared authentic task bank encompassing teacher profession case studies, teacher meeting simulations, and teaching practice video analyses, adaptable across classes with contextual adjustments. These steps align with the collaborative curriculum design principle articulated by Zeichner and Conklin (2016), whereby the quality of teacher education depends on coherence among curriculum design, teaching practice, and mutually supportive assessment systems.

These implications also align with contemporary assessment scholarship. Ajjawi et al. (2024) and Vlachopoulos and Makri (2024) emphasize that meaningful assessment must connect academic tasks with professional practice contexts. Therefore, future development of the Teaching Profession Course should not rely solely on final examination scores, but should also integrate reflective portfolios, teacher profession case studies, practice observations, problem-based presentations, and validated performance rubrics. Such strategies will produce stronger and more credible claims of professional competency achievement, appropriate for publication in reputable journals.

CONCLUSION

This study concludes that the learning achievement of pre-service science teachers through the Teaching Profession Course at Universitas Negeri Makassar was categorized as Good overall, with a grand mean of 84.45 (SD=9.04). The achievement distribution across the three classes (Regular A, Regular B, and ICP) showed that the majority of students fell within the Good to

Excellent categories. The Kruskal-Wallis test found no significant difference in final score achievement across the three classes (H=0.533; p=0.766), confirmed by Mann-Whitney tests with very small effect sizes across all pairwise comparisons. These findings indicate that students' final score achievement was relatively equitable across classes; however, it does not yet fully represent professional competency in its entirety. Therefore, the development of the Teaching Profession Course needs to be complemented by authentic assessments, reflective portfolios, performance evaluations, and comprehensive competency rubrics.

ACKNOWLEDGMENTS

The author expresses gratitude to all students of Regular Class A, Regular Class B, and the ICP in the Teaching Profession Course during the even semester of 2025–2026 for their active participation in the learning process. Appreciation is also extended to the Department of Science Education, Faculty of Mathematics and Natural Sciences, State University of Makassar, for the institutional support provided throughout this research.

REFERENCES

Ajjawi, R., Tai, J., Dollinger, M., Dawson, P., Boud, D., & Bearman, M. (2024). From authentic assessment to authenticity in assessment: Broadening perspectives. Assessment & Evaluation in Higher Education,49(4),499–510. https://doi.org/10.1080/02602938.2023.2271193

Creswell, J. W. (2014). Research design: Qualitative, quantitative, and mixed methods approaches (4th ed.). SAGE Publications.

Darling-Hammond, L. (2017). Teacher education around the world: What can we learn from international practice? European Journal of Teacher Education, 40(3),291–309. https://doi.org/10.1080/02619768.2017.1315399

Dagunduro, A., Chikwe, C., Ajuwon, O., & Ediae, A. (2024). Adaptive Learning Models for Diverse Classrooms: Enhancing Educational Equity. *International Journal of Applied Research in Social Sciences*, *6*(9), 2228–2240. https://doi.org/10.51594/ijarss.v6i9.1588

Dolezal, D., Motschnig, R., & Ambros, R. (2025). Pre-service teachers' digital competence: A call for action. Education Sciences, 15(2), Article 160.https://doi.org/10.3390/educsci15020160

Field, A. (2013). Discovering statistics using IBM SPSS statistics (4th ed.). SAGE Publications.

Jarauta, B., Quiles-Fernández, E., & Hervas, G. (2019). Professional knowledge and teacher identity: Learning from students and university instructors' perceptions in a teacher education program. *ICERI Proceedings*, *1*, 3676–3679. https://doi.org/10.21125/iceri.2019.0943

Kemendikbud. (2020). Peraturan Menteri Pendidikan dan Kebudayaan Nomor 3 Tahun 2020 tentang Standar Nasional Pendidikan Tinggi. Kementerian Pendidikan dan Kebudayaan Republik Indonesia.

Kuh, G. D., Kinzie, J., Buckley, J. A., Bridges, B. K., & Hayek, J. C. (2018). What matters to student success: A review of the literature. National Postsecondary Education Cooperative.

Mulyasa, E. (2013). Standar kompetensi dan sertifikasi guru. PT Remaja Rosdakarya.

Stiggins, R. J. (2014). Assessment for learning: A key to student motivation and achievement. Edge, 2(2), 3–19.

Sejdiu Shala, D., Thaçi, E., & Shala, A. (2024). Learning Styles and Motivation: Their Role in Academic Performance. *Journal of Educational and Social Research*, *14*(3), 258. https://doi.org/10.36941/jesr-2024-0071

Sharma, A., Jamal, N., Verma, M., Jain, N., & Muthukumar, E. (2024). The Role of Reflective Practice in Teacher Education: A Comprehensive Review. *European Economic Letters.* https://doi.org/10.52783/eel.v14i2.1451

Suarez, V., & McGrath, J. (2022). Teacher professional identity: How to develop and support it in times of change (OECD Education Working Papers No. 267). OECD Publishing. https://doi.org/10.1787/b19f5af7-en

Suparlan. (2019). Menjadi guru efektif. Hikayat Publishing.

Susantini, E., Kartowagiran, B., Hamdi, S., Hadi, S., Jaedun, A., Wesnawa, I. G. A., Sunendar, D., & Laliyo, L. A. R. (2022). Developing competency evaluation of pre-service science teachers in industrial revolution 4.0: Revealing pedagogic and professional competencies. International Journal of Educational Methodology, 8(2), 347–362. https://doi.org/10.12973/ijem.8.2.347

Undang-Undang Republik Indonesia Nomor 14 Tahun 2005 tentang Guru dan Dosen. Sekretariat Negara Republik Indonesia.

Villalba-Condori, K. O., Adúriz-Bravo, A., Lavonen, J., Wong, L.-H., & Wang, T.-H. (2020). *Importance of the Concept of "Competency" in Science Teacher Education: What Are the Professional Competencies for Science Teachers?* (pp. 1–5). Springer. https://doi.org/10.1007/978-3-030-45344-2_1

Vlachopoulos, D., & Makri, A. (2024). A systematic literature review on authentic assessment in higher education: Best practices for the development of 21st century skills, and policy considerations. Studies in Educational Evaluation, 83, Article 101425. https://doi.org/10.1016/j.stueduc.2024.101425

Win, N. L., Wynn, S. D., & Win, K. M. (2015). *A Study on Academic Performance of International Students* (pp. 101–108). Springer Singapore. https://doi.org/10.1007/978-981-287-399-6_9

Zeichner, K., & Conklin, H. G. (2016). Beyond knowledge ventriloquism and echo chambers: Raising the quality of the debate in teacher education. Teachers College Record, 118(12), 1–38. https://doi.org/10.1177/016146811611801203

Zimmerman, B. J., & Schunk, D. H. (2013). *Self-Regulated Learning and Academic Achievement*. Routledge. https://doi.org/10.4324/9781410601032