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Implementing Research-Based Learning in Kazakhstan's Pre-Service Teacher Education

Gulmira Yermekbayeva[1], Gulzhana Kuzembayeva[2*], Zhumagul Maydangalieva[3] & Olessya Goncharenko[4]

Abstract

This study aims to examine the formal integration of scientific research within teacher preparation programs at universities in Kazakhstan, aiming to enhance the research capacity of pre-service teachers. It introduces a research-based learning (RBL) model for delivering research components in postgraduate programs, tailored to address individual research interests through defined modules and directed research projects. The study's objective is to examine the effectiveness of implementing the RBL model in building pre-service teachers' research capacity. Using a quasi-experimental pretest-posttest design, the study employs a questionnaire survey to evaluate participants' self-perceived research skills and knowledge before and after the intervention, assessing the development of their research capability dimensions. Expert assessment is utilized to examine research performance and writing skills among pre-service teachers. The study involved students from language teacher education departments, specifically 120 postgraduate (master's level) students from K. Zhubanov Aktobe Regional University and Baishev University in Aktobe, Kazakhstan. The research findings highlight the effectiveness of the RBL model in training pre-service teachers across various stages of the research process. This includes formulating research questions, reviewing literature, planning research activities, clarifying methodologies, conducting investigations, analyzing data, and presenting results. The study shows that the RBL model enhances students' understanding of research, their ability to plan and design research projects, knowledge of research methodology, data analysis skills, research writing abilities, and capabilities in publishing and presenting research. These findings offer valuable insights for university instructors and suggest avenues for further investigation. The study also examines potential implications for how teacher education research is conducted and how programs are designed.

Keywords: *Developing research competency, higher education, research-based learning, RBL, pre-service teachers, research capacity, teacher education*

Introduction

To address the growing diversity in student learning needs, teachers need support in becoming innovators and researchers in education. Teacher preparation programs have an important role in laying the foundation for this ongoing learning and professional growth. This includes equipping

[1] *Ph.D. in Education, Senior Lecturer, K. Zhubanov Aktobe Regional University, Kazakhstan; gabitovna86@mail.ru*
[2] *Ph.D. in Philology, Assoc. Prof., K. Zhubanov Aktobe Regional University, Kazakhstan; kuzembayeva@mail.ru*
[3] *Ph.D. in Education, Associate Professor, Baishev University, Postdoctoral researcher of Kh.Dosmukhamedov Atyrau University, Kazakhstan; maydangalieva@mail.ru*
[4] *MSc in Education, Senior Lecturer, K. Zhubanov Aktobe Regional University, Kazakhstan; 35olessya@mail.ru*

educators with the skills and knowledge needed to navigate various student differences, such as academic, behavioral, physical, and cultural differences. By fostering a culture of innovation and research within teacher training programs can empower educators to develop effective teaching strategies and interventions tailored to meet the diverse needs of their students (Brouwer & Korthagen, 2005).

Engaging in authentic scientific inquiry not only benefits teachers' professional development but also inspires future generations of scientists. Encouraging students to develop competencies relevant to research practice can be achieved through research-related activities (Noguez & Neri, 2019). RBL serves as a valuable approach in this regard, offering a perspective or paradigm that promotes active engagement in inquiry-based learning. By incorporating RBL into teaching practices, educators empower students to become lifelong learners and inquisitive thinkers, fostering a culture of curiosity and exploration in the classroom.

RBL prioritizes students' active engagement as researchers, moving away from traditional fact-based learning and teacher-centred approaches. Through writing and dialogue, students enhance their communication skills while honing their abilities to comprehend, analyze, and critically evaluate texts. RBL empowers students to develop and test hypotheses, think creatively, solve problems, and navigate challenges independently. In RBL classrooms, teachers frequently adopt the role of facilitators, guiding students as they formulate questions, collect and analyze information, and draw their own conclusions. This approach emphasizes student autonomy and encourages them to share their findings with their peers (Seif, 2021). By fostering a research-driven environment, it becomes imperative to raise and strengthen educators' interest in research and motivate them to make informed decisions grounded in evidence.

Ciraso-Calí and colleagues (2022) report that the analysis of HEI curriculum reveals inconsistencies in the design for research competency acquisition, with a noticeable lack of clear articulation across various courses. Furthermore, Wagner, Garner, Kawulich (2011) note that there is no formal culture of research methodology instruction within the field of social science. Given this context, the authors aimed to develop an effective mechanism to enhance pre-service EFL teachers’ capacity for and enthusiasm towards conducting school-based research, particularly action research.

This research is to examine the effectiveness of implementing the RBL model in pre-service teachers' education to enhance their research capacity. The study seeks to answer the following research question:

RQ: What impact does the implementation of the RBL model have on enhancing the research capacity of pre-service English as a Foreign Language (EFL) teachers, particularly in terms of their research skills and knowledge, research performance, and writing skills?

The hypotheses proposed are as follows:

H_0: There is no statistically significant difference in pre-service EFL teachers' research capabilities before and after the intervention of the RBL model of education in terms of their level of understanding research, ability to plan and design research, knowledge of research methodology, data analysis skills, research writing skills, and competence in publishing and presenting research.

H_1: There is a statistically significant difference in pre-service EFL teachers' research capabilities before and after the intervention of the RBL model of education in terms of their level of understanding research, ability to plan and design research, knowledge of research methodology, data analysis skills, research writing skills, and ability to publish and present research.

The research findings are expected to inspire lecturers and researchers to implement innovative learning models, such as the RBL model, to enhance students' research abilities and competencies.

Literature Review

Acquiring Research Competency in Teacher Training

Research plays a crucial role in transforming society, as a strong research mindset is key to driving innovation and improving quality of life (Salom, 2013). Research competency, a vital 21st-century skill, enables students to navigate the complexities of an ever-changing world (Ciraso-Calí et al., 2022). Research competency encompasses the capacity to approach problems systematically, employing scientific methods such as planning, data collection, and analysis, whether through statistical instruments or qualitative techniques (Ismail & Meerah, 2012; Salom et al., 2013). It's a skill set that demands continual refinement, suggesting that active participation in research-related activities and writing workshops can contribute to its development (Manongsong & Panopio, 2018; Perez et al., 2022).

Research within education departments has often centred on assessing the research capabilities of graduates (Abarro et al., 2016; Ulla et al., 2017; Wong, 2019). Despite the expectation that

individuals earning advanced degrees should engage in research and publication, studies suggest a gap between this expectation and actual involvement in research activities (Kho & Ling, 2017; Salem et al., 2016).

Ciraso-Calí and colleagues (2022) conducted a study on higher education institution (HEI) curricula, revealing an uneven and poorly articulated approach to acquiring research competency across various courses. Similarly, Wagner, Garner, Kawulich (2011) observed a lack of established teaching culture in the field of social science regarding research methodology.

There are significant deficiencies in these disciplines concerning finding scientific information, analyzing data, and communicating that data in a manner consistent with scientific norms (Salmento et al., 2021). Despite this, Gess, Geiger, Ziegler (2018) emphasize the importance and emphasis on developing research competency in the social sciences – understanding publication guidelines, quality standards, and the definition of social research, along with disciplinary expertise. Additionally, they highlight the need for tools specifically focused on analyzing research competency in this field.

Teachers' engagement in research is considered influential in enhancing their ability to solve educational problems and consistently deliver quality instruction to students. The structured and systematic inquiry process of an action research cycle can help teachers advance their expertise in teaching and learning while also promoting continuous improvement in practice (UY & Callo, 2023). This process typically involves identifying a research topic, reviewing relevant literature, formulating a research question, designing the study, collecting data, analyzing findings, and disseminating results within the academic community. Collaborative action research with fellow teachers facing similar issues and challenges offers benefits such as knowledge construction (McGee, 2008) and emotional support (Elliott, 1991).

Brew (2007) emphasizes the importance of equipping students with essential skills for their professional futures, including problem investigation, evidence-based judgment, rational decision-making, and comprehensive understanding. He claims that research and inquiry are indispensable components of professional life in the modern era, not limited to those pursuing academic careers. Teaching methods can align with this philosophy in various ways: (1) research-led approaches prioritize conveying research findings and aligning curriculum with faculty research interests, often relying on information transmission as the primary teaching mode; (2) research-oriented methods emphasize both learning about research processes and studying how knowledge is

generated, aiming to instill a research ethos among students; (3) research-based strategies immerse students in research roles, organizing curriculum around inquiry-based activities and minimizing the teacher-student divide; and (4) research-tutored approaches focus on student-centred learning through activities such as paper writing and discussions (Healey, 2005; Griffith, 2004).

Healey (2005) argues that although traditional university teaching often leans towards research-led approaches, higher education should prioritize research-tutored or research-based pedagogies, as they prove most effective for student learning. Research-based curricula, which equip students with research skills, have demonstrated benefits such as enhanced understanding of science content, improved ability to process scientific literature and data, strengthened critical thinking skills, increased passion for learning, and improved teamwork abilities. Moreover, undergraduate research experiences contribute to students' confidence and interest in their field (Meijerman et al., 2016).

Benefits of the RBL Paradigm

The RBL model, as described by Hidayatul and colleagues (2020), is a problem-based learning strategy focused on real-life challenges. It provides students with a context to develop problem-solving skills and strategies while learning essential information and concepts from the subject. The subject-oriented RBL approach shifts the educational emphasis from traditional inheritance to inquiry (Li, 2022). Like scientific research, RBL involves students in identifying research topics from their social and academic experiences. Through autonomous inquiry, they acquire knowledge and apply it (Li, 2022). Engaging in real-life study can greatly motivate learners to explore topics further. Additionally, participation in actual research helps students understand the nature of research and their role as researchers (Muratbekovna et al., 2024; Panfilova et al., 2024).

Pratama et al. (2019) suggest that students can enhance their understanding and knowledge by engaging in activities such as searching, formulating hypotheses, gathering and evaluating data, and drawing conclusions within the RBL paradigm. Those who adopt the RBL approach are more inclined to: 1) understand key concepts and effective strategies; 2) tackle problems in a systematic, rational, and creative manner; and 3) cultivate a scientific mindset characterized by a continuous pursuit of truth with openness and honesty (Suyatman, 2021).

The RBL approach provides students with the opportunity to actively participate in their education. Through collaborative learning experiences, students engage in research activities that involve

literature searches, hypothesis construction, data collection, analysis, testing, and conclusion drawing, complementing the lecturer's materials. This hands-on approach fosters the development of metacognitive skills and enhances critical thinking, prediction-making, causal factor-proposal, and argument-presenting abilities (Susiani et al., 2018).

Student research workshops hold significant potential to improve research writing abilities and foster academic success. A previous study by Lee and colleagues (2017) found that workshop interventions could enhance students' self-efficacy in research writing. Academics suggest that allowing students to complete writing assignments and receive constructive feedback can elevate their self-esteem (Gonzaga et al., 2023), improve their writing abilities (Domingo & Sicat, 2020), and increase their confidence (Lim & Chai, 2019).

Method

Research Design

The research aims to explore the effectiveness of implementing the RBL model in pre-service teachers' education to enhance their research capacity. A one-group pretest-posttest research design, allowing for a simple assessment of the intervention applied to a cohort of research subjects (Kairgozhin et al., 2023; Stratton, 2019), was employed to study the effect of the RBL model of education on pre-service EFL teachers' research capabilities in terms of their level of understanding research, ability to plan and design research, knowledge of research methodology, data analysis skills, research writing skills, and ability to publish and present research.

Study Sample

The research was conducted at K. Zhubanov Aktobe Regional University and Baishev University in Aktobe, the Republic of Kazakhstan. The participants consisted of 120 postgraduate (master's level) students from language teacher education departments. The study employed probability random sampling technique, considering existing strata in the population, to select the sample, which represented all members of the population. Table 1 presents the demographic information of the participants.

Table 1

Participants' Demographic Information (N=120)

Categories	Number	Percent
Gender		
Male	25	20.8%
Female	95	79.2%
Level of Education		
Graduate	-	-
Postgraduate	120	100%
University		
Zhubanov University	72	60%
Baishev University	48	40%
Educational Program		
Foreign Language: Two Foreign Languages	72	60%
Kazakh Language and Literature	30	25%
Russian Language and Literature	18	15%

Instrument

To assess pre-service teachers' research capacity, a questionnaire survey was administered. The survey consisted of a 30-item questionnaire on research capability, adapted from Perez and colleagues (2022), utilizing a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Validation and reliability testing of the questionnaire were conducted by George and Mallery (2003), yielding a high Cronbach's alpha value of 0.89. The instrument underwent validation processes including concept, criteria, content (expert), and face validity, as described by Perez and colleagues (2022).

The questionnaire survey was utilized to evaluate the participants' self-perceived research skills and knowledge both before the intervention and after, aiming to measure the development of pre-service teachers' research capacity over the course of the study.

The expert-assessment method, as described by Danelyan (2015), was employed to evaluate the research performance and writing skills of pre-service teachers. This method involves collecting

information about a subject and leveraging the opinions of specialists and experts to arrive at a decision or conclusion.

Intervention: Implementing the RBL Model in Pre-service Teacher Education

The authors developed and implemented the model of research-based learning in regional university teacher education programs, as illustrated in Figure 1.

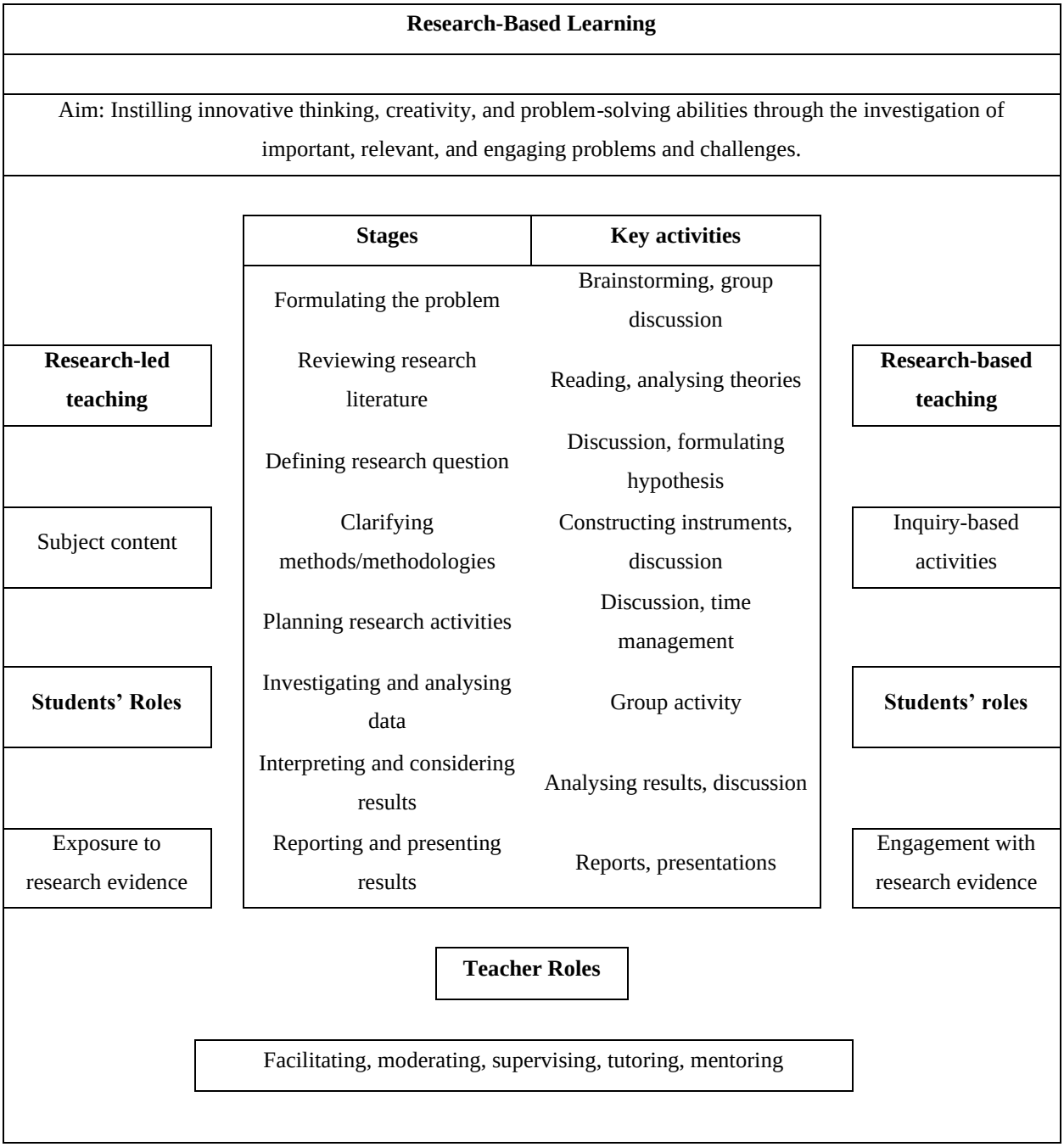

Figure 1. Model of Research-Based Learning

Examples of RBL procedures within the model's framework include formulating a general question, reviewing research literature, defining the research question, planning research activities, clarifying methods/methodologies, conducting investigation, analyzing data, interpreting and considering results, and reporting and presenting findings. The inquiry-based learning method serves as the foundational structure of the theoretical model of the research-based approach, encompassing the following components:

1) Designing a research plan: Crafting a project strategy encompassing the necessary tools, methodical processes, and actions systematically undertaken aids in achieving the project's objectives effectively.

2) Time management: Establishing a schedule is beneficial for accomplishing research objectives within the specified deadline.

3) Monitoring students' activities and progress: Students engage in consultations, communicate their activity progress, and address any encountered difficulties during the research process.

4) Assessment, feedback, and reflection: Students submit their finished research projects on the university's educational platform. The teacher evaluates students' accomplishments and offers feedback. Students present their research projects in class, facilitating reflection among both teacher and peers. The outcomes may also be shared on social media platforms.

Data Collection and Analysis

Descriptive statistics were utilized to analyse the quantitative research data on pre-service teachers' research capacity using Statistical Package for Social Sciences (SPSS). The non-parametric Wilcoxon Signed Ranks Test was employed to delineate the effect of the intervention, comparing pre- and post-intervention measurements.

The efficacy of the intervention was assessed by analysing the pretest-post-test results based on students' questionnaires, following the method outlined by Balida, Guillergan, Hapinat (2023), as shown in Table 2.

Table 2

Evaluation Scale of Students' Research Capabilities

Score	Responses	Scale	Verbal Interpretation
5	Strongly Agree	4.50-5.00	Very High
4	Agree	3.50-4.49	High
3	Moderately Agree	2.50-3.49	Moderately High
2	Disagree	1.50-2.49	Low
1	Strongly Disagree	1.00-1.49	Very Low

The research activities and written outputs of pre-service teachers, conducted within one-term (15 weeks) courses, were evaluated by expert-teachers. Expert assessment focused on pre-service teachers' research behaviour and project performance, encompassing evaluation of their preparation for research work, readiness for research, engagement in research, competency in conducting research, and research writing skills. Quantitative measures were employed by experts to evaluate student-teachers' research activities, competencies, and project performance. Table 3 shows the scale created to capture various aspects of students' research behaviour and performance, utilized by the experts during assessment.

Table 3

Evaluation Scale of Students' Research Activities

No	Assessment Criteria	Grade
Research behaviour		
1	Internal motivation to perform activities	10
2	Activeness on their own initiative and the desire and ability to act according to their own views and beliefs	10
3	Striving on their own for new knowledge and readiness to search for various solutions without outside participation	10
4	Expressed awareness of their actions	10
Project Performance		
5	Identifying the Topic for Research, Literature Review, Theoretical and Conceptual Framework	15
6	Research Design (Research Instrument, Sample, Data Collection and Analysis)	15
7	Findings, Discussion and Conclusion, Limitations and Implications of Research, Abstract and Keywords	15
8	Writing and presenting research	15
Total		100

Findings

The RBL model was implemented to train pre-service teachers in formulating a general question/topic/problem, reviewing research literature, defining the research question, planning research activities, clarifying methods/methodologies, conducting investigation, analysing data, interpreting and considering results, and reporting and presenting results. The questionnaire survey assessed the pre-service teachers' levels of research capabilities before and after the intervention of the RBL model of education, as presented in Tables 3 and 4.

Table 4

Pretest and Post-test Results of Students' Research Capabilities

Items	**Pretest (Mean)**	**Posttest (Mean)**
Understanding Research		
I know the nature of educational research well.	3.17	4.21
I can understand the language of Research.	3.21	4.50
I am familiar with the famous authors in Researches.	2.92	4.29
Planning and Designing Research		
I know how to make a research title.	2.75	4.46
I know how to write an introduction to an article.	3.08	4.54
I know how to look for Literature and Studies.	3.04	4.58
I know how to write a review of related literature.	2.79	4.46
I know how to formulate research question/s.	3	4.46
I know how to set the parameters of the study.	2.75	4.25
I know how to make conceptual and theoretical frameworks.	2.88	4.29
Research Methodology		
I can decide what appropriate research design.	2.96	4.25
I know the kind of sampling technique I need to utilize.	2.75	4.33
I know what population and sample are.	2.83	4.33
I can identify a particular statistical tool to be used in my study.	2.71	4.13
I know how to validate an instrument.	2.83	4.38
I know how to sustain trustworthiness of the data gathered.	2.54	4.25
I know how to conduct interview.	3.13	4.5

I know how to organize a pedagogical experiment.	3.08	4.21
I know what the ethical considerations are in conducting research.	2.75	4.46
Data Analysis		
I know how to analyse results.	2.96	4.46
I know how to read tables and other graphical representations.	2.96	4.50
I know how to use software to analyse the data.	2.75	4.25
I know how to corroborate the results.	2.88	4.50
Writing Research		
I know how to make conclusions.	3.17	4.42
I know how to do in-text citations.	3.13	4.38
I know how to paraphrase and summarize.	3.08	4.50
I know how to use citation styles (APA, GOST).	3	4.33
Publishing and Presenting Research		
I know how to make my paper publishable.	3.04	4.54
I know how to scrutinize journals.	3	4.38
I know how to present my paper at international conferences.	2.79	4.29
I am good at making the abstract of the study.	3.08	4.38

Table 5

Pretest and post-test Results of Pre-Service Teachers' Research Capabilities

Items	**Pretest (Mean)**	**Posttest (Mean)**
Understanding Research	3.1	4.3
Planning and Designing Research	2.9	4.4
Research Methodology	2.8	4.3
Data Analysis	2.9	4.3
Writing Research	3.1	4.4
Publishing and Presenting Research	3	4.4

Figure 2 compares the results of pretest and post-test on pre-service teachers' research capacity dimensions.

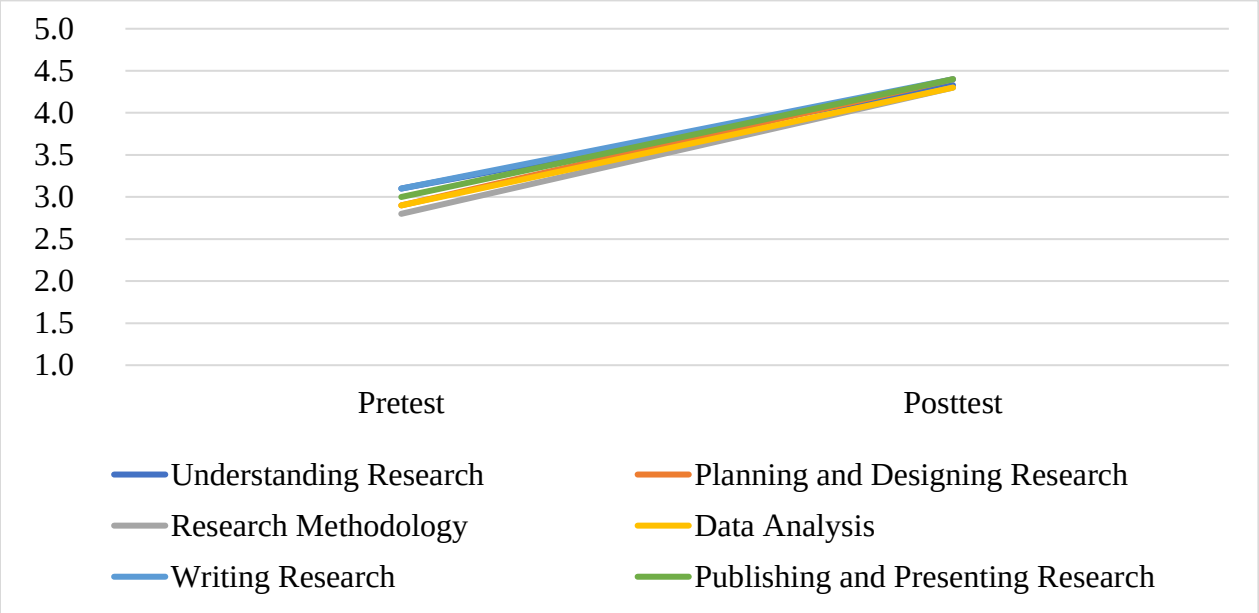

Figure 2. Development of Dimensions of Research Capacity in Pre-Service Teachers

As illustrated in Figure 2, there is a significant difference in pre-service teachers' research capabilities between the pretest and post-test phases, indicating a notable increase in competency across various aspects. Specifically, pre-service teachers exhibit enhanced proficiency in understanding research, planning and designing research, research methodology, data analysis, research writing, and publishing and presenting research.

Table 6 presents the results of Wilcoxon Signed Ranks Test, utilized to delineate the effect of the intervention by comparing pre- and post-intervention measurements.

Table 6

Wilcoxon Test Results for the Comparison of Pretest and post-test Results of Pre-Service Teachers' Research Capabilities

Dimensions	Ranks	Descriptive Statistics			Wilcoxon Test	
		N	Mean Rank	Sum of Ranks	Z	p
Understanding Research	Negative Ranks	5	3.00	15.00	-8.44	0.00*
	Positive Ranks	90	50.50	4545.00		
	Ties	25				

Planning and Designing Research	Negative Ranks	0	0.00	0.00	-8.91	0.00*
	Positive Ranks	105	53.00	5565.00		
	Ties	15				
Research Methodology	Negative Ranks	5	8.00	40.00	-8.77	0.00*
	Positive Ranks	100	55.25	5525.00		
	Ties	15				
Data Analysis	Negative Ranks	0	0.00	0.00	-8.93	0.00*
	Positive Ranks	105	53.00	5565.00		
	Ties	15				
Writing Research	Negative Ranks	0	0.00	0.00	-8.49	0.00*
	Positive Ranks	95	48.00	4560.00		
	Ties	25				
Publishing and Presenting Research	Negative Ranks	0	0.00	0.00	-8.69	0.00*
	Positive Ranks	100	50.50	5050.00		
	Ties	20				

* significant at $p<0.01$

As observed from Table 6, there exists a statistically significant difference in all dimensions of pre-service teachers' research capability between the pretest and the post-test, affirming the effectiveness of the intervention of the RBL model of education.

The results show that the null hypothesis (H_0: There is no statistically significant difference in pre-service EFL teachers' research capabilities before and after the intervention of the RBL model of education, in terms of their level of understanding research, planning and designing research, knowledge of research methodology, data analysis skills, research writing skills, and publishing and presenting research) was rejected. Conversely, the alternative hypothesis (H_1: There is a statistically significant difference in pre-service EFL teachers' research capabilities before and after the intervention of the RBL model of education, in terms of their level of understanding research, planning and designing research, knowledge of research methodology, data analysis skills, research writing skills, and publishing and presenting research) was accepted.

The research activities and written outputs of pre-service teachers, conducted within 15-week courses, were evaluated by expert-teachers, focusing on various aspects such as research project

preparation, readiness for research, engagement in research, competency in conducting research, and research writing skills. The pre-service teachers' research behaviour and performance received high evaluations from the expert-teachers, with a mean grade of 89.9 out of 100 points (N=120). Additionally, 63% of students achieved the highest level of performance (Grades A and A-, Excellent, 95-100 and 90-94 respectively), while only 3.3% of students were categorised as low-performing (Grade C, Satisfactory, 65-69).

Pre-service EFL teachers' research capabilities assessment results were compared before the intervention ($_{bi}$) and after the intervention ($_{ai}$) of the RBL model of teaching. The Wilcoxon signed-rank test indicated the improvement in pre-service EFL teachers' understanding research (Md_{bi} = 9.00, Md_{ai} = 13.00, W = 15, z = -8.44, p = .00), planning and designing research (Md_{bi} = 21.00, Md_{ai} = 33.00, W = 0, z = -8.91, p = .00), research methodology (Md_{bi} = 27.00, Md_{ai} = 39.00, W = 40, z = -8.77, p = .00), data analysis (Md_{bi} = 11.50, Md_{ai} = 16.50, W = 0, z = -8.93, p = .00), writing research (Md_{bi} = 12.50, Md_{ai} = 18.00, W = 0, z = -8.49, p = .00), publishing and presenting research (Md_{bi} = 12.00, Md_{ai} = 17.50, W = 0, z = -8.69, p = .00). Thus, the intervention had a statistically significant effect on scores.

The study results prove the efficiency of implementing the RBL model in enhancing the research capacity of pre-service EFL teachers. The hypothesis posited in the study, that the RBL model of teaching would significantly enhance pre-service EFL teachers' research capabilities, particularly in terms of their readiness for research, engagement in research, competency in conducting research, and research writing skills, is supported and accepted.

Discussion

This study aimed to examine the effectiveness of implementing the RBL model in pre-service teachers' education to enhance their research capacity. In line with the perspectives of scholars such as Brew and Mantai (2017) and Lorencová and colleagues (2019), who emphasise the importance of research skills and advocate for diverse pedagogical approaches to enrich student learning, we proposed integrating the RBL model into teacher preparation programmes at Kazakhstan's regional universities.

In alignment with Balloo's (2019) emphasis on educators' awareness of students' challenges and the assessment of pedagogical strategies to aid in overcoming these obstacles, the proposed model incorporated a comprehensive range of RBL procedures. These procedures encompassed various

stages such as formulating a broad research question, conducting literature reviews, refining the research question, planning research activities, elucidating techniques/methodologies, conducting research, analysing data, interpreting and considering findings, and finally, reporting and presenting results. Rooted within the theoretical framework of the research-based approach, inquiry-based learning emerged as the central concept and organizational framework, emphasising the integration of research methodologies into teaching practices to enhance student learning outcomes.

The study assessed the perceived levels of pre-service teachers' research capability dimensions, mirroring the approach of Perez and colleagues (2022). These dimensions included understanding research, planning and designing research, knowledge of research methodology, data analysis skills, research writing skills, and publishing and presenting research, which were evaluated through pretest and post-test questionnaire surveys. Additionally, the research examined pre-service teachers' performance and writing abilities in terms of their internal motivation to complete tasks, their proactive approach and willingness to act based on their own opinions and beliefs, their independence in seeking new knowledge and readiness to explore different options without external assistance, and their self-awareness in their actions, as assessed by teacher-experts.

The participants in this study comprised 120 postgraduate (master's level) students from language teacher education departments at two Kazakhstani universities. The pretest results revealed a low level of all dimensions of pre-service teachers' research capabilities: understanding research (M=3.1), planning and designing research (M=2.9), research methodology (M=2.8), data analysis (M=2.9), research writing (M=3.1), and publishing and presenting research (M=3). This indicates a lack of opportunities for the acquisition and development of research competence during the participants' undergraduate studies. This finding aligns with Thiel and Böttcher's (2014) observation that courses emphasizing the development of research competency are unevenly distributed across academic years and education cycles, often grouped into final courses. Consequently, the curriculum may not adequately support university students in acquiring, developing, and advancing critical research competency (Ciraso-Calí et al., 2022).

The implemented RBL model of education demonstrated its effectiveness in enhancing pre-service teachers' research capacity. The post-test results revealed significant improvements in various dimensions: understanding of research (M=4.3), planning and designing research (M=4.4), knowledge of research methodology (M=4.3), data analysis skills (M=4.3), research writing skills

(M=4.4), and publishing and presenting research capabilities (M=4.4). These findings are consistent with the observations of Munthe and Rogne (2015) and Gess, Geiger, Ziegler (2018), who emphasize the importance of establishing a coordinated connection between education professionals' research competency and instructional practice through training curricula and courses.

Therefore, the study findings revealed the significant effect of implementing the RBL model of education in enhancing the research capacity of pre-service teachers, with a significant difference observed at the .01 level. The null hypothesis was rejected, while the alternative hypothesis was accepted.

Furthermore, the research performance and writing skills of pre-service teachers received high assessments from expert-teachers, with 63% of students achieving the highest level of performance and only 3.3% categorised as low performers. Engaging in research projects enabled pre-service teachers to gain confidence in conducting research in the fields of social sciences and education, fostering a deeper interest in the discipline. When given the opportunity to examine topics of personal interest, pre-service teachers became actively involved in research activities. The process of formulating questions, conducting research, collecting and analysing data, and discussing and reflecting on results stimulated the development of a broad range of research skills among pre-service teachers, in line with findings reported by Meijerman and Koster (2016), Lorencová and colleagues (2019), and Salmento, Murtonen, Kiley (2021).

The advantage of the RBL paradigm lies in students' active engagement in research, contrasting with teacher-led research approaches. This aligns with the findings of Munthe and Rogne (2015), who highlight the benefits of the RBL paradigm for the development of pre-service teachers' research skills. School-related factors, including teachers' support in research activities and timely feedback provision, play an important role in fostering research capabilities and activities among students. This observation is consistent with UY and Callo (2023), who claim that factors such as the research culture within the university, leadership skills of education managers, and support mechanisms are instrumental in promoting research engagement among both teachers and learners. Therefore, these factors should be considered when designing educational projects and programmes aimed at enhancing research skills and engagement.

Limitations and Implications of Research

While this study provides valuable insights, there are some limitations regarding the data and methodology. The data on research capability dimensions was collected through self-perceived questionnaire surveys, which may have led to superficial responses from pre-service teachers. However, to mitigate this limitation, an expert assessment of pre-service teachers' research performance and writing skills was conducted, indicating the validity of the data.

The study's findings offer implications for higher education and educational practice at large. To enhance students' research competency, teacher training departments, academics, and scholars may need to revise curriculum and syllabi learning objectives. Implementing the RBL model can encourage students to think creatively and develop practical solutions for real-world challenges in education, highlighting one of the advantages of the RBL educational paradigm. Further research is warranted to deepen our understanding of students' perceptions regarding the incorporation of the RBL model in the field of Education Sciences.

Conclusion

The study findings unequivocally demonstrate the efficiency of the implemented RBL model of education in fostering the research capacity of pre-service teachers. The RBL model can be effectively integrated into pre-service teacher training programmes across various stages, including formulating a general question/topic/problem, reviewing research literature, defining the research question, planning research activities, clarifying methods/methodologies, conducting an investigation, analysing data, interpreting and considering results, and finally, reporting and presenting results. The success of learning activities facilitated by the RBL model is closely linked to its numerous advantages. The benefits gained from this RBL model of pre-service teachers' education include its potential to: (1) enhance student understanding of research, (2) facilitate mastery of planning and designing research, (3) increase student knowledge of research methodology, (4) improve student data analysis skills, (5) foster student research writing skills, and (6) enhance student publishing and presenting research capabilities.

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