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Views of pre-service teachers on the research-based teacher education approach

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Abstract: In this study, the aim was to complete an investigation based on the views of pre-service teachers taking a scientific research methods course grounded on the critical features of the research-based teacher education approach. Within this scope, answers to the questions of “what are the views of pre-service teachers about (a) the outcomes provided by the research methods course, (b) the reasons for teachers to have research competencies, and (c) the professional function of scientific studies?” were sought. This research was designed with the basic qualitative research pattern. The researcher developed an interview form comprising open-ended questions to specify the views of pre-service teachers, which were the research target. To create the study group for the research, criterion sampling was chosen from the targeted sampling methods. The study was completed with 110 pre-service teachers attending the educational faculty of a state university in Turkey. A detailed analysis process was completed in four stages for the research data. Analyses were performed on statements reporting a total of 684 views. Pre-service teachers showed development in 25 subcategories classified into research competence, professional competence, and personal growth. Teachers’ need for research competency was justified based on the needs of contemporary teachers, the requirements due to the nature of the class, and ensuring the optimal conditions for effective teaching. Pre-service teachers’ views on the professional function of scientific studies were examined under five categories. These are reliable knowledge, real context, ideal practice, beyond experience, and distance from being guides. The research findings can be interpreted as the fact that teacher education practices which take the principles of the research-based teacher education approach into account have the potential to achieve the teacher qualifications targeted by this approach. Considering the potential of these qualifications to fulfill the

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complex and high-level expectations demanded from the teacher, it is recommended that studies be conducted on how the principles of research-based teacher education can be integrated into existing teacher education programs.

Keywords: Pre-service teachers; research-based teacher education; scientific research methods course; teacher education; teacher education curriculum.

I. Introduction

When the learning approaches accepted by the educational understanding in our age and the qualities expected in an educated person are investigated, it appears that individuals must have research competency both to accurately direct learning processes and to be able to use what they learn in real-life contexts. Both in curricula¹ and in the literature related to 21st-century skills,^{2,3,4} developing higher-order thinking skills, obtaining accurate information, and using what is known based on the needs of everyday contexts require individuals to have research competencies to a large extent. Within this framework, there is a long history of students making efforts to develop research skills, especially in the name of research-based, problem-based, and case-based learning studies. To raise researchers responding to the multidimensional and complicated expectations demanded in the 21st century, and individuals with scientific attitudes and behavior, it is vital to cultivate qualified teachers who are able to foster a scientific understanding and culture in schools.

Education to raise individuals with scientific thinking power is mentioned in political texts (National Education Basic Law number 1739), in curricula,⁵ and in guidelines for teacher competencies.⁶ Teacher education curricula fulfil a critical function to raise individuals with scientific thinking skill, which is included among the primary targets of our educational system, and to adhere to the basic principle in education of being scientific. Teacher

¹ Ministry of National Education, *Turkish Course Curriculum* (Ankara: Ministry of National Education Publishing, 2019), 3.

² Ching-Sing Chai, and Siu Cheung-Kong, "Professional Learning for 21st Century Education," *Journal of Computer in Education* 4, no.1 (July 2017): 1-4, <https://doi.org/10.1007/s40692-016-0069-y>.

³ Linda Darling-Hammond, "Constructing 21st-Century Teacher Education," *Journal of Teacher Education* 57, no.3 (May/June 2006): 300-314, <https://doi.org/10.1177/0022487105285962>.

⁴ Rosefsky A. Saavedra and Darleen V. Opfer, *Teaching and Learning 21st Century Skills: Lessons from the Learning Sciences. A Global Cities Education Network Report* (New York: Asia Society, 2012), 3-24.

⁵ Ministry of National Education, *Turkish Course Curriculum*, 3.

⁶ General Directorate of Teacher Education and Development, *General Competencies of Teaching Profession* (Ankara: Ministry of National Education Publishing, 2017), 5.

education is accepted as an essential factor in coping with the difficulties of the 21st century and increasing the quality of education.⁷ For this reason, teacher education is included among topics attracting significant interest from both political decision-makers and ordinary members of the public.⁸

Teaching is becoming a profession that demands the use of increasingly complex knowledge and skills.^{9,10} The complexity of the modern world, characterized by unprecedented technological (r)evolution, increased mobility, migration, and rapid and profound social change, poses new challenges to teaching and teacher education.¹¹ Teachers have to use the opportunities offered by technologies¹² and respond to the demand for individualized learning.¹³ Moreover, classes now contain a heterogeneous mix of students with different backgrounds, abilities and disability levels.^{14,15} The Lisbon Strategy,¹⁶ the EU 2020 strategy,¹⁷ the MEB 2019-2023 Strategy Paper,¹⁸ the

⁷ Päivi Hökkä, and Anneli Eteläpelto, "Seeking New Perspectives on the Development of Teacher Education: A Study of the Finnish Context," *Journal of Teacher Education* 65, no. 1 (January/February 2014): 39-52, <https://doi.org/10.1177/0022487113504220>.

⁸ Organisation for Economic Co-Operation and Development, *A Flying Start: Improving Initial Teacher Preparation Systems* (Paris: OECD Publishing, 2019), <https://doi.org/10.1787/cf74e549-en>.

⁹ Darling-Hammond, "Constructing," 300-314.

¹⁰ European Commission, *Supporting the Teaching Professions for Better Learning Outcomes* (Strasbourg: European Commission, 2012), 22-42.

¹¹ Ana Raquel Simões, Monica Lourenço, and Nilza Costa, *Teacher Education Policy and Practice in Europe* (New York: Routledge, 2018), 3-5.

¹² Laura Menabò, Alessandra Sansavini, Antonella Brighi, Grace Skrzypiec, and Annalisa Guarini, "Promoting the Integration of Technology in Teaching: An Analysis of The Factors That Increase The Intention To Use Technologies Among Italian Teachers," *Journal of Computer Assisted Learning* 37, no.6 (February 2021), 1566-1577, <https://doi.org/10.1111/jcal.12554>.

¹³ Robert M. Bernard, Eugene Borokhovski, Richard F. Schmid, David I. Waddington, and David I. Pickup, "Twenty-First Century Adaptive Teaching and Individualized Learning Operationalized as Specific Blends of Student-Centered Instructional Events: A Systematic Review and Meta-Analysis," *Campbell Systematic Reviews* 15, no. 1-2 (June 2019): 1, <https://doi.org/10.1002/cl2.1017>.

¹⁴ Elaine Munthe, and Magne M. Rogne, "Research-based Teacher Education," *Teaching and Teacher Education* 46, (February 2015): 17-24, <https://doi.org/10.1016/j.tate.2014.10.006>.

¹⁵ European Commission, *Improving the Quality of Teacher Education* (Brussels: European Commission, 2007), 2-16.

¹⁶ "The Lisbon Strategy," The Lisbon Strategy, Google, accessed April 17, 2022, https://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressData/en/ec/00100-r1.en0.htm.

¹⁷ European Commission, *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions on achieving the European Education Area by 2025* (Brussels: European Commission, 2020), 1-29.

¹⁸ Ministry of National Education, *2019-2023 Strategy Paper* (Ankara: Ministry of National Education Publishing, 2019), 37-88.

U.S. Government Strategy on International Basic Education for Fiscal Years 2019-2023,¹⁹ and the targets set in the Reinforcing Education Accountability in Development²⁰ (READ) Act also point to the necessity of high-level teacher qualifications. On the other hand, teacher education systems are not equipped with the highest quality in every aspect to meet these new demands. In a study carried out by the OECD,²¹ it was reported that there were deficiencies in teaching skills in almost all countries and that teachers had difficulties in terms of updating their skills. It is thought that the development goals targeted by the research-based teacher education approach^{22,23,24,25,26,27} have the potential to overcome the deficiencies examined in the report.

The Common European Principles for Teacher Competences and Qualifications were adopted in the report on improving the quality of teacher education prepared by the Commission of the European Communities,²⁸ and in line with these principles, the Commission proposed a number of policy steps for improving the quality of teacher education in the European Union. Among these steps, the competencies that all teachers should possess at every point in their careers are described. Among these competencies, teachers' possession of research competencies comes to the fore. In the same report, under the heading of reflective practice and research, which is one of

¹⁹ "The U.S. Government Strategy on International Basic Education for Fiscal Years 2019-2023," The U.S. Government Strategy on Education, Google, accessed March 10, 2022, https://www.usaid.gov/sites/default/files/documents/1865/USG-Education-Strategy_FY2019-2023_Final_Web.pdf.

²⁰ "Reinforcing Education Accountability in Development (READ) Act (Division A, Public Law, 115-56)," Reinforcing Education Accountability in Development, Google, accessed March 10, 2022, <https://www.congress.gov/115/plaws/publ56/PLAW-115publ56.pdf>.

²¹ Organisation for Economic Co-Operation and Development, *Attracting, Developing and Retaining Effective Teachers* (Paris: OECD Publishing, 2005), 1-12.

²² Kirsi Tirri, "The last 40 Years in Finnish Teacher Education," *Journal of Education for Teaching* 40, no. 5 (September 2014): 600-609, <https://doi.org/10.1080/02607476.2014.956545>.

²³ Jessica Aspfors, Gunilla Eklund, and Sven-Erik Hansén, "Early Career Teachers' Experiences of Developing Professional Knowledge-from Research-Based Teacher Education through Five Years in The Profession," *Nordisk Tidskrift för Allmän Didaktik* 5, no. 1 (December 2019): 2-18.

²⁴ Hannele Niemi, "Educating Student Teachers to Become High Quality Professionals a Finnish Case," *Center for Educational Policy Studies Journal* 1, no. 1 (January 2011): 43-66, <https://doi.org/10.26529/cepsj.440>.

²⁵ Hannele Niemi, and Ritva Jakku-Sihvonen, "In the Front of the Bologna Process Thirty Years of Research-based Teacher Education in Finland," *Education Science*, (2006): 50-69.

²⁶ Sven-Erik Hansén, Liselott Forsman, Jessica Aspfors, and Marina Bendtsen, "Visions for Teacher Education Experiences from Finland," *Acta Didactica Norge* 6, no.1 (2012): 1-17.

²⁷ Hökkä and Eteläpelto, "Seeking," 39-52.

²⁸ European Commission, "Improving the Quality," 2-16.

the policy steps developed for increasing teacher qualifications, it is clearly stated that teachers should conduct classroom-based research, include classroom and academic research results in their teaching, and evaluate their effectiveness. In summary, the principles and steps written on the basis of the experiences of teachers and teacher educators across Europe, and endorsed by stakeholders, reveal the importance of having research competencies for improving the quality of teacher education in the European Union. This requirement can be fulfilled by a teacher education that helps teachers to be innovative and enquiring and that makes continuous learning and change possible.^{29,30} It is accepted that the research-based teacher education approach has great potential for fulfilling the abovementioned requirements.³¹

When teachers are educated to be autonomous actors with rational theoretical-based decision-making and skills in producing and using research, they may overcome the difficulties of the future.³² Undoubtedly, it is possible to see very different models in teacher education.³³ In this context, the classification³⁴ of teacher education based on behavioral, personal, traditional craft, and research-oriented paradigms can be examined. Research-based teacher education is equivalent to the research-oriented paradigm preparing teachers to analyze their actions and the resulting consequences. Additionally, this model abides by the technology-oriented teacher education derived from Feiman-Nemser's scientific study of knowledge teaching³⁵ and Moore's³⁶ definition of a teacher being a reflective practitioner. In this approach, prospective teachers are not passive recipients of professional knowledge

²⁹ Niels Brouwer and Fred Korthagen, "Can Teacher Education Make a Difference?" *American Educational Research Journal* 42, no. 1 (January 2005): 153-224, <https://doi.org/10.3102/00028312042001153>.

³⁰ Linda Darling-Hammond and John Bransford, *Preparing Teacher for Changing World. What Teachers Should Learn and Be Able to Do* (San Francisco: Jossey Bass, 2005), 1-39.

³¹ Auli Toom, Heikki Kynäslähti, Leena Krokfors, Riitta Jyrhämä, Reijo Byman, Katriina Stenberg, Katriina Maaranen, and Pertti Kansanen, "Experiences of a Research-based Approach to Teacher Education: Suggestions for Future Policies," *European Journal of Education* 45, no. 2 (May 2010): 331-344, <https://doi.org/10.1111/j.1465-3435.2010.01432.x>.

³² Toom et al., "Experiences," 331-344.

³³ Yasemin T. Cakcak, "A Critical Review of Teacher Education Models," *International Journal of Educational Policies* 10, no. 2 (Winter 2016): 121- 137.

³⁴ Kenneth M. Zeichner, "Alternative Paradigms of Teacher Education," *Journal of Teacher Education* 34, no. 3 (May 1983): 3-9, <https://doi.org/10.1177/002248718303400302>.

³⁵ "Teacher Presentation: Structural and Conceptual Alternatives," Teacher Presentation: Structural and Conceptual Alternatives, Google, accessed March 17, 2021, <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.463.5326&rep=rep1&type=pdf>.

³⁶ Alex Moore, *The Good Teacher: Dominant Discourses in Teaching and Teacher Education* (London: Routledge Falmer, 2004), 3-26.

produced by educational scientists; they are seen as autonomous actors actively participating in knowledge production.³⁷

There is a growing interest in research-based education in teacher education policy and practice in Europe and internationally.^{38,39} Here, the aim is not to cultivate researchers or even teacher-researchers. The purpose is that pre-service teachers mainly acquire a questioning attitude to teaching.⁴⁰ Thus, teachers will be able to observe, analyze and develop studies. Pedagogical thinking of teachers means they can conceptualize daily phenomena, see them as part of an overall teaching process, and have the ability to rationalize decisions and actions taken during this process. Pre-service teachers receiving this education may display argumentation, decision-making, and analytical skills⁴¹ during studies and acquire research skills.⁴² These skills have great importance for teachers who need to act in the context of continuously changing education.

Research-based teacher education aims to cultivate autonomous, responsible, and reflective professional teachers who can base their teaching on research principles and can successfully use these principles to deal with the practical difficulties of the profession.^{43,44} Research-based teacher education supports both individual and collective development. At a personal level, this means developing skills for analysis, in other words, problem solving and restructuring of solutions, and development of critical awareness and skills encouraging intellectual and personal growth. At the collective level, this

³⁷ Mikko Puustinen, Janni Säntti, Anna Koski, and Tuure Tammi, "Teaching: A Practical or Research-based Profession? Teacher Candidates' Approaches to Research-Based Teacher Education," *Teaching and Teacher Education* 74, (August 2018): 170-179, <https://doi.org/10.1016/j.tate.2018.05.004>.

³⁸ Ulrika Bergmark, "Teachers' Professional Learning when Building a Research-based Education: Context-specific, Collaborative and Teacher-driven Professional Development," *Professional Development in Education* (Latest Article), <https://doi.org/10.1080/19415257.2020.1827011>.

³⁹ Ulrika Bergmark, and Kristina Hansson, "How Teachers and Principals Enact the Policy of Building Education in Sweden on a Scientific Foundation and Proven Experience: Challenges and Opportunities," *Scandinavian Journal of Educational Research* 65, no.3 (April 2021): 448, <https://doi.org/10.1080/00313831.2020.1713883>.

⁴⁰ Mireia Giralt-Romeu, Eva Liesa, and Montserrat Castelló, "Teacher Identity as Inquirer: Voices of Teacher Educators," *European Journal of Teacher Education* (Latest Article), <https://doi.org/10.1080/02619768.2021.2015319>.

⁴¹ Kirsti M. Jegstad, Tove A. Fiskum, Jessica Aspfors, and Gunilla Eklund, "Dichotomous and Multifaceted: Teacher Educators' Understanding of Professional Knowledge in Research-based Teacher Education," *Scandinavian Journal of Educational Research* 66, no.6 (October 2022): 1010, <https://doi.org/10.1080/00313831.2021.1958255>.

⁴² Toom, "Experiences," 331-344.

⁴³ Krokfors vd., "Investigating," 1-13.

⁴⁴ Tirri, "The Last," 600-609.

target means the activation of systematic thinking skills, using a professional language, and revealing the transformative potential of collaborative thinking.⁴⁵ Another target of research-based teacher education is to support teachers in professional development throughout their careers.^{46,47,48}

Research-based teacher education encourages the development of the critical thinking skills of candidates and systematic investigation of daily professional work.^{49,50,51} Thesis preparation activities, which are part of research-based teacher education, help students become familiar with scientific thinking processes.^{52,53} For this reason, this approach focuses on alternative ways of carrying out advanced research-oriented activities that include both research-based concepts and teachers' professional practice. Suppose it is necessary to summarize the targets of research-based teacher education. In that case, firstly, the aim is to train reflective and autonomous teachers qualified to act like practicing researchers and think pedagogically. However, the purpose of research-based teacher education is not only to facilitate searchers but also to enable the knowledge and skills to be able to apply what they have learned to students, to observe students, to analyze their thoughts, and hence to become 're'searchers.^{54,55}

With the Decree on the Organization of Higher Education Institutions number 41, dated 20 July 1982 in Turkey, all higher education institutions

⁴⁵ Sven-Erik Hansén, Gunilla Eklund, and Jan Sjöberg, "General Didactics in Finnish Teacher Education-the Case of Class Teacher Education at Åbo Akademi University," *Nordisk Tidskrift för Allmän Didaktik* 1, no. 1 (October 2015): 7-20.

⁴⁶ Jessica, Aspfors, Sven-Erik Hansen, and Johanne Ray, "Stability, Structure and Development. Features Constituting Finnish Teacher Education," *Scuola Democratica* 4, no. 3 (September/December 2013): 1-11. <https://doi.org/10.12828/75800>.

⁴⁷ Niemi, "Educating," 43-66.

⁴⁸ Niemi, and Jakku-Sihvonen, "In the Front of the Bologna," 50-69.

⁴⁹ Hilde W. Afdal, "Knowledge in Teacher Education Curricula Examining Differences Between a Research-Based Program and a General Professional Program," *Nordic Studies in Education* 32, no. 03-04 (Autumn 2012): 245-261.

⁵⁰ Hansén, "General," 7-20.

⁵¹ Pertti Kansanen, "Teaching," in *Workplace Learning in Teacher Education. Professional Learning and Development in Schools, and Higher Education*, eds. Olwen McNamara, Jean Murray, and Marion Jones (New York: Springer, 2014), 279-292, https://doi.org/10.1007/978-94-007-7826-9_16.

⁵² Hansén, "General," 7-20.

⁵³ Hansén, Eklund, and Sjöberg, "General Didactics," 7-20.

⁵⁴ Toom et al., "Experiences," 331-344.

⁵⁵ Ian Westbury, Sven-Erik Hansén, Pertti Kansanen, and Ole Björkvist, "Teacher Education for Research-based Practice in Expanded Roles: Finland's Experience," *Scandinavian Journal of Educational Research* 49, no. 5 (November 2005): 475-485. <https://doi.org/10.1080/00313830500267937>.

training teachers were handed over to universities.⁵⁶ The task of educating teachers gained a new structure and status. This date is accepted as the first step toward a research-based teacher education approach in Turkey. From 2007 to the present day (April 2022), scientific research methods courses have been compulsory in education faculties. In the preschool teaching program, the scientific research methods and research project courses are included in two semesters. Undoubtedly, as much as the structural organization of teacher education programs, a determining element for the success of the programs is how the implementation process is performed. This research aims to present an investigation of views expressed by pre-service teachers based on their experiences, about the potential of the scientific research methods course in the framework of research-based teacher education.

Pre-service teachers participating in this research took a scientific research methods course structured by noting the critical principles of the research-based teacher education approach, which are explained below. The aims of this course in research-based teacher education were designed based on the following features: the activities are organized in such a way that students can practice discussion, decision making and making justifications while researching and solving pedagogical problems; students learn search skills during studies; the program knowledge base is dynamic; and pre-service teachers are active processors of this knowledge.^{57,58} During the lesson, pre-service teachers are requested to perform decision making, rationalizing, and argumentation while searching and resolving problems with cases and articles.⁵⁹ The program investigated in detail within the research context cannot include all dimensions of the research-based teacher education program within a two-hour theoretical lesson. However, it is vital as it has the feature of being a teaching implementation developed by noting the principles with critical importance for research-based teacher education within the scope of a theoretical lesson.

In this study, it is intended to investigate in depth how pre-service teachers who have experienced a scientific research methods course, designed by considering the critical principles of research-based teacher education, made sense of this experience. In this way, it will be possible to investigate the potential of this research methods course for the development of pre-service teachers. The research also investigates pre-service teachers' interpretations about the reasons for teachers to have research competency and the professional

⁵⁶ "Official Gazette," Higher Education Institutions Training Teachers Were Handed Over to Universities, Google, accessed March 1, 2022, <https://www.resmigazete.gov.tr/arsiv/17760.pdf>.

⁵⁷ Krokfors, "Investigating," 1-13.

⁵⁸ Zeichner, "Alternative," 3-9.

⁵⁹ Toom, "Experiences," 331-344.

function of scientific studies from various angles. Undoubtedly, these views provide the opportunity to make inferences about the proximity of the pre-service teachers to being teachers who think pedagogically, and who are reflective and research oriented. This description is valuable in reflecting the views of a group experiencing a scientific research methods course developed on the basis of the critical principles of the research-based teacher education approach. In this context, answers to the following questions were sought: What are the views of pre-service teachers about:

- the outcomes provided by the research methods course.
- the reasons for teachers to have research competency?
- the professional function of scientific studies?

When the relevant literature is examined based on the research context, design-based longitudinal studies on research-based teacher education⁶⁰ are seen. In addition, studies examining the research-based teacher education approach from the perspectives of teacher candidates, teachers, mentor teachers, and teacher educators^{61,62,63,64,65,66,67,68,69} are available. No research

⁶⁰ Hilde W. Afdal, and Kari Spernes, “Designing and Redesigning Research-based Teacher Education,” *Teaching and Teacher Education* 74, no. 1, (August 2018): 215-228, <https://doi.org/10.1016/j.tate.2018.05.011>.

⁶¹ Daniel Alvunger, and Ninni Wahlström, “Research-based Teacher Education? Exploring the Meaning Potentials of Swedish Teacher Education,” *Teachers and Teaching* 24, no. 4 (May 2018): 332-349, <https://doi.org/10.1080/13540602.2017.1403315>.

⁶² Aspfors, Eklund, and Hansén, “Early Career,” 1-18.

⁶³ Jessica Aspfors, and Gunilla Eklund, “Explicit and Implicit Perspectives on Research-based Teacher Education: Newly Qualified Teachers’ Experiences in Finland,” *Journal of Education for Teaching* 43, no. 4 (March 2017): 400-413, <https://doi.org/10.1080/02607476.2017.1297042>.

⁶⁴ Angela Brew, and Constanze Saunders, “Making Sense of Research-based Learning in Teacher Education,” *Teaching and Teacher Education* 87, no: 2020 (January 2020): 1-11, <https://doi.org/10.1016/j.tate.2019.102935>.

⁶⁵ Gunilla Eklund, “Student Teachers’ Experiences of Research-based Teacher Education and Its Relationship to Their Future Profession A Finnish Case,” *Nordisk Tidskrift för Allmän Didaktik* 4, no. 1 (April 2018): 3-17.

⁶⁶ Rachel Jakhelln, Gunilla Eklund, Jessica Aspfors, Kristin Bjørndal, and Gerd Stølen, “Newly Qualified Teachers’ Understandings of Research-based Teacher Education Practices-Two Cases from Finland and Norway,” *Scandinavian Journal of Educational Research* 65, no. 1 (February 2021): 123-139, <https://doi.org/10.1080/00313831.2019.1659402>.

⁶⁷ Katarina Pajchel, Marie K. Jegstad, Gunilla Eklund, Siv G. Aalbergsjø, and PerØyvind Sollid, “The Role of School Placement Within Research-based Teacher Education through The Eyes of Science Mentors,” *Teachers and Teaching* 27, no.1-4 (May 2021): 193-205, <https://doi.org/10.1080/13540602.2021.1933416>.

⁶⁸ Puustinen, Sääntti, Koski, and Tammi, “Teaching,” 170-179.

⁶⁹ Jegstad, Fiskum, Aspfors, and Eklund, “Dichotomous,” 1-15.

has been found on research-based teacher education in Turkey, while it is seen that some research has been carried out on the scientific research methods course. In this scope, it appears that the views of pre-service teachers about scientific research processes,^{70,71} attitudes to scientific research^{72,73,74,75} and the correlation of attitudes to a variety of variables⁷⁶ were investigated, and that some experimental research⁷⁷ was performed. In the relevant literature, no other study has been found in which a scientific research course applied on the basis of a research-based understanding is discussed in terms of teacher qualifications. From this aspect, it is thought this study will contribute to the literature.

II. Methodology

II.1. Research design

The basic research method, which is included in the qualitative research models, was used in the study. The basic research method seeks to answer

⁷⁰ Adnan Küçükoğlu, Adnan Taşgın, and Nilay Çelik, "An Investigation of Prospective Teachers' Perceptions toward Scientific Research Process," *Turkish Journal of Social Research* 17, no. 3 (March 2013): 11-24.

⁷¹ Sümeýra Z. Et, and Mehmet N. Gömleksiz, "Graduate Students' Opinions on the Scientific Research," *Gaziantep University Journal of Educational Sciences* 6 (April 2022), 59-82.

⁷² Zafer Çakmak, Cengiz Taşkıran, and Birol Bulut, "Examining Attitudes of Social Studies Pre-Service Teachers towards Scientific Research," *Adiyaman University Journal of Educational Sciences* 5, no. 2 (December 2015): 266-287, <http://dx.doi.org/10.17984/adyuebd.02575>.

⁷³ Aziz İlhan, Halil Çelik, and Alper Aslan, "Evaluating the Attitudes of University Students About Scientific Research," *Journal of Inonu University Faculty of Education* 17, no.2 (May 2016): 141-156, <https://doi.org/10.17679/iuefd.17218132>.

⁷⁴ Murat Polat, "Students' Attitudes towards Scientific Research in the Faculty of Education," *Pamukkale University Journal of Social Sciences Institute* 18, (May 2014): 77-90.

⁷⁵ Sevilay Karamustafaoğlu, and Bahri Meşeci, "Investigation of Attitude of Education Faculty Students Towards the Scientific Research Methods Course," *Anatolian Journal of Teacher* 5, no.1 (June 2021), 19-38, <https://doi.org/10.35346/aod.917301>.

⁷⁶ Mehmet A. Dombaycı, and Orhan Ercan, "Examining the Scientific Literacy Levels and Attitudes Towards Scientific Research of the Teacher Candidates' In Terms of Various Variables," *Abant İzzet Baysal University Journal of the Faculty of Education* 17, no. 3, (September 2017): 1265-1284, <https://doi.org/10.17240/aibuefd.2017.17.31178-338822>.

⁷⁷ Nazım Çoğaltay, "The Effect of the Methods of Scientific Research Course on Preservice Teachers' Scientific Epistemological Beliefs and Attitudes towards Scientific Researchers," *Journal of Social Sciences of Muş Alparlan University* 4, no. 2 (December 2016): 125-139, <https://doi.org/10.18506/anemon.258557>.

‘what’ and ‘how’ questions. The purpose of basic research is to understand, explain and search for basic patterns related to the research phenomenon.⁷⁸ Researchers applying the basic research method are interested in how people interpret their lives, how they build their worlds, and what meaning they give to their experiences. It seeks to understand how people grasp their lives and experiences. The main aim of basic research is to ascertain and interpret these meanings.⁷⁹ In this study, it is emphasized how pre-service teachers interpret the outcomes provided by the scientific research methods course, how they perceive the reasons for teachers to have research competency, and how they comprehend the professional functions of scientific studies. To that end, in order to understand and explain the views of teacher candidates in general within the scope of research competencies, the basic research method was adopted in this study. The views of the pre-service teachers focusing on the three themes reflected by the research problems were analyzed according to the principles of qualitative data analysis, and the analysis findings were summarized using descriptive statistics.

II.2. Sample and data collection

To determine the views of pre-service teachers, which were targeted for investigation within the scope of the research, an interview form comprising open-ended questions was developed by the researcher. This document included sections equivalent to the three problems in the study. For each research problem, two different questions were designed. In the process of developing the data collection tool, the opinions of three expert academicians in the fields of curriculum development, classroom teaching and preschool teaching were sought. The interviews with the specialists were made face-to-face. Based on the opinions of the experts, revisions were made on the basis of language and intelligibility requirements so that the expressions in the data collection tool could be understood by everyone in the same way. Moreover, expressions in the questions that were determined to be repetitive and to possibly cause overlap were removed. Finally, the compatibility of the questions in the data collection tool with the research problems was examined. In this context, the questions were examined one by one. After obtaining the endorsement of the experts, the draft form was finalized prior to the trial

⁷⁸ Michael Quinn Patton, *Qualitative Research and Evaluation Methods*, trans. Mesut Büttün, and Selçuk B. Demir (Ankara: Pegem, 2018), 215.

⁷⁹ Sharan B. Merriam, and Elizabeth J. Tisdell, *Qualitative Research: A Guide to Design and Implementation* (San Francisco: Jossey Bass, 2015), 23-25.

implementation. Then the form was trialed with seven pre-service teachers. Data obtained from the trial implementation were analyzed and investigated to determine whether the targeted information was procured or not. As a result of the investigations, revisions were made where necessary, and the tool was given its final form.

The research was completed with pre-service teachers attending a state university in Turkey. The university where the research was carried out is not a research university. However, bachelor's, postgraduate, doctorate and non-thesis master's programs are active in the primary education department where the research was conducted. Faculty members in the department work collaboratively on innovative practices in teacher education and conduct joint academic research and projects within this scope. Criterion sampling was chosen from the targeted sampling methods when creating the study group. The first criterion in this research was attending the basic education department. In this way, the target was to investigate possibilities in a broad framework without creating a discipline-based advantage or disadvantage for research teaching. The second criterion was taking the scientific research methods course. Pre-service teachers who attended the research education course designed on the basis of the research-based teacher education approach for 14 weeks participated in the research. The study group of the research comprised 110 pre-service teachers attending the basic education department in the education faculty of a state university. Information related to the characteristics of the study group is shown in Table 1.

Table 1
Characteristics of the study group

	Elementary Education Department	Preschool Education Department
Women	46	34
Men	25	5
Total	71	39

II.3. Analysis of data

Bernard⁸⁰ (2006) briefly defines analysis as examination of the patterns in the data and the ideas that will help to investigate the reasons why these

⁸⁰ Bernard H. Russel, *Research Methods in Anthropology. Qualitative and Quantitative Approaches* (Oxford: Altamira Press, 2006), 452-453.

patterns exist in the data. Creswell⁸¹ (2013) defined the steps of this process as collection, breakdown, and coding of the data, and finding subcategories, categories and themes from the codes. In this research, qualitative content analysis was used as the data analysis method,⁸² and an intensive analysis process consisting of four stages was followed. After the analysis process, which is explained in detail below, was completed by the researcher, the data and findings for the analysis were shared with a domain expert. The expert was asked to examine and evaluate all codes, subcategories, categories and themes related to the analysis. In addition, the expert was requested to correct the erroneous parts by providing explanations and to carry out the analysis process that was deemed appropriate. The items of feedback received from the expert were examined one-by-one, and the corrections made were accepted. Based on the feedback from the expert, the names of four subcategories were changed, and two subcategories were combined with other related subcategories in the same category. The inter-coder agreement was calculated as .91 according to the Miles and Huberman formula.

II.3.1. First stage: Open coding

In this process, coding is performed on the data set. The coding process is generally expressed as the process of separating the text into meaningful parts and labeling it⁸³. When codes are repeatedly applied to qualitative data, coding is made. Coding enables the researcher to organize similarly coded data and group them around certain categories due to some common characteristics. In the open coding stage, the entire data set was read line by line. In this process, the data were divided into single or multiple sentences that reflected the views of the pre-service teachers. Following this process, 684 expressions reflecting opinions were determined from the data set. In the coding process, each expression was coded using in vivo coding. In vivo codes are codes created using actual words expressed by the interviewees⁸⁴. Choosing the code names from among the pre-service teachers' expressions prevented possible errors that may originate from the researcher in the coding process. In this way, the influence of the researcher was reduced to a

⁸¹ John W. Creswell, *Qualitative Inquiry Research Design Choosing Among Five Approaches* (Thousand Oaks, CA: Sage Publications, 2013), 179-188.

⁸² Margrit Schreier, "Qualitative Content Analysis," in *The SAGE Handbook of Qualitative Data Analysis*, ed. Uwe Flick (London: SAGE, 2014), 171-183.

⁸³ Creswell, *Qualitative Inquiry*, 179-188.

⁸⁴ Anselm Strauss, *Qualitative Analysis for Social Scientists* (Cambridge: Cambridge University Press, 1987), 87.

minimum⁸⁵. All analysis in the research was carried out on these codes. Following this process, a total of 684 statements expressing views, of which 310 were those of preschool teachers and 374 belonged to classroom teachers, were labeled using in vivo coding.

II.3.2. Second stage: Classification of the dataset based on categories

The process performed at this stage is axial coding. The purpose of this coding is to strategically reassemble data that were split or fragmented during the open coding process⁸⁶. The axis of axial coding is the categories recognized in the first-cycle coding. These categories are linked with subcategories in the next-stage analyses⁸⁷. Compared to open coding, axial coding involves a higher degree of theoretical inference and analytic induction⁸⁸. At this stage, the question “What subject is this statement related to?” was posed about the statements expressing opinions that were coded in the first stage. In this process, the statements were read again and again and classified on the basis of the issues that were considered to be relevant. Expressions coded in this way were classified on the category axis. Furthermore, the features of the three categories found were clearly separated, so that the axes, to which the subcategories found in the next stages would be connected, were clarified.

Table 2

The appearance of codes after the second stage of the analysis

	Views about the outcomes provided by research education	Views about the reasons for teachers to have research competencies	Views about the professional function of scientific studies
Preschool Education Dept.	135	130	45
Elementary Education Dept.	165	168	41
Total	300	298	86

⁸⁵ Jimmie Manning, “In Vivo Coding,” in *The International Encyclopedia of Communication Research Methods*, ed. Jörg Matthes (New York: Wiley-Blackwell, 2017), 1-2.

⁸⁶ Anselm Strauss and Juliet Corbin, *Basics of Qualitative Research Techniques and Procedures for Developing Grounded Theory* (Thousand Oaks, CA: Sage Publications, 1998), 124.

⁸⁷ Kathy Charmaz, *Constructing Grounded Theory* (London: Sage Publications, 2014), 148.

⁸⁸ Scott Cliff and Melissa Medaugh, “Axial Coding,” in *The International Encyclopedia of Communication Research Methods*, ed. Jörg Matthes (New York: Wiley-Blackwell, 2017), 10.

II.3.3. Third stage: Classification of subcategories within categories

In this stage, opinion statements classified on the basis of topics were categorized based on the reflected perspective. In this stage, using the continuous comparative analysis method,⁸⁹ data coded in the same category were defined compared to other data. Saldana⁹⁰ considers this stage to be a synthesis and states that it is a process of discovery that will lead to unified meaning in the data. Analysis in this stage continued until there was no change in the subcategories. Opinion statements were classified in clusters named using letters without giving any names based on the candidates' perspectives in this analysis stage. Groups were continuously compared with each other, maintaining the necessary combination and separation processes. After repeated reading, naming processes were not completed until a class was proven to be complete. After completing the classification process, the classification clusters were named using the word or group of words thought to include the scope in the best way. After this analysis, the first category had 25 subcategories, while the second and third categories had five each.

II.3.4. Fourth stage: Accessing themes from categories

In the fourth stage of the analysis, categories representing pre-service teacher candidates' views were combined in themes. This process involved accessing themes in order to explain the data more clearly and in a more integrated way, and thereby, to make the analyses more meaningful. As the themes of the first sub-problem of the research, the themes used by Aspfors and Eklund⁹¹ (2017) to categorize the views on research-based teacher education expressed by pre-service teachers in Finland who had just completed their postgraduate education were used. The reasons for this were that both studies mainly examine which outcomes are provided to pre-service teachers by the research-based teacher education approach on the basis of their views. Furthermore, the parallels in the method adopted in the research, the study group, the characteristics of the research data and the data analysis processes had an effect on this decision. The thematic research system with common aims was appropriate for the thematic classification of subcategories and categories accessed in the study. The researcher created the themes for the other two categories.

⁸⁹ Berney G. Glaser, "The Constant Comparative Method of Qualitative Analysis," *Oxford Journals* 12, no. 4 (Spring 1965): 436-445, <https://doi.org/10.2307/798843>.

⁹⁰ Johnny Saldana, *The Coding Manual for Qualitative Researchers* (Thousand Oaks, California: Sage Publications, 2019), 10.

⁹¹ Aspfors, and Eklund, "Explicit," 400-413.

Table 3
The appearance of codes after the fourth stage of the analysis

Views about the outcomes provided by research education	Views about the for teachers to have research competencies		Views about the professional function of scientific studies				
	PS*	C**	PS	C	PS	C	
Research competence	64	92	54	75	They have a function	39	37
Professional Competence	57	64			They do not have a function	6	4
Personal Competence	14	9	71	85			
			5	8			
Total	135	165	130	168		45	41

* PS. Preschool teacher candidates.

** C. Classroom teacher candidates.

II.4. Research context

The pre-service teachers included in the study group of this research fulfilled the requirements of a 14-week teaching program in the scientific research methods course. Within the scope of the curriculum, the pre-service teachers saw all the theoretical content of scientific research methods. In addition to this, they examined seven cases specialized on the basis of classroom teaching and preschool teaching throughout the course. Each of the cases seen in Table 4 consists of problem areas that fall within the scope of their own fields and are specialized in educational research. Case studies consist of a case sample and open-ended questions directed to analyze the case. Each examined case was arranged in a way that would allow the pre-service teachers to practice discussion, decision making and justification while researching and solving pedagogical problems on the basis of questions.⁹² The questions included in each case were designed in such a way as to lead the pre-service teachers to design a research proposal. The pre-service teachers analyzed the cases every two weeks, and by putting their analyses into report form, sent them by e-mail to the lecturer who conducted

⁹² Toom et al., "Experiences," 331-344.

the course. Another study carried out by the pre-service teachers within the scope of the curriculum was to analyze at least three articles each week.

In this way, the pre-service teachers examined at least 6 articles based on the analysis form given to them within the scope of the subject of the case they examined. The inquiry-based approach is based on the idea that the knowledge base of the study program is dynamic and that the prospective teacher is an active processor of this knowledge.⁹³ Based on this, the pre-service teachers experienced an active operational process with the dynamic content of the cases and articles they examined. The articles that the pre-service teachers were to read were sent to the candidates by e-mail each week by the faculty member. The case, case questions and article review questions used within the scope of the program were developed by two experts in program development in education, one of whom was the researcher herself. In addition to the theoretical courses, group discussions on the cases and the reviewed articles were held every two weeks. During the semester, the pre-service teachers developed 7 case-based research proposals and analyzed 42 articles. In this respect, it can be said that the pre-service teachers who participated in the study had a common experience guided by the expert regarding the cases examined within the scope of the study. The faculty member responsible for the course is a specialist in program development in education and has taken courses on teacher education programs during doctoral education and has teaching experience in scientific research methods and research project courses at undergraduate and postgraduate levels.

Table 4

Case topics investigated within the scope of the teaching program

Case topics for elementary education	Case topics for preschool education
Reading comprehension	Class management
Misconceptions	Special teaching methods
Emotional factors in learning	Individual differences
Professional development	Family participation
Class management	Adjustment to school
Learning responsibility	Problematic behavior
Peer bullying	Peer bullying

⁹³ Zeichner, "Alternative," 3-9.

II.5. Compliance with ethical conventions

Ethics committee approval was obtained for this research from the Social and Human Sciences Research Ethics Committee of Ordu University, where the research was conducted (dated 15.09.2021 and numbered 2021-125). The British Educational Research Association Ethical Guidelines for Educational Research (2018) principles were taken into account in the study. In the research, the principles of consent and information, review of possible harm, protection of confidentiality, and the impact of the results on society were taken into consideration. During the data collection process, the participants were informed about the purpose of the study, why their participation was necessary, what they were asked to do, what would happen to the information they provided, how this information would be used, how and to whom it would be reported, and how they could access the research results. The participants were encouraged to express their reservations on these issues clearly, and their questions were answered. Data were collected on the day and time that each participant stated was appropriate. It was stated that participation in the study was voluntary and that participants had the right to withdraw from the study at any time. It was also stated that the identity information of the participants would be kept completely confidential, and that the data obtained would be kept in the encrypted computer of the researcher. All kinds of information that could lead to the identification of the participants were removed, and code names were used instead of their real names. While quoting the interview recordings, information that could reveal the identities of the participants was avoided. All the possible effects of the research results, and how the research results should be handled in order to be beneficial were mentioned, and suggestions were made for researchers and relevant stakeholders.

II.6. Validity and reliability of the study

Establishing validity and reliability of a qualitative research study requires the fulfilment of credibility, transferability, consistency, and verifiability thresholds.⁹⁴ To ensure credibility in qualitative research, the number and characteristics of the participants, how they were selected, the data collection tools, and analysis techniques used in the study should be explained in detail.⁹⁵ This information is described in detail under the method heading of the research. It is recommended to use detailed description and sample selection

⁹⁴ Merriam and Tisdell, *Qualitative Research*, 238-266.

⁹⁵ John W. Creswell, and Miller L. Dana, "Determining Validity in Qualitative Inquiry," *Theory into Practice* 39, no:3 (June 2000): 124-130, https://doi.org/10.1207/s15430421tip3903_2.

strategies to fulfil the transferability requirement of the study.⁹⁶ The criterion sampling method was used in the study. In this way, a group was selected from which the richest data could be obtained to answer the research questions. Regarding detailed description, direct quotations in each subcategory are presented in the findings section. All research analyses were performed on in vivo codes. In this way, the statements of the participants directly constitute the most basic unit of the analysis. Long-term interaction, expert review, and participant validation strategies are recommended to increase credibility in qualitative research.⁹⁷ In the study, the opinions of three experts were obtained during the development of the data collection tool. After the analysis was completed, for inter-coder reliability, the data and findings of the analysis were shared with a domain expert. The expert was asked to examine and evaluate all codes, subcategories, categories, and themes of the analysis. In addition, the expert was requested to correct the incorrect parts by providing explanations and to perform the analysis that was deemed appropriate. After the feedback from the expert, the inter-coder agreement was calculated as .91 according to Miles and Huberman's formula.⁹⁸ After the feedback received from the expert, the names of four subcategories were changed, and two subcategories were combined with other relevant subcategories in the same category.

This research has a range of limitations. The first limitation is that the data in the study only refer to the views of pre-service teachers. Within the scope of the study, pre-service teachers were not observed in real class practice or in environments where research competency could be applied. Another limitation of the research is that the two hours of theoretical lessons in the scientific research methods course completed by pre-service teachers were based on the principles explaining research-based teacher education. A further limitation of the research is that the findings were limited to the views of pre-service teachers in a state university.

III. Findings

III.1. Findings related to the first problem of the research

The first problem of the research sought answers to the question about the views of pre-service teachers related to the outcomes provided by the

⁹⁶ Merriam and Tisdell, *Qualitative Research*, 238-266.

⁹⁷ Merriam and Tisdell, *Qualitative Research*, 238-266.

⁹⁸ Mathew B. Miles and Michael A. Huberman, *Qualitative Data Analysis* (Thousand Oaks, California: Sage Publications), 64.

scientific research methods course. The findings regarding this problem can be seen in Table 5.

Table 5

Views about the outcomes provided by the scientific research methods course

	f	%
Research Competence		
Scientific thinking and understanding	59	37.8
Research competence	97	62.2
Professional Competence		
Professional thinking and understanding	90	74.4
Research-related teaching	5	4.1
Pedagogical theories and knowledge	26	21.5
Personal Development		
Maturity and self-knowledge	8	34.8
Self-discipline and confidence	11	47.8
Interpersonal ability	4	17.4

The views of the pre-service teachers about the outcomes provided by the scientific research methods course were classified into three themes and eight categories. The ideas of the pre-service teachers about the outcomes from the scientific research methods course were organized as research competence, professional competence, and personal development.

The research competence theme was classified in the categories of scientific thinking and understanding, and research competence. The research competence theme was examined, as seen in Table 6.

Table 6

Views about the research competence outcomes of the scientific research methods course

Scientific thinking and understanding	f	%
STU.1. A multidimensional approach to problems	20	33.9
STU.2. An investigative approach to professional problems	16	27.1
STU.3. Awareness of scientific steps required for the solution of problems	15	25.5
STU.4. Understanding of the guiding power of scientific resources when faced with problems	8	13.5

Research competence		
RC.1. Development of scientific thinking processes	19	19.6
RC.2. Ability to access scientific resources	17	17.6
RC.3. Ability to analyze articles	10	10.3
RC.4. Structuring of the scientific research process	43	44.3
RC.5. Following scientific procedures in theoretical knowledge	8	8.2

The category of scientific thinking and understanding refers to the improving effect of the research methods course in the approach to professional problems, events and knowledge. The research competence category represents the development of skills used directly in scientific thinking and research processes. Direct quotations of pre-service teachers about the subcategories investigated within the scope of research competence are shown in Table 7.

Table 7
Direct quotations about the research competence outcomes
of the research methods course

STU	Scientific thinking and understanding
STU.1.	<i>Due to the cases we investigated and articles we read in the scientific research lessons, I developed the ability to look at events from multiple dimensions. I noticed that there might be not just one but several solution routes when faced with a problem.</i>
STU.2.	<i>I began to look at the behavior of children and teachers in depth. I began to ask investigative questions, such as "What are the effects of a child's behavior on the class when faced with situations?"; "What are the results of the teacher's behavior on students?"</i>
STU.3.	<i>I learned coping methods for problems I will face in my professional life. Rather than hearsay or preaching, I will consult science as a teacher suitable for the characteristics of the age. I will investigate articles. I will try to solve problems I encounter using scientific solution methods.</i>
STU.4.	<i>I realized the importance for my profession of using scientific resources as guides when faced with problems in my domain.</i>
RC	Research competence
RC.1.	<i>I can think analytically when faced with problems, and I feel I have an integrated approach to events.</i>
RC.2.	<i>As I read so many articles, it became easier to understand them. When I need it, I know where I can access that information.</i>

RC	Research competence
RC.3.	<i>Firstly, I learned to read and analyze the articles. In this way, I know how to benefit from information and articles in the field when I need them.</i>
RC.4.	<i>I learned which routes I will use when I need to perform any research when I begin my profession; I know what processes I need to perform with scientific tools for problems I face.</i>
RC.5.	<i>Now, I can understand that the theoretical knowledge we see in education science is a product of scientific research and what process produced it.</i>

Another theme about the outcomes from the research methods course was professional development. When the professional development theme is examined, this competence was classified into the categories of professional thinking and understanding, research-related teaching, and pedagogical knowledge and teaching, as seen in Table 8. The professional thinking and understanding category included views on the teaching profession identity, general practice and management, problem fields, and professional development. In the research-related teaching category, students' views about the development of research competence outcomes were included. Finally, the pedagogical knowledge and teaching category included views about learning and development during the teaching process

Table 8
Views about the professional competence outcomes
of the research methods course

	f	%
Professional thinking and understanding		
PTU.1. I gained a professional identity	6	6.6
PTU.2. I conceptualized problem areas in teaching	38	42.2
PTU.3. I understood that being a teacher is not just about teaching	21	23.2
PTU.4. I noticed that science is the backbone of professional development	13	14.4
PTU.5. I see the intertwining of teaching with science	12	13.6
Research-Related Teaching		
RT.1. Performing interrogation-based teaching	2	40
RT.2. Being a role model	3	60

	f	%
Pedagogical Knowledge and Teaching		
PKT.1. I can notice individual differences in teaching	3	11.5
PKT.2. I can access teaching methods with proven efficacy	19	73.1
PKT.3. I clarified the topic of class needs	4	15.4

Citations from pre-service teachers related to the subcategories investigated within the scope of professional competence can be seen in Table 9.

Table 9
Direct quotations about the professional competence outcomes
of the research methods course

	Professional thinking and understanding
PTU.1.	<i>This course provided a more professional identity.</i>
PTU.2.	<i>The articles I read within the scope of this course ensured that I had more information about problems in class. It provided information about what problems I will encounter in my professional life and their solutions.</i>
PTU.3.	<i>I saw that teaching is not just about teaching things but is also about producing new information by observation. Instead of ignoring a problem, I learned the need to investigate the causes and find solutions. At the same time, I understood that this information should be shared and that these resources should be used.</i>
PTU.4.	<i>There are many lessons to be inferred from the cases we investigated in class and the articles we read. The most significant contribution is that I understood how necessary scientific processes and publications are for professional development. I look to the future with hope.</i>
PTU.5.	<i>The guiding statements of our teachers and the findings in the articles we read expanded my perspective about teaching. I believed that the teaching profession could only achieve success with love. However, now I think the first and most vital step is to develop continuously, and I learned the scientific basis of being open to learning.</i>
	Research-related teaching
RT.1.	<i>Researcher teachers will ensure learning by interrogating and questioning students. Teachers without this type of equipment will provide rote-based education.</i>
RT.2.	<i>Teachers are responsible for young generations' acquisition of research, investigation, problem-solving, and critical thinking skills, but we need to have these skills ourselves first. These teachers are teachers with scientific attitudes and behavior.</i>

	Pedagogical knowledge and teaching
PKT.1.	<i>Due to the experience I obtained through the articles and case investigations, I can develop appropriate solutions and methods for individual differences in class.</i>
PKT.2.	<i>I learned new strategies and practices. At the same time, I know what results are provided when these strategies and procedures are applied. I learned how to access these resources.</i>
PKT.3.	<i>I think scientific research will guide me in finding what can be good or bad for students, what can be done for their development, and how to teach effectively.</i>

The personal development theme was investigated in the categories of maturity and self-knowledge, self-discipline and confidence, and interpersonal ability, as seen in Table 10. The maturity and self-knowledge category includes views about the lessons of pre-service teachers reflecting themselves, awareness of their strong and weak aspects, and the outcomes of work regarding maturity. In the self-discipline and confidence category, they expressed views about acquiring self-discipline and confidence, as the requirements of the research process took them out of their comfort zone. The interpersonal ability category included views involving the development of social communication and interaction in lessons.

Table 10
Views about the personal development outcomes
of the research methods course

Personal Development Outcomes	f	%
MS.1. Maturity and Self-knowledge	8	34.8
SDC.1. Self-discipline and Confidence	11	47.8
IA.1. Interpersonal Ability	4	17.4

Quotations related to the subcategories investigated within the scope of personal development of pre-service teachers can be seen in Table 11.

Table 11

Direct quotations about the personal development outcomes of the research methods course

	Personal Development
MS.1.	<i>When I came across topics I wasn't interested in, I thought, "If you only learn topics you love, you can never develop yourself. It would be best if you forced yourself for the topics you don't like so that you can develop..." That thought motivated me.</i>
SDC.1.	<i>The most outstanding contribution in terms of my development is to the thought of pushing and expanding the boundaries of the brain by researching, questioning, thinking, and continuously learning in a comfortable environment.</i>
IA.1.	<i>It ensured that I could more easily express myself academically.</i>

III.2. Findings related to the second problem of the research

The second problem of the research sought answers to the question about pre-service teachers' views regarding the reasons for teachers to have research competency. The findings related to this problem can be seen in Table 12.

Table 12

Views about the reasons for teachers to have research competencies

	f	%
Requirement for contemporary teaching		
NMT.1.Contemporary teaching requires scientific knowledge and pathways	109	84.5
NMT.2.Current teachers must think at higher levels	20	15.5
Requirement for the nature of the class		
RNC.1.The scientific method shows the class discovery paths	25	16
RNC.2.A class can only solve complicated problems via scientific routes	131	84
Requirement for qualified teaching		
NQT.1 Qualified teaching needs methods proven to be effective	13	100

The pre-service teachers explained that teachers' possession of research competency was a requirement for contemporary teaching, requirement for the

nature of the class, and requirement for qualified teaching. The first category included views about the necessity of being a researcher to be a qualified teacher in the present day. Another point emphasized was that the higher-order thinking skills of researcher teachers are a requirement for teaching today. In the second category, the pre-service teachers explained the need for teachers to have research competency to explore the class and the nature of cases and problems requiring solutions. In the last category, the pre-service teachers stated that they saw teachers' possession of research competence as a necessity for qualified teaching. The pre-service teachers emphasized that methods with proven effectiveness should be researched and applied in order to increase the success level of students. Direct quotations related to these categories investigated within the scope of this problem are given in Table 13.

Table 13

Direct quotations about the reasons for teachers to have research competencies

Requirement for contemporary teaching	
NMT.1.	<i>Researcher teachers work in a more planned and careful way. They don't act based on guesses. They use science for their decisions. They are open to innovation and change. They read continuously. They solve problems they encounter through the scientific process. They use articles and include methods with positive outcomes in class. All of these are expected from teachers with the constructivist approach.</i>
NMT.2.	<i>Researcher teachers use their minds more effectively. While they can develop solutions more rapidly, analytically, and accurately when faced with problems, other teachers may produce solutions that cause chaos. For this reason, instead of a learning-centred approach, they use routes, and so they don't lose authority.</i>
Requirement for the nature of the class	
RNC.1.	<i>Researcher teachers actually explore the class using scientific processes. They observe student behavior and ask themselves questions. Why is it this way? What is the effect and they search for answers to these questions that will benefit students.</i>
RNC.2.	<i>In scientific research processes, answers are found by working from a problem. When I'm a teacher, I may encounter many problem situations in class. I will only be able to solve all these problems through scientific process skills.</i>
Requirement for qualified teaching	
RQT.1.	<i>Teachers equipped with knowledge of the scientific research process will apply positive outcomes and create a more qualified teaching process. They will be able to achieve their aims.</i>

III.3. Findings related to the third problem of the research

The third problem of the research sought answers to the question about the views of pre-service teachers related to the professional function of scientific studies. The results related to this problem can be seen in Table 14.

Table 14
Views about the professional function of scientific studies

They have a function	f	%	They do not have a function	f	%
HF.1.Real context	30	39.7	HNF.1.Distance from being guides	10	100
HF.2.Reliable knowledge	25	32.8			
HF.3.Beyond experience	14	18.3			
HF.4.Ideal practice	7	9.2			
Total	76	100		10	100

The views of pre-service teachers about the professional function of scientific studies were classified into five categories. The views expressed by the pre-service teachers were investigated in the categories of real context, reliable knowledge, beyond experience, ideal practice, and distance from being guides. The real context category dealt with the need for data from scientific studies in the actual class and school contexts in teachers' professional lives, and they explained topics in terms of situations and events encountered every day in teaching. The reliable knowledge category included validity and reliability information about scientific studies and views about the functional role for teachers in terms of being obtained from experts. The ideal practice category included views of pre-service teachers about the efficacy of articles as guides for teachers, including proven exemplary implementations. The category of beyond experience included views about teachers being informed by scientific studies about realities that they would not be aware of in real life and the fact that teachers required them for this reason. Views in the final category were about how scientific studies were far from being guides for teachers as they were very general and did not openly state what should be done in class. Direct quotations about these categories investigated within the scope of this subproblem can be seen in Table 15.

Table 15
Direct quotations about the professional function of scientific studies

They have a function	
HF.1.	<i>Every topic dealt with in the articles considered behavior as it is seen in class. For this reason, when I'm a teacher, I will know a little about what the results of the style of behavior I display will be and about the internal mood of students and parents. As a result, I can say these articles put me in the field for my professional life.</i>
HF.2.	<i>The articles we read in class were prepared based on scientific data by experts. All of this knowledge is free from errors as much as possible, and is obtained by fulfilling scientific requirements.</i>
HF.3.	<i>I think I will be able to apply what I read in the articles in my class. They reflect what has been researched and actually should happen. They reflect the ideal practices in similar situations.</i>
HF.4.	<i>The articles informed me about topics that I would not have noticed if we were in class. They told us about issues that would not have come to mind.</i>
They do not have a function	
HNF.1.	<i>All of the articles we investigated were based on broad topics. Explanations were all based on scientific findings. They did not include information based on practice. As they included obscure work, I didn't understand what I need to do, or when and how to do it.</i>

IV. Conclusion and discussion

The research findings showed that the pre-service teachers did not consider the outcomes of research-based teacher education only within the framework of research competence. The opinions of the teacher candidates showed that they also evaluated the outcomes of this teaching process within the scope of professional competence and personal development. Studies with teacher educators, teacher candidates and mentor teachers for research-based teacher education have similarly expressed the contribution of research-based teacher education to multi-faceted development.^{99,100,101}

A close examination of the research competence category reveals that this competence was not only considered within the scope of the skills used

⁹⁹ Jegstad, Fiskum, Aspfors, and Eklund, "Dichotomous," 1-15.

¹⁰⁰ Aspfors, and Eklund, "Explicit," 400-413.

¹⁰¹ Pajchel, Jegstad, Eklund, Aalbergsjø, and Sollid, "The Role of School," 193-205.

between the planning stage of a research process up to the reporting stage. They also discussed research competence in terms of the improvement enabled by the instruction in their approaches to professional problems, events, and knowledge accumulation. While fulfilling the requirements of the profession, a multidimensional approach to problems, an exploratory approach to professional events, the realization that the solution of professional problems requires scientific steps, and the realization of the guiding power of scientific resources in the face of problems, are among the subcategories that emerged here.

Some of the pre-service teachers' views examined under the category of professional development focused on the development of professional thinking and understanding. It can be understood from the teacher candidates' explanations that they developed an understanding of the complex nature of the teaching profession and its close connection with science. Again, in the same category, the teacher candidates stated that they were able to overcome the challenging problems of the teaching and learning process through scientific research and the skills they developed in this process. It is seen that important requirements, such as taking individual differences into account, access to teaching methods whose effectiveness has not been tested, and clarification about classroom needs were mentioned here. Finally, they expressed the outcomes that they thought they had achieved in terms of developing their students' research and inquiry skills.

The research shows that this process also made important contributions to the pre-service teachers' personal development. One of the most striking features in this category is that the instruction process enabled them to develop their maturity and self-knowledge skills. It can be seen that the reflective texts they wrote and the evaluations they made during the process were effective in enabling them to recognize their own strengths and weaknesses. Moreover, they stated that during the research-based teaching process, they gained self-discipline and confidence through planned studies requiring discipline that took them out of their comfort zone. Finally, they reported that they showed improvement in their communication skills with the studies carried out in this category. It is thought that the effective use of both written and oral communication methods contributed to this development.

The second sub-problem of the study examined the reasons why teachers should have research competencies. The review showed that the teacher candidates discussed having research competence as a requirement of contemporary teaching. Here, the candidates evaluated their research competence within the scope of a high-level thinking skill. The explanations in the second subcategory indicate that the candidates regarded the classroom

as a place that can only be discovered and solved by means of the scientific process and knowledge. In the last category, they justified having research competence as a requirement of the quality of teaching as a process.

The pre-service teachers' views on scientific studies were examined under two categories as having a function and not having a function. It can be understood that the teacher candidates who stated that scientific studies do not fulfill any function wanted to see clear instructions from scientific studies about what should be done in the classroom. The candidates who stated that scientific studies are functional gave explanations to the effect that science is based on observation, interview and experimentation in real life contexts, is valid and reliable, and heightens teachers' awareness of realities that cannot be discerned in real life. In a study¹⁰² in which the relationship between theory and practice is neglected in teacher education programs, it is stated that developmental research-based teacher education ensures that the individual theories of the candidates are rooted in the context of real problems.

According to teacher educators, one of the essential axes of research-based teacher education is to enable candidates to become teachers who can think pedagogically.¹⁰³ The results of the research indicate that the teacher candidates achieved a large number of gains related to pedagogical thinking. Such a development was also seen in the results of Afdal and Spernes.¹⁰⁴ The research showed that the majority of pre-service teacher gained skills and knowledge to reflect on and approach educational research systematically. Van Ingen and Ariew,¹⁰⁵ moreover, found that the systematic approach to academic reading, which was also attempted to be achieved in this research, allowed students to integrate research-based knowledge with professional reasoning and practice in a variety of ways. In the study, it was seen that many teacher candidates reflected similar views.

The research also shows that the pre-service teachers expressed their views on the multifaceted benefits of a scientific research methods course prepared on the basis of the research-based teacher education approach.

¹⁰² Guillaume Escalié, Sébastien Chaliès, Pascal Legrain, and Sylvie Moussay, "A Developmental Research-based Teacher Education: Designing and Implementing a New Program for Preservice Teachers in France," *Teaching Education* (Latest Article). <https://doi.org/10.1080/10476210.2022.2066076>.

¹⁰³ Krokfors, "Investigating," 1-13.

¹⁰⁴ Afdal, and Spernes, "Designing," 215-228.

¹⁰⁵ Sarah van Ingen, and Susan Ariew. "Making the Invisible Visible: Preparing Preservice Teachers for First Steps in Linking Research to Practice." *Teaching and Teacher Education* 51, (October 2015): 182-190, <https://doi.org/10.1016/j.tate.2015.07.001>.

Similarly, Aspfors and Eklund¹⁰⁶ examined multidimensional development areas under the themes of research, professional and personal competencies in their research. In a design-based longitudinal study by Afdal and Spernes,¹⁰⁷ it was seen that pre-service teachers progressively valued the ability to think and work with others during studies based on the research-based teacher education approach. In this study, similar outcomes were observed in the personal development category. In addition, it has been seen that the outcomes examined within the scope of the research competence theme are largely compatible with those of Afdal and Spernes'¹⁰⁸ research. Research has shown that most students learn to identify professional problems and explore analytically using literature and research-based methods. Qualification research-based skills are considered essential for candidates to make informed decisions.¹⁰⁹ In the study, it was seen that the teacher candidates gained new perspectives about their professional practices during their education process based on this approach, in line with the research results of Afdal and Spernes¹¹⁰ Dobber et al.,¹¹¹ and Aspfors and Eklund.¹¹²

At this point, it may be interpreted that research teaching is an essential part of the course in terms of providing development from multiple aspects for pre-service teachers. From this perspective, the compulsory inclusion of a scientific research methods course in teacher education curricula may be considered as the right decision. It appears that research competency is included among teacher competencies.¹¹³ Additionally, research project courses, included in preschool teaching curricula and allowing pre-service teachers the opportunity to acquire research experience directly, may be recommended as a compulsory course in other departments. However, it is essential to underline the critical need to consider courses within a model reflecting the research-based teacher education approach when adding

¹⁰⁶ Aspfors, and Eklund, "Explicit," 400-413.

¹⁰⁷ Afdal, and Spernes, "Designing," 215-228.

¹⁰⁸ Afdal, and Spernes, "Designing," 215-228.

¹⁰⁹ Marilyn Cochran-Smith, Mikael Alexandersson, Viv Ellis, Lexie Grudnoff, Karen Hammerness, Alis Oancea, and Auli Toom, *Transforming Norwegian Teacher Education: The Final Report of The International Advisory Panel for Primary and Lower Secondary Teacher Education* (Lysaker: Norwegian Agency for Quality Assurance in Education NOKUT, 2020), 109.

¹¹⁰ Afdal, and Spernes, "Designing," 215-228.

¹¹¹ Marjolein Dobber, Sanne F. Akkerman, Nico Verloop, and Jan D. Vermunt, "Student Teachers' Collaborative Research: Small-Scale Research Projects during Teacher Education," *Teaching and Teacher Education* 28, no. 4 (May 2012): 609-617, <https://doi.org/10.1016/j.tate.2012.01.009>.

¹¹² Aspfors, and Eklund, "Explicit," 400-413.

¹¹³ General Directorate of Teacher Education and Development, "General," 5.

courses to teacher education curricula. It is known that there are essential deficiencies in ensuring that prospective teachers are actively involved in the research and implementation process.¹¹⁴ Krokfors et al.¹¹⁵ stated that the importance of all faculties in higher education is linked to the same organizational theme and that each should understand this subject in a similar way. It is also essential to consider the research findings of Brew and Saunders,¹¹⁶ because the research shows that the views of teacher educators on the issues related to the research-based teacher education approach are not in agreement. Pajchel et al.,¹¹⁷ on the other hand, stated in their research that a more advanced collective knowledge base covering content and methodological approaches within research-based teacher education should be established. Afdal and Spernes¹¹⁸ stated that there is still a prevalent conflict about what research-based education infers and how it should be organized. It is important to pay regard to these findings in the process of disseminating the research-based teacher education approach in Turkey.

Another problem in the research is related to the views of pre-service teachers about the requirements for teachers to have research competency. The majority of pre-service teachers' views related to the reasons for a teacher to have research competency appear to be expressed based on the need for contemporary teaching understanding. Considering the requirements for teaching based on the constructivist learning concept, teachers are expected to fulfill requirements like being guides, acting at the level of the student, being aware of individual differences, applying up-to-date teaching methods, and paying attention to affective factors that have an effect on the learning process and outcomes.¹¹⁹ Fulfilment of these requirements is possible if teachers actively use their research competence in the classroom. In the study, it was revealed that teacher candidates established a relationship between contemporary teaching conditions and research competencies. It is noteworthy that all teacher candidates participating in the study had completed their primary education after the program reform in 2005. The fact that they had graduated from a constructivist learning-based curriculum may have

¹¹⁴ Munthe, and Rogne, "Research," 17-24.

¹¹⁵ Leena Krokfors, Heikki Kynäslähti, Katariina Stenberg, Auli Toom, Katriina Maaranen, Riitta Jyrhämä, Reijo Byman, and Pertti Kansanen. "Investigating Finnish Teacher Educators' Views on Research-based Teacher Education," *Teaching Education* 22, no. 1, (March 2011): 1-13, <https://doi.org/10.1080/10476210.2010.542559>.

¹¹⁶ Brew, and Constanze, "Making," 1-11.

¹¹⁷ Pajchel, Jegstad, Eklund, Aalbergsjø, and Sollid, "The Role of School," 193-205.

¹¹⁸ Afdal, and Spernes, "Designing," 215-228.

¹¹⁹ Dale H. Schunk, *Learning Theories*, trans. Muzaffer Şahin (Ankara: Nobel Publishing, 2014).

been effective in the establishing of this relationship by pre-service teachers. Eklund's¹²⁰ research findings also support this finding. In these studies, students regarded research-based education as part of the professional requirements of the future teaching profession and stated that research is the basis and rationale of the domain.

Another important point here is the statements of pre-service teachers to the effect that their research competencies had a function in using higher-order thinking skills effectively. The research process served to enhance the higher-order thinking skills of teacher candidates, led by analytical thinking.^{121,122,123,124,125} It is expected that pre-service teachers following active reading and analysis processes within a research-based implementation will acquire competence in using their thinking capacity at a higher level. It is crucial to provide teachers and teacher candidates with the chance to enhance their thinking capacity at higher levels through active use during scientific thinking processes.

Another reason for teachers to have research proficiency is explained on the basis of the nature of the classroom. Classroom life is complex and multidimensional for the teacher. The myriad daily tasks and responsibilities of teaching simultaneously compete for attention. Class experiences are complicated and multidimensional from the perspective of the teacher.¹²⁶ The categorization by¹²⁷ Shulman assists us in seeing the complex nature of teaching. Teaching actions are shaped by many cognitive decisions that teachers make before, during, and after teaching.¹²⁸ A teacher needs to interpret the culture in the class and community contexts to know how students learn and the most effective way to teach them. Additionally, teachers should find a way to understand and nourish the soul and personality of each child in class. It is necessary to effectively use reflection skills to efficiently construct and manage class activities, create good communication,

¹²⁰ Eklund, "Student Teachers' Experiences," 3-17.

¹²¹ Hansén, Eklund, and Sjöberg, "General," 7-20.

¹²² Kansanen, "Research-based," 131-146.

¹²³ Krokfors, "Two-fold," 147-159.

¹²⁴ Toom, "Experiences," 331-344.

¹²⁵ Westbury, "Teacher," 1-13.

¹²⁶ Aspfors, Eklund, and Hansén, "Early," 2-18.

¹²⁷ Lee Shulman, "Knowledge and Teaching: Foundations of the New Reform," *Harvard Educational Review* 57, no. 1 (February 1987): 1-23, <https://doi.org/10.17763/haer.57.1.j463w79r56455411>.

¹²⁸ Kendra M. Hall-Kenyon, and Smith K. Leigh, "Negotiating a Shared Definition of Curriculum Integration: A Self-Study of Two Teacher Educators from Different Disciplines," *Teacher Education Quarterly* 40, no. 2 (Spring 2013): 89-108.

use technology, and continuously improve these skills.¹²⁹ These explanations reveal the complicated nature of the class, awaiting discovery by the teacher. In the research, the pre-service teachers explained the need for research competency due to the class requiring exploration and being full of problems waiting to be solved. It is thought that the in-depth discussions and analyses about classes based on the cases and articles investigated within the scope of the course were influential on the accurate comprehension of this reality by teacher candidates.

Finally, the research investigated the views of pre-service teachers about the professional function of scientific studies. Some pre-service teachers stated that they became aware of topics and concepts unrecognizable in real life due to the articles. However, some pre-service teachers noted that the papers were far from being guides. Similarly, the study by Puustinen et al.¹³⁰ shows that some teacher candidates do not accept or understand the impact of research in teacher education or teacher studies. It is considered that views about this topic reflected pre-service teachers' perspectives about the roles of teachers. It is assumed that teacher candidates' views may be interrogated in the context of whether they see teaching as work for a passive technician or as having an implementer role. The current educational system in Turkey is criticized for cultivating pre-service teachers as passive technicians.¹³¹ Schön¹³² criticized the assumption that all professional problems can be solved based on research outcomes in traditional teacher education, qualified as technical rationality. Current professional knowledge draws attention to the idea that not every problem encountered in the teaching profession may have a solution. In this approach that reduces teachers to passive implementers, teachers are not expected to perform research, yet they are expected to implement the research in practice. In this model's role, there is no place for the development of teachers' creativity and critical thinking powers. In the study, some pre-service teachers did not expect the articles they read to support their independent intellectual, professional practice but expected them to explain what they should do in a class entirely. This approach observed among the views of the pre-service teachers is thought to reflect the passive technician teacher role. It is believed that research-based teacher

¹²⁹ Darling-Hammond, "Constructing," 300-314.

¹³⁰ Puustinen, "Teaching," 170-179.

¹³¹ Yasemin S. Tezgiden-Cakcak, "*Preparing Teacher Candidates as Passive Technicians, Reflective Practitioners or Transformative Intellectuals?*" (PhD diss., Middle East Technical University, 2015).

¹³² Donald A. Schön, *Educating the Reflective Practitioner: Toward a New Design for Teaching and Learning in the Professions* (USA: Jossey-Bass, 1987).

education, with teachers producing knowledge and solving problems, will play an essential part in their adopting the position of thinking implementers.

V. Recommendations

In the future, it is recommended that researchers carry out the following studies. The effects of research-based teacher education practices on pre-service teachers can be investigated based on observations in real classroom environments. Longitudinal studies can be designed to observe the practices of pre-service teachers who have been educated with a research-based teacher education approach after starting the profession. Research studies examining the effectiveness of enriched teaching practices designed on the basis of the research-based teacher education approach can be designed. In the future, studies can be designed to include pre-service teachers attending various universities. In addition to the above suggestions, it is recommended that experts and policy makers conduct collaborative studies on how to implement the principles of research-based teacher education in teacher education curricula. Finally, teacher educators need to focus on ways to implement the principles of the research-based teacher education approach in their practices for teacher education curricula. In this context, faculties can cooperate in developing a joint strategy on integrating this approach with the courses in the current curriculum.

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