

BÖLÜM 7

ERKEN ÇOCUKLUKTA FEN EĞİTİMİ VE OKUL ÖNCESİ ÖĞRETMENLERİNİN FEN ÖĞRETİMİNE İLİŞKİN PEDAGOJİK YAPILARI

Ali Yiğit KUTLUCA¹

GİRİŞ

Erken çocukluk eğitimini zenginleştirmek ve çocukların akademik hazırbulunuşluklarına katkıda bulunmak için fen öğretiminin erken yıllarda başlaması gerektiğine ilişkin geniş ve büyüyen bir fikir birliği vardır (Gomes & Fleer, 2020; Larimore, 2020). Çok sayıda araştırma, bilim ve süreçlerinin dil ve okuryazarlık becerileriyle bütünleştirilerek erken çocukluk eğitim müfredatlarına entegre edilmesinin akademik hazırbulunuşluğa katkı sağladığını ortaya koymuştur (Gonzalez vd., 2011; Wright & Gotwals, 2017).

Tarihsel olarak erken çocukluk eğitimi, Piaget'in yapılandırmacı yaklaşımından ve sosyal etkileşimlerin öğrenme için önemli sayıldığı Vygotsky'nin yaklaşımından büyük ölçüde etkilenmiştir (Coppie & Bredekamp, 2009). Bu nedenle bilimi okul öncesi öğrenme ortamlarına dâhil etmenin en önemli faydası, bilimsel aktivitelerin çocukların sosyal etkileşimlerini ve bilim diline aşinalıklarını arttırmasıdır. Diğer yandan bilim insanları ve çocukların olgusal dünyayı anlamlandırma biçimleri, birbiriyle paralellik göstermektedir (Desli & Dimitriou, 2014). Bu da çocuklardaki merak, gözlem ve keşfetme isteğinin, çevrelerinde meydana gelen doğal olayları bilimsel düşünce temelinde açıklamalarını kolaylaştırdığının kanıtıdır. Küçük yaşta bilim ve onun süreçleri ile karşılaşan çocukların bilime yönelik olumlu tutum sergilemeleri daha olasıdır. Bu ana un-

¹ Dr. Öğr. Üyesi, İstanbul Aydın Üniversitesi, Eğitim Fakültesi, Temel Eğitim Bölümü alikutluca@aydin.edu.tr

Tüm bu belirtilenler özelinde okul öncesi öğretmen ve öğretmen adaylarının katılımıyla gerçekleştirilecek fen öğretimi araştırmalarının aşağıdaki konulara odaklanması alanyazına katkı sağlayabilir.

1. Sosyobilimsel konulara ilişkin pedagojik görüşler,
2. Erken fen öğretimine özgü müfredatın geliştirilmesi, uygulanması ve öğretmen pedagojik yapılarına olan etkisi,
3. Erken fen öğretimiyle ilgili konu ve alana özgü stratejiler, müfredat ve ölçme ve değerlendirme temelli meslekî gelişim olanaklarının öğretmen pedagojik yapılarına olan etkisi.

KAYNAKLAR

- Abell, S. K. (2008). Twenty years later: Does pedagogical content knowledge remain a useful idea?. *International journal of science education*, 30(10), 1405-1416.
- Akerson, V. L., Buzzelli, C. A., & Eastwood, J. L. (2012). Bridging the gap between preservice early childhood teachers' cultural values, perceptions of values held by scientists, and the relationships of these values to conceptions of nature of science. *Journal of Science Teacher Education*, 23(2), 133-157.
- Akşam, E., & Kutluca, A. Y. (2021). Okul öncesi öğretmenlerinin fen öğretimi uygulamalarının teorik ve pratik doğasının keşfedilmesi. *Uludağ Üniversitesi Eğitim Fakültesi Dergisi*, 34(1), 386-435.
- Andersson, K., & Gullberg, A. (2014). What is science in preschool and what do teachers have to know to empower children?. *Cultural studies of science education*, 9(2), 275-296.
- Babaroğlu, A., & Metwalley, E. O. (2018). Erken çocukluk döneminde fen eğitimine ilişkin okul öncesi öğretmenlerinin görüşleri. *Hitit Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, 11(1), 125-148.
- Barenthien, J. M., & Dunekacke, S. (2021). The implementation of early science education in preschool teachers' initial teacher education. A survey of teacher educators about their aims, practices and challenges in teaching science. *Journal of Early Childhood Teacher Education*, 1-19. <https://doi.org/10.1080/10901027.2021.1962443>
- Barenthien, J., Lindner, M. A., Ziegler, T., & Steffensky, M. (2020). Exploring preschool teachers' science-specific knowledge. *Early Years*, 40(3), 335-350.
- Brenneman, K. (2011). Assessment for preschool science learning and learning environments. *Early Childhood Research & Practice*, 13(1), 1-9.
- Buldu, E., & Buldu, M. (2021). Investigating pre-service early childhood teachers' cPCK and pPCK on the knowledge used in scientific process through CoRe. *SAGE Open*, 11(2), 1-16.
- Büyüktaşkapu, S., Çeliköz, N., & Akman, B. (2012). Yapılandırmacı bilim eğitimi programının 6 yaş çocuklarının bilimsel süreç becerilerine etkisi. *Eğitim ve Bilim*, 37(165).
- Clements, D. H., & Sarama, J. (2018). Myths of early math. *Education Sciences*, 8(2), 1-7.
- Copple, C., & Bredekamp, S. (2009). *Developmentally appropriate practice in early childhood programs serving children from birth through age 8 (3. baskı)*. Washington, DC: National Association for the Education of Young Children.

- Croninger, R. G., Buese, D., & Larson, J. (2012). A mixed-methods look at teaching quality: Challenges and possibilities from one study. *Teachers College Record*, 114(4), 1-36.
- Davies, D., Howe, A., Collier, C., Digby, R., Earle, S., & McMahon, K. (2003). *Teaching science, design and technology in the early years*. David Fulton Publishers.
- Desli, D., & Dimitriou, A. (2014). Teaching mathematics and science in early childhood: prospective kindergarten and primary school teachers' beliefs. *Review of Science, Mathematics and ICT Education*, 8(2), 25-48.
- Fleer, M. (2009). Supporting scientific conceptual consciousness or learning in 'a roundabout way' in play-based contexts. *International Journal of Science Education*, 31(8), 1069-1089.
- Fleer, M., Gomes, J., & March, S. (2014). Science learning affordances in preschool environments. *Australasian Journal of Early Childhood*, 39(1), 38-48.
- Furman, M., De Angelis, S., Dominguez Prost, E., & Taylor, I. (2019). Tablets as an educational tool for enhancing preschool science. *International Journal of Early Years Education*, 27(1), 6-19.
- Garbett, D. (2003). Science education in early childhood teacher education: Putting forward a case to enhance student teachers' confidence and competence. *Research in science education*, 33(4), 467-481.
- Gerde, H. K., Pierce, S. J., Lee, K., & Van Egeren, L. A. (2018). Early childhood educators' self-efficacy in science, math, and literacy instruction and science practice in the classroom. *Early Education and Development*, 29(1), 70-90.
- Gess-Newsome, J. (2015). A model of teacher professional knowledge and skill including PCK. *Re-examining pedagogical content knowledge in science education*, 41(7), 28-42.
- Gomes, J., & Fleer, M. (2020). Is science really everywhere? Teachers' perspectives on science learning possibilities in the preschool environment. *Research in Science Education*, 50(5), 1961-1989.
- Gonzalez, J. E., Pollard-Durodola, S., Simmons, D. C., Taylor, A. B., Davis, M. J., Kim, M., & Simmons, L. (2010). Developing low-income preschoolers' social studies and science vocabulary knowledge through content-focused shared book reading. *Journal of Research on Educational Effectiveness*, 4(1), 25-52.
- Greenfield, D. B., Alexander, A., & Frechette, E. (2017). Unleashing the Power of Science in Early Childhood: A Foundation for High-Quality Interactions and Learning. *Zero to Three*, 37(5), 13-21.
- Gropen, J., Kook, J. F., Hoisington, C., & Clark-Chiarelli, N. (2017). Foundations of science literacy: Efficacy of a preschool professional development program in science on classroom instruction, teachers' pedagogical content knowledge, and children's observations and predictions. *Early Education and Development*, 28(5), 607-631.
- Grossman, P. L. (1990). *The making of a teacher: Teacher knowledge and teacher education*. Teachers College Press, Teachers College, Columbia University.
- Guarrella, C., Cohrssen, C., & van Driel, J. (2021). The quality of teacher-child interactions during the enactment of playful science games in preschool. *Early Education and Development*, 33(4), 1-21.
- Gullberg, A., Andersson, K., Danielsson, A., Scantlebury, K., & Hussénus, A. (2018). Pre-service teachers' views of the child-reproducing or challenging gender stereotypes in science in preschool. *Research in Science Education*, 48(4), 691-715.
- Hamel, E., Joo, Y., Hong, S. Y., & Burton, A. (2021). Teacher questioning practices in early childhood science activities. *Early Childhood Education Journal*, 49(3), 375-384.

- Hammer, A. S. E., & He, M. (2016). Preschool teachers' approaches to science: A comparison of a Chinese and a Norwegian kindergarten. *European Early Childhood Education Research Journal*, 24(3), 450-464.
- Hashweh, M. Z. (2005). Teacher pedagogical constructions: a reconfiguration of pedagogical content knowledge. *Teachers and teaching*, 11(3), 273-292.
- Hashweh, M. (2013). Pedagogical content knowledge: Twenty-five years later. In *From teacher thinking to teachers and teaching: The evolution of a research community*. Emerald Group Publishing Limited.
- Herman, B. C. (2018). Students' environmental NOS views, compassion, intent, and action: Impact of place-based socioscientific issues instruction. *Journal of Research in Science Teaching*, 55(4), 600-638.
- Kang, E. J., Donovan, C., & McCarthy, M. J. (2018). Exploring elementary teachers' pedagogical content knowledge and confidence in implementing the NGSS science and engineering practices. *Journal of Science Teacher Education*, 29(1), 9-29.
- Karabon, A. (2021). Examining how early childhood preservice teacher funds of knowledge shapes pedagogical decision making. *Teaching and Teacher Education*, 106, 103449.
- Karademir, A., Kartal, A., & Türk, C. (2020). Science education activities in Turkey: A Qualitative comparison study in preschool classrooms. *Early Childhood Education Journal*, 48(3), 285-304.
- Kind, V. (2009). Pedagogical content knowledge in science education: perspectives and potential for progress. *Studies in science education*, 45(2), 169-204.
- Kind, V., & Chan, K. K. (2019). Resolving the amalgam: connecting pedagogical content knowledge, content knowledge and pedagogical knowledge. *International Journal of Science Education*, 41(7), 964-978.
- Kutluca, A. Y. (2021a). An investigation of elementary teachers' pedagogical content knowledge for socioscientific argumentation: The effect of a learning and teaching experience. *Science Education*, 105(4), 743-775.
- Kutluca, A. Y. (2021b). Investigation of the interactions among preschool teachers' components of pedagogical content knowledge for early science teaching. *Southeast Asia Early Childhood Journal*, 10(1), 117-137.
- Kutluca, A. Y., & Mercan, N. (2022). Exploring the effects of preschool teachers' epistemological beliefs on content-based pedagogical conceptualizations and pck integrations towards science teaching. *European Journal of Science and Mathematics Education*, 10(2), 170-192.
- Larimore, R. A. (2020). Preschool science education: A vision for the future. *Early Childhood Education Journal*, 48(6), 703-714.
- Leuchter, M., Saalbach, H., Studhalter, U., & Tettenborn, A. (2020). Teaching for conceptual change in preschool science: Relations among teachers' professional beliefs, knowledge, and instructional practice. *International Journal of Science Education*, 42(12), 1941-1967.
- Loughran, J. J., Berry, A., & Mulhall, P. (2006). *Understanding and developing science teachers' pedagogical content knowledge*. Brill.
- Magnusson, S., Krajcik, J., & Borko, H. (1999). Nature, sources, and development of pedagogical content knowledge for science teaching. In *Examining pedagogical content knowledge* (pp. 95-132). Springer, Dordrecht.

- McLean, K., Jones, M., & Schaper, C. (2015). Children's literature as an invitation to science inquiry in early childhood education. *Australasian Journal of Early Childhood*, 40(4), 49-56.
- Milli Eğitim Bakanlığı. (2013). Okul Öncesi Eğitim Programı. Ankara.
- Mutekwe, E. (2017). Advancing the learning equity agenda through a social constructivist epistemology to teaching and learning in the curriculum. *International Journal of Educational Sciences*, 17(1-3), 197-204.
- National Research Council. (2013). *A framework for K-12 science education: practices, cross-cutting concepts, and core ideas*. Washington: The National Academies Press.
- Neuman, S. B., & Danielson, K. (2021). Enacting content-rich curriculum in early childhood: the role of teacher knowledge and pedagogy. *Early Education and Development*, 32(3), 443-458.
- Neumann, K., Kind, V., & Harms, U. (2019). Probing the amalgam: the relationship between science teachers' content, pedagogical and pedagogical content knowledge. *International Journal of Science Education*, 41(7), 847-861.
- NGSS Lead States. (2013). *Next generation science standards: For states, by states*. Washington, DC: The National Academy Press.
- Nilsson, P., & Elm, A. (2017). Capturing and developing early childhood teachers' science pedagogical content knowledge through CoRes. *Journal of Science Teacher Education*, 28(5), 406-424.
- Nilsson, P., & Loughran, J. (2012). Exploring the development of pre-service science elementary teachers' pedagogical content knowledge. *Journal of Science Teacher Education*, 23(7), 699-721.
- Olgan, R. (2015). Influences on Turkish early childhood teachers' science teaching practices and the science content covered in the early years. *Early Child Development and Care*, 185(6), 926-942.
- Oppermann, E., Brunner, M., & Anders, Y. (2019). The interplay between preschool teachers' science self-efficacy beliefs, their teaching practices, and girls' and boys' early science motivation. *Learning and Individual Differences*, 70, 86-99.
- Oppermann, E., Hummel, T., & Anders, Y. (2021). Preschool teachers' science practices: Associations with teachers' qualifications and their self-efficacy beliefs in science. *Early Child Development and Care*, 191(5), 800-814.
- Osborne, J., Collins, S., Ratcliffe, M., Millar, R., & Duschl, R. (2003). What "ideas-about-science" should be taught in school science? A Delphi study of the expert community. *Journal of research in science teaching*, 40(7), 692-720.
- Park, S., & Oliver, J. S. (2008). Revisiting the conceptualisation of pedagogical content knowledge (PCK): PCK as a conceptual tool to understand teachers as professionals. *Research in Science Education*, 38(3), 261-284.
- Park, S., & Suh, JK. (2015). From portraying toward assessing PCK: Drivers, dilemmas, and directions for future research. In A. Berry, P. Friedrichsen, y J. Loughran (Eds.), *Re-examining Pedagogical Content Knowledge in Science Education* (pp. 104-119). Routledge.
- Saçkes, M., Trundle, K. C., Bell, R. L., & O'Connell, A. A. (2011). The influence of early science experience in kindergarten on children's immediate and later science achievement: Evidence from the early childhood longitudinal study. *Journal of Research in Science Teaching*, 48(2), 217-235.

- Saçkes, M., Trundle, K. C., & Shaheen, M. (2020). The effect of Balanced Learning® curriculum on young children's learning of science. *Early Childhood Education Journal*, 48(3), 305-312.
- Samuelsson, R. (2018). Children's explorations of the concept of spinning in preschool: Science learning in mediated activity. *Learning, Culture and Social Interaction*, 17, 90-102.
- Seefeldt, C., & Galper, A. (2007). "Sciencing" and young children. *Early Childhood Today*, 21(7), 12-13.
- Siry, C. (2014). Towards multidimensional approaches to early childhood science education. *Cultural Studies of Science Education*, 9(2), 297-304.
- Shulman, L. S. (2015). PCK: Its genesis and exodus. In *Re-examining pedagogical content knowledge in science education* (pp. 13-23). Routledge.
- Shulman, L. S. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4-14.
- Sundberg, B., & Ottander, C. (2013). The conflict within the role: A longitudinal study of preschool student teachers' developing competence in and attitudes towards science teaching in relation to developing a professional role. *Journal of early childhood teacher education*, 34(1), 80-94.
- Torbeyns, J., Verbruggen, S., & Depaepe, F. (2020). Pedagogical content knowledge in pre-service preschool teachers and its association with opportunities to learn during teacher training. *ZDM-Mathematics Education*, 52(2), 269-280.
- Trundle, K. C., & Saçkes, M. (2021). Teaching and learning science during the early years. *Journal of Childhood, Education & Society*, 2(3), 217-219.
- Trundle, C. K. (2015). The inclusion of science in early childhood classrooms. In *Research in early childhood science education* (pp. 1-6). Springer, Dordrecht.
- van der Aalsvoort, G., van der Zee, S., & de Wit, T. (2020). Improving science skills by practicing geometry and measurement in Kindergarten. *Early Child Development and Care*, 190(4), 537-548.
- Warwick, P., Wilson, E., & Winterbottom, M. (2006). *Teaching and learning primary science with ICT*. City: McGraw-Hill Education (UK).
- Wright, T. S., & Gotwals, A. W. (2017). Supporting kindergartners' science talk in the context of an integrated science and disciplinary literacy curriculum. *The Elementary School Journal*, 117(3), 513-537.
- Wu, D., Liao, T., Yang, W., & Li, H. (2021). Exploring the relationships between scientific epistemic beliefs, science teaching beliefs and science-specific PCK among pre-service kindergarten teachers in China. *Early Education and Development*, 32(1), 82-97.
- Yıldız, S., & Tükel, A. (2018). Okul öncesi öğretmenlerinin fen etkinliklerine yer verme durumlarının değerlendirilmesi. *Uluslararası Sosyal Bilimler Eğitimi Dergisi*, 4(1), 49-59.
- Yılmaz, M. M., Özen, R., & Sığırtmaç, A. D. (2020). Okul öncesi fen eğitimi alanında yapılan çalışmaların tematik içerik analizi: 2015-2019 yılları arası. *Gazi Üniversitesi Gazi Eğitim Fakültesi Dergisi*, 40(2), 553-589.
- Zeidler, D. L., & Nichols, B. H. (2009). Socioscientific issues: Theory and practice. *Journal of elementary science education*, 21(2), 49-58.