Teaching Innovations, Volume 36, Issue 2, pp. 17–34
DOI: 10.5937/inovacije2302017S

Miljana D. Stajin[1]
Zorica S. Kovačević
University of Belgrade, Teacher Education Faculty, Belgrade, Serbia

Original research paper

Paper received: Feb 21 2022
Paper accepted: Maj 26 2023
Article Published: Jul 5 2023

Attitudes of Preschool Teachers Towards the Importance of Developing Competences in Natural Sciences in Working With Children of the Preschool Age

Extended summary

In the modern society of science and technology, scientific literacy is seen as one of the key educational competencies. However, research shows that young people's interest in natural sciences is very low, that the average achievement of the fifteen-year-olds in the field of natural sciences in Serbia is significantly lower compared to the OECD average, but also that significantly higher results in the field of natural sciences are achieved by students of the fourth grade in Serbia who were included in the preschool education program. Supporting the development of scientific literacy in early childhood can greatly contribute to building a positive attitude of children towards science, and there are certainly good grounds for this because in no other period of life is curiosity as intense as in childhood. With appropriate support, this natural curiosity and need to explore the world can become the basis for introducing children to elementary research procedures and building a scientific worldview. In this, the role that preschool teachers play is of great importance, which is linked to their attitude towards natural sciences and the development of scientific competencies. The preschool teacher is expected to have a positive attitude towards natural sciences, elementary knowledge in the field of natural sciences, to support children's interest in natural sciences and world exploration and create a stimulating environment for research.

The paper presents the results of the research aimed at examining the relationship of the preschool teachers towards natural sciences and the development of the scientific competen-

1 miljana.micovic@uf.bg.ac.rs

cies of preschool children - how they assess their interest in natural sciences and their knowledge in the field of natural sciences, how they assess children's interest in the phenomena in the field of natural sciences and what they see as the greatest contribution of the situations during which they explore together with the children the phenomena they study in natural sciences. A descriptive method was used, with surveying as a research technique. The preschool teachers' attitudes were examined using a survey questionnaire with open and closed questions, and the research included 149 teachers employed in kindergartens in the territory of the Republic of Serbia. The results of the research show that preschool teachers in Serbia have a positive attitude towards natural sciences and the development of scientific literacy. As many as 83.2% of the surveyed teachers are interested in the phenomena studied in natural sciences, 87.9% of them believe that they have satisfactory knowledge in the field of natural sciences, and 88.6% believe that starting research with children on natural phenomena requires their prior knowledge of these phenomena. These results confirm the attitudes that indicate the connection and mutual conditioning of the teachers' assessment of the possession of elementary knowledge about natural phenomena and their relationship to natural sciences. The preschool teachers working in the countryside (M=3.90) and the preschool teachers working in Belgrade (3.88) estimated children's interest in the phenomena they study in natural sciences, on a scale of 1 to 5, slightly higher than the preschool teachers working in a small town (M=3.58). Almost two-thirds of teachers believe that there is a connection between children's interest in natural phenomena and children's age, i.e., that older children, in comparison to younger children, are more interested in natural phenomena. The majority of the preschool teachers (84.6%) believe that there is no connection between children's interest in natural phenomena and children's gender. Slightly more than a half of the preschool teachers (55.0%) believe that there is no connection between children's interest in natural phenomena and the level of education and the occupation of parents, but they state that the way parents spend their free time with their children can be important.

However, the results of the research also indicate that the majority of the preschool teachers opt for topics that are not temporally and contextually close to children and that do not provide an opportunity for direct research, as well as that a very small percentage of preschool teachers allows children to check their initial theories through direct research in which they see themselves as children's partners in research and not as providers of the ready-made knowledge. Preschool teachers believe that the greatest contribution of the situations in which children explore natural phenomena is the fact that they enable children to enjoy themselves and have fun (M=4.78), and the smallest contribution is perceived in developing children's interest in science or professions close to natural sciences (M=4.11). The preschool teachers who work in the countryside or in Belgrade, compared to those who work in a smaller city, attach statistically significantly greater importance to all segments of the development of scientific literacy. This indicates that extreme situations, such as a direct contact with nature and a spatial distance from nature, result in the perception of a greater significance in the situations during which natural phenomena are investigated.

The development of transversal competencies was not sufficiently recognized neither in the preschool education curricula, nor in the curricula of the initial preschool teacher educa-

tion. Such circumstances left a mark on the attitude of the preschool teachers towards researching natural phenomena with children - for them it represents something exciting and interesting for children to research, and not a basis for the development of scientific competencies, critical thinking, and dispositions for learning. It would be important to examine in some new research whether the new curricular conception of the Years of Ascension will lead to transformations in the attitude of the preschool teachers towards the development of scientific competencies. In all of this, the programs of initial education and professional development of preschool teachers which can provide a strong support in facing the challenges that await them are of great importance.

Keywords: key educational competencies, competencies in natural sciences, scientific literacy, preschool children

References

- Andersson, K., and 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. https://doi.org/10.1007/s11422-012-9439-6
- Baucal, A. i Pavlović Babić, D. (2010). *PISA 2009 u Srbiji: prvi rezultati Nauči me da mislim, nauči me da učim.* Beograd: Institut za psihologiju Filozofskog fakulteta u Beogradu, Centar za primenjenu psihologiju.
- Belay, R. i Pol, D. (2009). Istraživački pristup znanstvenom obrazovanju. *Djeca u Europi*. 1 (1), 13–16.
- Bernard, P. and Dudek, K. (2017). Revisiting students' perceptions of research scientists – outcomes of an indirect draw-a-scientist test (InDAST). *Journal of Baltic Science Education*. 16 (4), 562–575.
- Blagdanic, S., Miscevic Kadijevic, G. and Kovacevic, Z. (2019). Gender stereotypes in preschoolers' image of scientists. *European Early Childhood Education Research Journal*. 27 (2), 272–284.
- Borić, E., Škugor, A. i Perković, I. (2010). Samoprocjena učitelja o izvanučioničkoj istraživačkoj nastavi prirode i društva. *Odgojne znanosti*. 12 (2), 361–371.
- Buđevac, N. i Kovačević, Z. (2020). Sagledavanje deteta i procesa učenja u novim osnovama programa predškolskog vaspitanja i obrazovanja. U: Opačić Z. i Zeljić, G. (ur.). *Programske (re)forme u obrazovanju i vaspitanju – izazovi i perspektive* (463–476). Međunarodni naučni skup *Programske (re)forme u obrazovanju i vaspitanju – izazovi i perspektive*, 20. 5. 2019. Beograd: Učiteljski fakultet.
- Buljan Culej, J. i Antulić, S. (2016). Rezultati istraživanja TIMSS i pokazatelji uspješnosti u odnosu na pohađanje predškolske ustanove – Knjiga sažetaka 3. U: Jugović, I. (ur.). *Dani obrazovnih znanosti – Obrazovne promjene: izazovi i očekivanja* (47–48). Interdisciplinarna naučna konferencija *Dani obrazovnih znanosti*, 20–21. 10. 2016. Zagreb: Institut za društvena istraživanja u Zagrebu.
- Carr, M. and Claxton, G. (2002). Tracking the Development of Learning Dispositions. *Assessment in Education: Principles, Policy & Practice*. 9 (1), 9–37. https://doi.org/ 10.1080/09695940220119148
- Carr, M. (2001). *Assessment in Early Childhood Settings*. London: Paul Chapman Publishing.
- Carr, M., Lee, W., Jones, C., Smith, A., Marshall, K. and Duncan, J. (2010). *Learning in the making: disposition and design in early education*. Rotterdam: Sense Publishers.

- Ceylan, R. C. and Akçay Malçok, B. (2020). Provedba STEM nastave u ranoj dobi i mišljenja svih dionika: primjer Turske. *Croatian Journal of Education*. 22 (3), 717-754. https://doi.org/10.15516/cje.v22i3.3544
- Chambers, D. (1983). Stereotypic Images of the Scientist: The Draw-A-Science Test, *Science Education*. 67 (2), 255-265.
- Đević, R., Stanišić, J. i Vujačić, M. (2021). Rane obrazovne aktivnosti roditelja sa decom i školsko postignuće učenika iz matematike i prirodnih nauka. U: Đerić, I., Gutvajn, N., Jošić, S. i Ševa, N. (ur.). *TIMSS 2019 u Srbiji: rezultati međunarodnog istraživanja postignuća učenika četvrtog razreda osnovne škole iz matematike i prirodnih nauka* (85-87). Beograd: Institut za pedagoška istraživanja.
- Elezović, I., Antulić Majcen, S., Vranković, B. i Muraja, J. (2021). *Rezultati TIMSS 2019 – Međunarodnoga istraživanja trendova u znanju matematike i prirodoslovlja Nacionalni izvještaj: Republika Hrvatska*. Zagreb: Nacionalni centar za vanjsko vrednovanje obrazovanja.
- European Commission. (2006). Recommendation of the European Parliament and of the Council of 18 December for lifelong learning. Retrieved September 29, 2018. from https://eur- lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:394:0010:0018:en:PDF
- European Commission (2018a). Council Recommendation on High Quality Early Childhood Education and Care Systems. Retrieved September 29, 2018. from https://eur- lex.europa.eu/resource.html?uri = cellar:05aa1e50-5dc7-11e8-ab9c- 01aa75ed71a1.0003.02/DOC_1&format = PDF
- European Commission (2018b). Proposal for a Council Recommendation on Key Competences for Lifelong Learning. Retrieved September 29, 2018. from https://eur- lex.europa.eu/resource.html?uri=cellar:395443f6-fb6d-11e7-b8f5-01aa75ed71a1.0001.02/DOC_1&format=PDF
- Gullberg, A., Andersson, K., Danielsson, A., Scantlebury, K. and Hussénius, 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. https://doi.org/10.1007/s11165-016-9593-z
- Jošić, S., Teodorović, J. i Jakšić, I. (2021). Faktori postignuća učenika iz matematike i prirodnih nauka. U: Đerić, I., Gutvajn, N., Jošić, S. i Ševa, N. (ur.). *TIMSS 2019 u Srbiji: rezultati međunarodnog istraživanja postignuća učenika četvrtog razreda osnovne škole iz matematike i prirodnih nauka* (45-65). Beograd: Institut za pedagoška istraživanja.
- Kovačević, Z. (2018). *Osposobljavanje za samostalno učenje*. Beograd: Učiteljski fakultet.
- Kovačević, Z. (2022). Čime se bavimo u vrtiću i zašto mislimo da je to važno?. *Research in Pedagogy*. 12 (2), 391-406. https://doi.org/10.5937/IstrPed2202391K
- Krnjaja, Ž. (2012b). Igra na ranim uzrastima. U: Baucal, A. (ur.). *Standardi za razvoj i učenje dece ranih uzrasta u Srbiji* (113-132). Beograd: Institut za psihologiju Filozofskog fakulteta.
- Krnjaja, Ž. i Pavlović Breneselović, D. (2022). *Vodič za razvijanje tema/projekata sa decom*. Beograd: Ministarstvo prosvete, nauke i tehnološkog razvoja.
- Marojević, J. i Milić, S. (2017). Habermas and Freire in a Dialogue: Pedagogical Reading of Habermas. *Croatian Journal of Education*, 19 (2), 605-635. https://doi.org/10.15516/cje.v19i2.2340
- Marojević, J., Todorović, K. i Milić, S. (2020). Pedagogija slušanja vs. pedagogija slušanja odgojitelja: etnografsko istraživanje o autonomiji djeteta u vrtićima u Crnoj Gori. *Društvena istraživanja*. 29 (4), 575-597. https://doi.org/10.5559/di.29.4.04

- Mićović, M. (2021). Stavovi vaspitača o značaju ključnih obrazovnih kompetencija za celoživotno učenje u radu sa decom predškolskog uzrasta. *Research in Pedagogy*, 11 (1), 297-310. https://doi.org/10.5937/IstrPed2101297M
- Milotić, B. (2013). Djeca kao znanstvenici – znanstvenici kao djeca. *Dijete, vrtić, obitelj*. 19 (73), 16-17.
- *Osnove programa predškolskog vaspitanja i obrazovanja – Godine uzleta* (2018). Beograd: Prosvetni pregled.
- Ozel, M. (2012). Children's Images of Scientists: Does Grade Level Make a Difference? *Educational Sciences: Theory & Practice*. 12 (4), 3187-3198.
- Özgelen, S. (2012). Turkish Young Children's Views on Science and Scientists. Educational Sciences. *Theory & Practice*. 12 (4), 3211-3225.
- Pavlović Babić, D. Baucal, A. i Kuzmanović, D. (2009). *Naučna pismenost*. Beograd: Ministrastvo prosvete Republike Srbije - Zavod za vrednovanje kvaliteta obrazovanja i vaspitanja - Institut za psihologiju Filozofskog fakulteta Univerziteta u Beogradu.
- Pavlović Breneselović, D. i Krnjaja, Ž. (2022). Program predškolskog odgoja i obrazovanja „Godine uzleta" u Srbiji: Reggio pedagogija kao inspiracija. U: Slunjski, E. (ur.). *Šta nas uči Reggio* (119-136). Zagreb: Element d.o.o.
- Pešić, M. (1985). *Motivacija predškolske dece za učenje*. Beograd: Novinska organizacija „Prosvetni pregled".
- Pešikan, A. (2010). Savremeni pogledi na prirodu školskog učenja i nastave: socio-konstruktivističko gledište i njegove praktične implikacije. *Psihološka istraživanja*. 13 (2), 157-184.
- Popović, S., Bošković, D. i Krneta, M. (2018). *Naučna pismenost – Priručnik za nastavnike*. Beograd: Ministrastvo prosvete, nauke i tehnološkog razvoja RS - Zavod za vrednovanje kvaliteta obrazovanja i vaspitanja.
- Purbrick, P. (1997). Addressing stereotypic images of the scientist. *Australian Science Teachers Journal*. 43 (1), 60-62.
- Rocard, M. (2007). *Science education now: A renewed pedagogy for the future of Europe*. Luxemburg: Office for Official Publications of the European Communities. Retrieved February 7, 2023. from https://www.eesc.europa.eu/sites/default/files/resources/docs/rapportrocardfinal.pdf
- Roychoudhury, A. (2014). Connecting science to everyday experiences in preschool settings. *Cultural Studies of Science Education*. 9 (2), 305-315. https://doi.org/10.1007/s11422-012-9446-7
- Ševkušić, S. i Kartal, V. (2017). Postignuća učenika iz prirodnih nauka: glavni nalazi, trendovi i nastavni program. U: Marušić Jablanović, M., Gutvajn, N. i Jakšić, I. (ur.). *TIMSS 2015: rezultati međunarodnog istraživanja postignuća učenika 4. razreda osnovne škole iz matematike i prirodnih nauka* (51-65). Beograd: Institut za pedagoška istraživanja.
- Siry, C. (2014). Towards multidimensional approaches to early childhood science education. *Cultural Studies of Science Education*. 9 (2), 297-304. https://doi.org/10.1007/s11422-012-9445-8
- Slunjski, E. (2008). *Dječji vrtić – zajednica koja uči*. Zagreb: Spektar Medija.
- Slunjski, E. (2012). Dijete kao znanstvenik – prirodoslovni aspekti suvremeno koncipiranoga kurikuluma ranog odgoja. *Školski vjesnik*. 61 (1-2), 163-178.
- *Te Whāriki - Early Childhood Curriculum* (2016). Wellington: Ministry of Education New Zealand.

- Togrol, A. Y. (2013). Turkish students' images of scientists. *Journal of Baltic Science Education*. 12 (3), 289–298.
- Van Keulen, H. (2018). STEM in early childhood education. *European Journal of STEM Education*. 3 (3), 7–9. https://doi.org/10.20897/ejsteme/3866
- Videnović, M. i Čarapić, G. (2020). *PISA 2018: Izveštaj za Republiku Srbiju*. Beograd: Ministarstvo prosvete, nauke i tehnološkog razvoja.
- Vujičić, L. (2013). Razvoj znanstvene pismenosti u vrtiću: izazov za odgajatelje. *Dijete, vrtić, obitelj*. 19 (73), 8–10.
- Vujičić, L. (2017). *Razvoj znanstvene pismenosti u ustanovama ranog odgoja.* Rijeka: Učiteljski fakultet.
- Vuković, O. (2015). Kako maturanti procenjuju značaj ključnih kompetencija za celoživotno učenje. U: Radosavljević, D. (ur.). *Vrednosti i identitet* (89–96). Međunarodni naučni skup *Vrednosti i identitet*. Novi Sad: Fakultet za pravne i poslovne studije „Dr Lazar Vrkatić".
- Worth, K. (2010). Science in early childhood classrooms: Content and process. *Early Childhood Research & Practice (ECRP)*. 12 (2), 1–17.