## 'Specialization in ICTs and Special Education: Psychopedagogy of Integration' Postgraduate Program DEMOCRITUS UNIVERSITY OF THRACE Department of Greek Philology in collaboration with NCSR DEMOKRITOS Informatics and Telecommunications Institute

## OPINIONS OF SECONDARY EDUCATION TEACHERS ON THE ROLE OF EDUCATIONAL MATERIAL IN TEACHING SCIENCES TO STUDENTS WITH LEARNING DISABILITIES

DIMOUDI ANASTASIA

POSTGRADUATE THESIS

Athens/Komotini 2021

## **ABSTRACT**

As the integration of students with Learning Disabilities is increasing in general education classes, it is considered necessary to apply teaching methods that will make the learning and teaching process easier for these students. One such method is the application and use of educational material which functions as a tool that facilitates the active participation of students in the educational process. The purpose of this paper is to investigate the views of secondary school teachers on the role of educational materials in teaching science to students with learning disabilities. For the conduct of the research, an electronic questionnaire was distributed to fifty secondary school teachers who have a basic degree in Sciences and work in schools in Attica.

64% of the participants stated that they use educational material and in total they reported that they apply most of the materials available to them with men making more use of video and laboratory experiment than women. Teachers claim to use the material to introduce new concepts, implement extension activities, enrich their teaching and offer collaborative learning opportunities. On the other hand, they do not use it either because it is not available from the school or because the lesson time is not enough, while the difficulty they encounter mainly concerns the fact that students need extra time. The didactic goals that are realized are the cultivation of the mutual cooperation, the individualized teaching is served, the students are actively involved with activities, they use the knowledge more practically in their daily life, they assimilate the material to a better degree and their interest increases. The criterion for selecting the material is initially the interest of the students, its duration and ease of use. Finally, attractive textbooks, appropriate materials and spaces as well as the teaching method, communication with classmates and the teacher, as well as feedback processes are factors that may mobilize students' interest.

## References

- Abrahams, I. & Millar, R. (2008). Does Practical Work Really Work? A study of the effectiveness of practical work as a teaching and learning method in school science, *International Journal of Science Education*, 30(14), 1945 1969, doi: 10.1080/09500690701749305
- Αγναντή, Β. (2018). Διερευνώντας τις απόψεις των δασκάλων Ειδικής Αγωγής για το ρόλο του εκπαιδευτικού υλικού στη διδασκαλία των Μαθηματικών και των Φυσικών Επιστημών. Πανεπιστήμιο Αιγαίου, Σχολή Ανθρωπιστικών Επιστημών, Τμήμα Επιστημών της Προσχολικής Αγωγής και του Εκπαιδευτικού Σχεδιασμού, Ρόδος
- Alibali, M. W. & Nathan, M. J. (2012). Embodiment in Mathematics Teaching and Learning: Evidence From Learners' and Teachers' Gestures. *Journal of the Learning Sciences*, *21*(2), 247-286. doi: 10.1080/10508406.2011.611446
- Ambrose, R. (2004). Initiating change in prospective elementary teachers' orientations to mathematics teaching by building on beliefs. *Journal of Mathematics Teacher Education*, 7(2), 91–119.
- Αναγνωστόπουλος, Δ.Κ. (2001). Η συννοσηρότητα των μαθησιακών διαταραχών. Αρχεία Ελληνικής Ιατρικής 2001, 18(5):457-465
- Anastasiou, D. (2005). Thoughts on the history of the field of Learning Disabilities. Contemporary Education (Σύγχρονη Εκπαίδευση), 140, 155-172. [in Greek]
- Antle, A. N., & Wise, A. F. (2013). Getting Down to Details: Using Theories of Cognition and Learning to Inform Tangible User Interface Design. *Interacting with Computers,* 25, 1-20.
- Arzi, H. J. & White, R. T. (2007). Change in Teachers' Knowledge of Subject Matter: A 17-

- Year Longitudinal Study, Science Education, 92, 221–251. doi:10.1002/sce.20239
- Ball, L. D., Thames, M. H., & Phelps, G. (2008). Content knowledge for teaching: What makes it special? *Journal of Teacher Education*, *59*(*5*), 389–407.
- Βασιλειάδης, Η. (2013). Υπουργείο Πολιτισμού, Παιδείας και Θρησκευμάτων. Πράξη:"
  Πιστοποίηση Ελληνομάθειας: Υποστήριξη και ποιοτική ανάδειξη της διδασκαλίας/εκμάθησης της ελληνικής ως ξένης/δεύτερης γλώσσας" .Παππάς, Β. (επ)
- Bertram, A. & Loughran, J. (2012). Science Teachers' Views on CoRes and PaP-eRs as a Framework for Articulating and Developing Pedagogical Content Knowledge. *Res Sci Educ 42, 1027–1047,* https://doi.org/10.1007/s11165-011-9227-4
- Brigham, F. J., Scruggs, T. E., & Mastropieri, M. A. (2011). Science education and students with learning disabilities. *Learning Disabilities Research & Practice*, *26*(4), 223-232.
- Casey, A. J. (2016). Going Beyond the Provided Curriculum: Teachers' Investigations of Outside Mathematics Materials. Dissertation. Ανακτήθηκε από https://escholarship.org/uc/item/6h962882.
- Clermont, C. P., Borko, H., & Krajcik, J. S. (1994). Comparative study of the pedagogical content knowledge of experienced and novice chemical demonstrators. *Journal of Research in Science Teaching*, *31*(4), 419–441.
- Cockett, A. & Kilgour, P. (2015). Mathematical Manipulatives: Creating an Environment for Understanding, Efficiency, Engagement, and Enjoyment. *Teach Collection of Christian Education*, *1*(1), 47 54.
- Coenders, F., Terlouw, C., Dijkstra S., & Pieters, J. (2010). The Effects of the Design and Development of a Chemistry Curriculum Reform on Teachers' Professional Growth: A Case Study. *J Sci Teacher Educ*, *21*, 535–557. doi: 10.1007/s10972-010-9194-z

- Coenders, F., Terlouw, C., & Dijkstra, S. (2008). Assessing teachers' beliefs to facilitate the transition to a new chemistry curriculum: what do the teachers want?. *Journal of science teacher education*, 19, 317-335.
- Davis, E., A., Janssen, F. J. J. M., & Van Driel, J. H.( 2016). Teachers and science curriculum materials: where we are and where we need to go, *Studies in Science Education*, *52*(2), 127-160, doi: 10.1080/03057267.2016.1161701
- Davis, J., D. (2009). Understanding the influence of two mathematics textbooks on prospective secondary teachers' knowledge. *Journal of Mathematics Teacher Education*, *12*, 365–389. doi: 10.1007/s10857-009-9115-2
- De Jong, T., Linn M. C., & Zacharia Z. C. (2013). Physical and Virtual Laboratories in Science and Engineering Education, *340(6130)*, 305-308, doi: 10.1126/science.1230579
- Forbes, C., T. (2013). Curriculum-Dependent and Curriculum-Independent Factors in Preservice Elementary Teachers' Adaptation of Science Curriculum Materials for Inquiry-Based Science, *Journal of Science Teacher Education, 24,* 179–197. doi: 10.1007/s10972-011-9245-0
- Gomez Zwiep, S. & Benken, B. (2013). Exploring teachers' knowledge and perceptions across Mathematics and Science through content-rich learning experiences in a professional development setting. *International Journal of Science & Mathematics Education*, 11(2), 299-324.
- Hofstein, A. & Lunetta, V. N. (2003). The Laboratory in Science Education: Foundations for the Twenty-First Century, *Science Education*, *88*, 28-54, doi: 10.1002/sce.10106
- Howard, P., Perry, B. & Tracey, D. (1997). Mathematics and manipulatives: Comparing primary and secondary teachers' views s. Paper presented at the annual conference of Australian Association for Research in Education, Brisbane, December.

- Θεοφανίδου, Χ. (2018). Συγκρίνοντας την ενσώματη μάθηση σε περιβάλλοντα μεικτής και συμβατικής πραγματικότητας: Η περίπτωση των νοερών αριθμογραμμών για τα κλάσματα. Πανεπιστήμιο Δυτικής Μακεδονίας, Παιδαγωγική Σχολή Φλώρινας, Παιδαγωγικό τμήμα, Τμήμα Δημοτικής Εκπαίδευσης, Φλώρινα.
- Καλαφατά, Μ., Σκουμπουρδή, Χ. & Χρυσανθή, Π. Τ. (2016). Απόψεις υποψήφιων και εν ενεργεία εκπαιδευτικών για το υλικό στη διδασκαλία των μαθηματικών. Στο Μ. Σκουμιός & Χ. Σκουμπουρδή (Επιμ.) 2ο Πανελλήνιο Συνέδριο: Το εκπαιδευτικό υλικό στα Μαθηματικά και το εκπαιδευτικό υλικό στις Φυσικές Επιστήμες: μοναχικές πορείες ή αλληλεπιδράσεις; (σελ. 391-400). Ρόδος: Εργαστήριο Μαθησιακής Τεχνολογίας και Διδακτικής Μηχανικής του Τ.Ε.Π.Α.Ε.Σ. και Εργαστήριο Φυσικών Επιστημών του Π.Τ.Δ.Ε. του Πανεπιστημίου Αιγαίου.
- Kahan, J. A., Cooper, D. A., & Bethea, K. A. (2003). The role of Mathematics teachers' cocntent knowledge in their teaching: A framework for research applied to a study of student teachers. *Journal of Mathematics Teacher Education 6*, 223–252.
- Kind, V. (2009). Pedagogical content knowledge in science education: perspectives and potential for progress. *Studies in Science Education*, *45(2)*, 169-204.
- Kontas, H. (2016). The Effect of Manipulatives on Mathematics Achievement and Attitudes of Secondary School Students. *Journal of Education and Learning*, *5*(3), 10-20.
- Levitt, K. E. (2002). An analysis of elementary teachers' beliefs regarding the teaching and learning of science. *Science education*, 86(1), 1-22.
- Lindgren, R. & Johnson-Glenberg, M. (2013). Emboldened by embodiment: Six precepts for research on embodied learning and mixed reality. *Educational Researcher*, *42(8)*, 445-452.
- Lindgren, R. & Moshell, J. M. (2011). Supporting children's learning with body-

- based metaphors in a mixed reality environment. In *Proceedings of the 10th International Conference on Interaction Design and Children,* (pp.177–180). New York: ACM.
- Loughran, J., Mulhall, P., & Berry, A. (2008). Exploring Pedagogical Content Knowledge in Science Teacher Education. *International Journal of Science*, *30(10)*, 1301–1320.
- Luna, M. (2007). Science teachers' beliefs about the role of curriculum materials in teaching and learning. Avaktήθηκε από http://www.project2061.org/publications/2061Connections/2007/media/KSIdocs/luna\_paper.pdf
- Μαντζανά, Α. & Νικολόπουλος, Γ. (2016). Ειδικές μαθησιακές δυσκολίες και ψηφιακό παιχνίδι. 6ο Πανελλήνιο Συνέδριο Επιστημών Εκπαίδευσης και Ειδικής Αγωγής. Υπουργείο Παιδείας, (σελ. 565-591).
- McCulloch Vinson, B. (2001). A Comparison of Preservice Teachers' Mathematics

  Anxiety Before and After a Methods Class Emphasizing Manipulatives, *Early Childhood Education Journal*, *29*(2), 89-94.
- McNeil, N. & Jarvin, L. (2007). When Theories Don't Add Up: Disentangling he Manipulatives Debate, Theory Into Practice, 46(4), 309-316, doi: 10.1080/00405840701593899
- Moyer, P. (2001). Are we having fun yet? How teachers use manipulatives to teach mathematics, *Educational Studies in Mathematics*, *47*, 175-197.
- Moyer, P. & Jones, G. (2004). Controlling choice: Teachers, pupils and manipulatives in mathematics classrooms, *School, Science and Mathematics*, *104(1)*, 16-31.
- Παντελιάδου, Σ. & Αντωνίου, Φ. (2008). Διδακτικές προσεγγίσεις και πρακτικές για μαθητές με Μαθησιακές Δυσκολίες. Βόλος: Γράφημα.

- Puchner, L., Taylor, A., O'Donnell, B., & Fick, K. (2008). Teacher Learning and Mathematics Manipulatives: A Collective Case Study About Teacher Use of Manipulatives in Elementary and Middle School Mathematics Lessons. *School Science and Mathematics*, 108(7), 313–325.
- Remillard, J. T. (2005). Examining key concepts in research on teachers' use of mathematics curricula. *Review of Educational Research*, 75(2), 211–246.
- Sherin, M. G. & Drake C. (2009). Curriculum strategy framework: investigating patterns in teachers' use of a reform-based elementary mathematics curriculum, *Journal of Curriculum Studies*, *41*(*4*), 467-500, doi: 10.1080/00220270802696115
- Shulman, S. (1987). Knowledge and teaching: Foundations of the new reform. *Harvard Educational Review*, *57*, 1–22.
- Shulman, L. (1986). Those who understand: Knowledge growth in teaching. *Educational Researcher*, 15(2), 4–14.
- Σκουμιός, Μ. & Σκουμπουρδή, Χ. (2018). Χρήση εκπαιδευτικού υλικού Μαθηματικών και Φυσικών Επιστημών: απόψεις εκπαιδευτικών. Στο Χ. Σκουμπουρδή & Μ. Σκουμιός (Επιμ.) 3ο Πανελλήνιο Συνέδριο: Εκπαιδευτικό Υλικό Μαθηματικών και Φυσικών Επιστημών: Διαφορετικές χρήσεις, διασταυρούμενε πορείες μάθησης (σελ. 14-65), Ρόδος.
- Σκουμιός, Μ. & Σκουμπουρδή, Χ. (2015). Ανάπτυξη εκπαιδευτικού υλικού στα Μαθηματικά και τις Φυσικές Επιστήμες. Στο Χ. Σκουμπουρδή & Μ. Σκουμιός (επιμ.) 1ο Πανελλήνιο Συνέδριο: Ανάπτυξη Εκπαιδευτικού Υλικού στα Μαθηματικά και τις Φυσικές Επιστήμες, (σελ. 14-37). Ρόδος.
- Singapogu, R. B. & Burg, T. C. (2009). Haptic virtual manipulatives for enhancing K-12 special education. In Proceedings of the 47th Annual Southeast Regional Conference, (p. 1-4). New York: ACM.

- Strickland, T. K. & Maccini, P. (2010). Strategies for Teaching Algebra to Students With Learning Disabilities: Making Research to Practice Connections, *Intervention in School and Clinic*, *46*(1), 38–45. doi:10.1177/1053451210369519
- Τζιβινίκου, Σ. (2015). Μαθησιακές Δυσκολίες Διδακτικές Παρεμβάσεις. Τμήμα Παιδαγωγικό Τμήμα Ειδικής Αγωγής, Πανεπιστήμιο Θεσσαλίας: Κάλλιπος. Ανακτήθηκε από: https://repository.kallipos.gr/handle/11419/5332
- Tobin, K. G. (1990). Research on science laboratory activities: In pursuit of better questions and answers to improve learning. *School Science and Mathematics*, *90(5)*, 403-418.
- Tolentino, L., Birchfield, D., Megowan-Romanowicz, C., Johnson-Glenberg, M. C., Kelliher, A., & Martinez, C. (2009). Teaching and Learning in the Mixed-Reality Science Classroom. *J Sci Educ Technol*, *18*, *501–517*. doi: 10.1007/s10956-009-9166-2
- Tooke, D. J., Hyatt, B., Leigh, M., Snyder, B., & Borda, T. (1992). Why Aren't Manipulatives Used in Every Middle School Mathematics Classroom? *Middle School Journal*, *24*(2), 61-62. doi: 10.1080/00940771.1992.11495172
- Tran, C., Smith, B., & Buschkuehl, M. (2017). Support of mathematical thinking through embodied cognition: Nondigital and digital approaches. *Cognitive research: principles and implications*, *2*(16), 1-18.
- Van Driel, J. H., Verloop, N., & de Vos, W. (1998). Developing science teachers' pedagogical content knowledge. *Journal of Research in Science Teaching*, *35(6)*, 673–695.
- Wilson, M. (2002). Six views of embodied cognition. *Psychonomic Bulletin & Review*, *9*(4), 625–636, https://doi.org/10.3758/BF03196322
- Χρυσογέλου, Μ. (2018). Απόψεις υποψηφίων και εν ενεργεία εκπαιδευτικών για το ρόλο του εκπαιδευτικού υλικού στη διδασκαλία των Μαθηματικών και Φυσικών

Επιστημών. Πανεπιστήμιο Αιγαίου, Σχολή Ανθρωπιστικών Επιστημών, Τμήμα Επιστημών της Προσχολικής Αγωγής και του Εκπαιδευτικού Σχεδιασμού, Ρόδος.