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| **Beyond Fragmentation: Global Perspectives on Didactics – Learning and**  **Teaching** |
| **Abstract**  The WERA IRN on Didactics - Learning and Teaching was established in February 2014 as a natural development of the network by the same name with the European Educational Research Association (EERA). The main aim of this IRN is to advance research on didactics - learning and teaching worldwide and to establish the research field fully on an international basis. This development aims to make a significant contribution to strengthening the vitality and reinforcing the sustainability of the field at a world level. In doing it aims to contribute to improving the quality of teaching, learning and the educational work of teachers at all levels of the education system, especially in schools and in teacher education. The place of didactics, learning and teaching was the subject of discussion within the EERA for several years prior to its establishment at the European Conference on Educational Research (ECER) that was held at the University of Geneva in 2006. Whilst issues related to teaching, learning and subject content are central to pedagogical and didactical practices, associated discussions have tended to be fragmented. This fragmentation can be reinforced by institutional structures, particular policy initiatives, the strength of some discourse communities and the relative weaknesses of others. The issues within the European context are reflected at the international level and this WERA IRN has been developed with the aim of providing a space for dialogue for integrating such discussions at a global level. We aim to establish an international space for advancing research on didactics – learning and teaching that will attract educational researchers with interests in pedagogical and didactical practices, curriculum, student learning and the teaching of specific subject areas worldwide. |
| **Summary**  The past decade has been marked by growing interest in teaching and learning at an international level, including particular interest in questions related to associated research and scholarship. Against this background are the long traditions when it comes to such questions. For example, the tradition of Didaktik can be traced back to John Amos Comenius in the seventeenth century though there is little discussion of didactics as such in the English-speaking educational community. Discussions about the nature of didactics - learning and teaching have taken on different characteristics in different national contexts and development has been especially strong in the domain of subject didactics. Furthermore, associated ideas have influenced the development of teacher education significantly in some countries, but not others, over recent years. For these reasons, we believed that it was timely to create a space for wider international dialogue in order to share perspectives and questions collectively as a WERA IRN community in relation to the advancement of research and scholarship in this field.  The work of the WERA IRN aims to build on the themes of the EERA Network. Considerable work has been undertaken already in developing common theoretical frameworks for the description, analysis and evaluation of classroom situations across national boundaries. This work has developed common ground and has involved a wide group of colleagues who are partners in the WERA IRN.   This symposium focuses on Sub Saharan Africa and on Ghana in particular, showcasing research studies on teachers’ views, teaching practices and learning outcomes. The first paper by Ernest Kofi Davis*,* Christopher Beccles & Joseph Ghartey Ampiah focuses on teachers’ views about teaching with the aim of ascertaining how their views place students at the centre of the teaching and learning process. The second paper by Christopher Yaw Kwaah and Joseph Ghartey Ampiah focuses on teaching practices of newly qualified, experienced trained and untrained teachers to examine how their practices compare. The third paper by Godwin Kwame Aboagyeand Theophilus Aquinas Ossei-Anto explored the effects of combining inquiry-based hands-on and simulation with cooperative learning on students’ learning outcomes in electric circuits. The fourth paper by Kofi Ayebi-Arthur & Kofi Acheaw Owusu explored an innovative way of engaging university students in classroom interaction using audience response system. Finally, Emmanuel Adu-Tutu Bofah and Foster Ntow looked at students’ learning outcomes by focusing on perceived social support network and student achievement in mathematics in an African context: mediation by motivational beliefs and moderation by gender.  **References**  Harford, J., Hudson, B. and Niemi, H. (Eds.) (2012) *Quality Assurance and Teacher Education: International Challenges and Expectations*, Peter Lang (Oxford). Hudson, B. and Meyer, M. (2011) Introduction: Finding common ground beyond fragmentation. In B. Hudson and M. Meyer (Eds.) *Beyond Fragmentation: Didactics, Learning and Teaching in Europe*, Verlag Barbara Budrich, Opladen and Farmington Hills, 9-28. Meyer, M. Hellekamps, S. and Prenzel, M. (2008) (Eds.) *Perspektiven der Didaktik: Zeitschrift für Erziehungswissenschaft*, Special Issue 9. Hudson, B. and Schneuwly, B. (2007) Editorial. In Hudson, B. and Schneuwly, B. (Eds.) Special Issue of the European *Educational Research Journal (EERJ) on Didactics: Learning and Teaching in Europe*, Vol. 6, No. 2, 106-108. Meyer, M.A., Hellekamps, St., and Wulf, Ch. (Eds.) (2012): Didactics in Europe. In: *Zeitschrift für Erziehungswissenschaft*, Vol. 15, No. 3. |
| **Session**  **Chair:** *Brian Hudson, University of Sussex, UK* |
| **Paper 1: Primary and Junior High School Mathematics and Science Teachers’ Views on Teaching**  *Ernest Kofi Davis, Christopher Beccles & Joseph Ghartey Ampiah, College of Education Studies, University of Cape Coast*    The performance of students in mathematics and science at the pre-tertiary level in Ghana has not been as good as it should. This paper draws on conceptualization of pupil-centred and teacher-centred methods by Brady (1985) to explore the views of primary school teachers and junior high school science and mathematics teachers on teaching, with the aim of ascertaining whether their views place the students at the centre of the teaching and learning process. Questionnaires were administered and responded to by 157 teachers (comprising 106 primary school teachers and 51 junior high school science and mathematics teachers) in the Cape Coast Metropolis of Ghana. The research participants were selected from all the six circuits in the Cape Coast Metropolis using stratified random sampling procedure. The quantitative data that were generated from the closed ended items were analysed using frequency counts, descriptive statistics (means and standard deviation) and inferential statistics (t-test). The qualitative data that were generated from the open ended items were analysed qualitatively and presented as narrative description with some illustrative examples. The findings from the study revealed among others that the participants’ views about teaching were predominantly teacher-centred with the majority perceiving the teacher as controller of the teaching and learning process and the sole judge of what is correct or wrong. Implication of the findings for mathematics and science teacher education in Ghana and other countries sub-Saharan African countries that share similar situation as Ghana is provided.  **Keywords**: Teachers, Views, Teaching, Science and Mathematics, Primary and Junior High School, Ghana  **References**  Brady, L. (1985). *Models and methods of teaching*. Australia, Prentice-Hall.  Mertens, D. M. (2010). *Research and evaluation in education and psychology interpreting diversity with quantitative, qualitative, and mixed methods (3rd ed.).* Los Angeles: SAGE Publications.  Mullis, I. V. S., Martin, M. O., Foy, P., & Arora, A. (2012). *TIMSS 2011 international results in mathematics*. Chestnut Hill, MA. |
| **Paper 2: Teaching Practices of Newly Qualified, Experienced Trained and Untrained Teachers in Basic Schools in Ghana**  *Christopher Yaw Kwaah & Joseph Ghartey Ampiah College of Education Studies, University of Cape Coast, Ghana*  This paper reports on the teaching practices of newly qualified teachers, experienced trained teachers and untrained teachers in Basic Schools in the Mfantsiman Municipal area in Ghana. The sequential mixed methods design was employed to collect both quantitative and qualitative data from the research participants. Questionnaires were administered to 425 basic school teachers randomly selected from rural and urban schools in the Municipality, using the stratified random sampling procedure. This was followed by observation of lessons of twenty teachers who were purposively selected. The research participants were selected from 20 public and 10 private schools in the rural and urban areas in the Municipality. Teacher type-related differences in teaching practices were explored using one-way multivariate analysis of variance (MANOVA) with a set of three scales as dependent variables and type of the teacher as the independent variables. The MANOVA results indicated differences in teaching strategies and delivery, assessment practices and classroom organisation and management among the three categories of teachers. However, all the three categories of teachers in both public and private schools favoured structured practices than student-oriented practices and enhanced activities. Furthermore, a hierarchical multiple regression analysis showed that beliefs on teaching and learning, years of teaching experience, qualification and age were the main reasons that explain the differences in teaching practices among the teachers. Implications for pre-service and in-service teacher training in Ghana have been discussed.  **Keywords**: Teaching practices, untrained teachers, newly qualified, experienced teachers, Ghana.  **References**  Akaguri, L. (2011). *Quality of low-fee private schools for the rural poor: Perceptions or reality? Evidence from southern Ghana*. CREATE Pathways to Access Research Monograh. No. 69. Brighton: University of Sussex.  Akyeampong, K. (2003). *Teacher training in Ghana: Does it count?* London: DFI.  Akyeampong, K. (2009). Revisiting free compulsory universal basic education (FCUBE) in Ghana. *Comparative Education*, *2(45)*, 175-196.  Akyeampong, K., Lussier, K., Pryor, J., & Westbrook, J. (2013). Improving teaching and learning of basic maths and reading in Africa : Does teacher preparation count ? *International Journal of Educational Development*, *33*, 272–282.  Borich, G. (1996). *Effective teaching methods*. *Comparative education* (3rd ed., Vol. 41). New York: Macmillan.  Charalambous, C. Y., Komitis, A., Papacharalambous, M., & Stefanou, A. (2014). Using generic and content-specific teaching practices in teacher evaluation: An exploratory study of teachers’ perceptions. *Teaching and Teacher Education*, *41*, 22–33. |
| **Paper 3: Effects of Combining Inquiry-Based Hands-On and Simulation with Cooperative Learning on Students’ Learning Outcomes in Electric Circuits**  *Godwin Kwame Aboagye, College of Education Studies, University of Cape Coast, Ghana & Theophilus Aquinas Ossei-Anto, College of Distance Education, University of Cape Coast, Ghana*  Concepts in electric circuits are reported in literature as being problematic for students at all levels of pre-tertiary education (Chi, 2008). The situation in Ghana is not different (Aboagye, Ossei-Anto & Johnson, 2011). This study was premised on the fact that combining inquiry-based real hands-on and computer simulation methods with cooperative learning has the potential of improving students’ learning outcomes. In all, 110 senior high school Form 2 students from two schools who participated were put into heterogeneous-ability and friendship cooperative learning groupings. Each group was taught electric circuits with the combination of inquiry-based real hands-on and computer simulation method. The aim was to compare the two groups in terms of their scientific reasoning and conceptual understanding. Within each group, the hypothetical-deductive and empirical-inductive students were also compared along the two learning outcomes. The results showed among others that the heterogeneous-ability group outperformed their counterparts in conceptual understanding of electric circuits but not scientific reasoning. Hypothetical-deductive and empirical-inductive students in the heterogeneous-ability group outperformed their counterparts in scientific reasoning and conceptual understanding. Implications of the findings for teaching and learning are discussed.  **Keywords**: Learning Outcome, Scientific Reasoning, Hypothetical-Deductive Reasoning, Empirical-Inductive Reasoning, Conceptual Understanding.  **References**  Abdullah, S., & Shariff, A. (2008). The effects of inquiry-based computer simulation with cooperative learning on scientific thinking and conceptual understanding of gas laws. *Eurasia Journal of Mathematics, Science and Technology Education, 4*(4), 387-398  Aboagye, G. K., Ossie-Anto, T. A., & Johnson, E. A. (2011). Comparison of learning cycle and traditional teaching approaches on students’ understanding of selected concepts in electricity. *International Journal of Educational Research and Administration, 8*(2), 28-35.  Baser, B. (2006). Effects of conceptual change and traditional confirmatory simulations on pre-service teachers’ understanding of direct current circuits. *Journal of Science Education and Technology, 15*(5), 367-381.  Farrokhnia, M. R., & Esmailpour, A. (2010). A study on the impact of real, virtual and  comprehensive experimenting on students’ conceptual understanding of DC electric  circuits and their skills in undergraduate electricity laboratory. *Procedia Social and*  *Behavioural Sciences, 2*, 5474-5482.  Gillies, R. (2006). Teachers' and students' verbal behaviours during cooperative and small-group learning. *British Journal of Educational Psychology, 76*, 271-287. |
| **Paper 4: Using Audience Response System as an Instructional tool in a third world country - The good, bad and ugly**  *Kofi Ayebi-Arthur & Kofi Acheaw Owusu, College of Education Studies, University of Cape Coast*  This paper reports an innovative method of engaging students through the use of contemporary digital technology in a University course. The Audience Response System (ARS), specifically, the *Socrative* app was used to explore the possibility of improving the interactions in the lecture theatres. The overarching research question was: *How best does ARS support lecturer-student interactions in the lecture theatre*? Specifically, the research sought to find answers to: interest students will have in ARS, how ARS can be an effective tool to improve class interactions, how ARS can ensure classroom collaboration as well as identify challenges that arise with the use of ARS. A questionnaire was used to elicit students’ views on the use of ARS as an instructional tool. Students reported that they enjoyed using ARS as it facilitated class interaction and collaboration. Erratic power supply, internet connectivity and incompatibility issues on some devices made teaching with the technology challenging.  **Keywords**: Audience Response System, Classroom, Collaboration, Technology, Tertiary Education  **References**  Caldwell, J. E. (2007). Clickers in the Large Classroom: Current Research and Best-Practice Tips. *CBE—Life Sciences Education, 6*, 9-20.  Kay, R. H. & LeSage, A. (2009). A strategic assessment of audience response systems used in higher education. *Australasian Journal of Educational Technology, 25*(2), 235-249.  Kay, R. H. & LeSage, A. (2009). Examining the benefits and challenges of using audience response systems: A review of the literature. *Computers & Education, 53*, 819–827.  Landrum, R. E. (2013). The ubiquitous clicker: sotl applications for scientist–educators. *Teaching of Psychology, 40*(2), 98-103.  Jackson, M., Ganger, A. C., Bridge, P. D., & Ginsburg, K. (2005). Wireless handheld  computers in the undergraduate medical curriculum. *Med Educ Online, 10*(5), 1-11.  Banks, D. A. (2006). *Audience response systems in higher education: Applications and cases.* Melbourne: Information Science Publishing  Preszler, R. W., Dawe, A., Shuster, C. B., & Shuster, M. (2007). Assessment of the effects of student response systems on student learning and attitudes over a broad range of biology courses. *CBE—Life Sciences Education, 6,* 29–41. |
| **Paper 5: Perceived Social Support Network and Student Achievement in Mathematics in an African Context: Mediation by Motivational Beliefs and Moderation by Gender**  *Emmanuel Adu-Tutu Bofah & Foster Ntow, College of Education, University of Cape Coast*  Research have shown that perceived social support network (PSS) (from parents and teachers) influences achievement. However, little is known about the process through which this relationship operates, especially in the African context. The purpose of the study is to examine the multiple mediational effect of students’ motivational beliefs (intrinsic motivation—student like learning mathematics, and extrinsic motivation—students’ value for mathematics) in relationship to the empirical association between PSS and mathematics achievement. The study also sought to find out if gender moderates the mediational effect. The sample included all the five African countries (Ghana, Botswana, South Africa, Morocco and Tunisia) that participated in the 2011 Trends in International Mathematics and Science Study (TIMSS 2011). A bootstrap analysis indicated a unique pattern of the role of motivational beliefs in mediating the relationships between PSS and achievement. Moreover, gender was found to moderate the indirect effect PSS on achievement through students’ motivational beliefs in some countries. The findings indicate that total mediation effect of students’ motivational belief on the relationship between PSS and achievement is “culture-fair but not culture-free”.  **References**  Ahmed, W., Minnaert, A., van der Werf, G., & Kuyper, H. (2010). Perceived social support and early adolescents’ achievement: the mediational roles of motivational beliefs and emotions. *Journal of Youth and Adolescence*, *39*(1), 36–46. https://doi.org/10.1007/s10964-008-9367-7  Bofah, E. A. (2015). Reciprocal determinism between students’ mathematics self-concept and achievement in an African context. In K. Krainer & N. Vondrová (Eds.), *Proceedings of the Ninth Congress of the European Society for Research in Mathematics Education (CERME 9)* (pp. 1688–1694). Prague, Czech Republic. Retrieved from https://hal.archives-ouvertes.fr/hal-01287995/  Bofah, E. A. (2016). *A cross-cultural analysis of the dimensions of mathematics-related affect: Assessing the psychometric properties and the relationship with achievement* (University of Helsinki, Department of Education, Research Report No. 390). Helsinki, Finland: University of Helsinki. Retrieved from https://helda.helsinki.fi/handle/10138/161278  Bofah, E. A., & Hannula, M. S. (2015). TIMSS data in an African comparative perspective: investigating the factors influencing achievement in mathematics and their psychometric properties. *Large-Scale Assessments in Education*, *3*(1), 4. <https://doi.org/10.1186/s40536-015-0014-y>  Cutrona, C. E., Cole, V., Colangelo, N., Assouline, S. G., & Russell, D. W. (1994). Perceived parental social support and academic achievement: an attachment theory perspective. *Journal of Personality and Social Psychology*, *66*(2), 369–378. https://doi.org/10.1037//0022-3514.66.2.369  Eccles[Parsons], J. S., Adler, T. F., Futterman, R., Goff, S. B., Kaczala, C. M., Meece, J. L., & Midgley, C. (1983). Expectations, values, and academic behavious. In J. T. Spence (Ed.), *Achievement and achievement motives: Psychological and sociological approaches* (pp. 76–146). San Francisco, CA: W. H. Freman and Company.  Eccles, J. S. (2007). Families, schools, and developing achievement- related motivations and engagement. In J. E. Grusec & P. D. Hastings (Eds.), *Handbook of socialization* (pp. 665–691). New York, NY: The Guilford Press.  Eccles, J. S. (2009). Who Am I and What Am I Going to Do With My Life? Personal and Collective Identities as Motivators of Action. *Educational Psychologist*, *44*(2), 78–89. https://doi.org/10.1080/00461520902832368  Eccles, J., Wigfield, A., Harold, R. D., & Blumenfeld, P. (1993). Age and gender differences in children’s self- and task perceptions during elementary school. *Child Development*, *64*(3), 830–847. https://doi.org/10.2307/1131221  Edwards, J. R., & Lambert, L. S. (2007). Methods for integrating moderation and mediation: A general analytical framework using moderated path analysis. *Psychological Methods*, *12*(1), 1–22. https://doi.org/10.1037/1082-989X.12.1.1 |
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