

CV – RICARDO A. S. KARAM

Associate Professor

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Physics Education

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University of Copenhagen

[ORCID](#) and [Google scholar](#)

CAREER SUMMARY AND HIGHLIGHTS

- Author of more than 50 peer-reviewed papers in science/physics education journals
- Contract with Princeton University Press to write a book about the history of complex numbers in physics
- More than 30 invited talks, including at [GIREP](#) and [APS](#) conferences
- Visiting scholar in more than 10 countries
- 25 years of teaching experience (physics and mathematics, high school and university)
- PhD in Physics Education, University of São Paulo (USP) and TU Dresden (2008-2011)
- Postdoctoral Humboldt fellow, University of Hamburg, Helsinki and TU Dresden (2012-2014)
- Supervision of 10 MSc students, 3 PhD students and 2 postdocs
- Pedagogical supervision of more than 30 physics staff members at the Niels Bohr Institute
- Head of the research group in Didactics of Physics, University of Copenhagen (2015-2022)
- Member of the International Scientific Committee of IHPST, GIREP and WCPE conferences
- Reviewer for the journals PR-PER, AJP, EJP, TPT, Sci. & Ed., RBEF, CBEF, EJMSTE and IJRUME
- Responsible for the History of Physics and of Quantum Mechanics courses at UCPH
- Director of the [IHPST](#) council (2015-2019)
- Guest editor of a [thematic issue](#) for the journal *Science & Education*
- Member of the Editorial Board of the journal *Science & Education* (2015-pres.)

EDUCATION

University of São Paulo & TU Dresden	2008-2012	PhD	Physics Education
Federal University of Santa Catarina	2004-2005	MSc	Physics Education
PUC-PR	2000-2003	BSc	Mathematics & Physics
Federal University of Paraná	1997-2002	BSc	Civil Engineering

EMPLOYMENT

2014 - present	Associate Professor, Department of Science Education, University of Copenhagen
2012 - 2014	Postdoctoral fellow, Humboldt foundation, Universities of Hamburg, Dresden and Helsinki
2007 - 2009	Associate Professor of Mathematics (tenured), Federal Institute of Santa Catarina
2006 - 2007	Assistant Professor of Physics, State University of Santa Catarina
2004 - 2006	Assistant Professor of Physics, Federal University of Santa Catarina
2000 - 2004	Mathematics and Physics high school teacher, Dom Bosco school

TEACHING (SELECTED)

2022-2023: [Philosophy of Science and Ethics for Physicists](#). Taught to undergraduate physics students.

2020-2022: [History of Quantum Mechanics](#). Taught with Christian Joas and Helge Kragh.

2017-2020: [History of Physics](#). Taught with Helge Kragh. Materials available [here](#).

2017-2019: [Fundamentals of the Didactics of Science and Mathematics](#). Taught to pre-service physics teachers.

2015-2025: [Introduction to University Pedagogy](#). Course taught to PhD students at the Faculty of Science.

2007-2009: Calculus, Statistics, and Linear Algebra at [IFSC](#)

2004-2007: Mechanics, Thermodynamics, Electromagnetism, and Quantum Mechanics at [UFSC](#) and [UDESC](#)

2000-2004: Physics and Mathematics to elementary and high school students at [Dom Bosco](#) school

INVITED TALKS (SELECTED)

- Mar 2026: Invited speaker at the [APS Global Physics Summit 2026](#), Denver, USA
- Nov 2025: Panelist at the symposium [Revisiting the History of Quantum Physics](#), Berlin, Germany
- Sep 2025: [50 years](#) of the Mathematics Education Department of Cinvestav, Mexico. [YouTube](#)
- Jul 2025: Opening keynote lecture at the [GIREP-EPEC 2025](#), Leiden, The Netherlands.
- Mar 2025: Invited speaker at the *Science Learning Innovation Workshop* at Universitas Sultan Ageng Tirtayasa (Untirta), Serang, Indonesia. Podcasts on Youtube [\[1\]](#) and [\[2\]](#)
- Mar 2025: Invited guest at Medan State University, Medan, Indonesia. [Pictures](#).
- Feb 2025: Two research seminars at the School of Physics of the University of Sydney, Australia.
- Nov 2024: Symposium [Complex Numbers in Quantum Theory](#), PSA 2024 conference, New Orleans, USA.
- Jun 2024: Plenary panel member at the [INDRUM 2024](#) conference, Barcelona, Spain.
- Nov 2022: Invited talk at the seminar series from the [Southern California Philosophy of Physics](#) group.
- Jun 2021: Invited online talk at [CICTA UFPA](#), Belém, Brazil. Available on [YouTube](#)
- Nov 2020: Invited lecture at Mestrado Profissional de Ensino de Física, Rio de Janeiro, Brazil. [YouTube](#)
- Oct 2020: Invited seminar at Mestrado Profissional de Ensino de Física, Rio de Janeiro, Brazil. [YouTube](#)
- Nov 2019: Talk at the conference [History for Physics](#), Vienna, Austria. 9k+ views on [YouTube](#)
- Aug 2018: Opening keynote at the [V Brazilian school of physics education](#), Blumenau, Brazil. [YouTube](#)
- Sep 2017: Invited talk at the [Danish Society for the History of Science](#), Copenhagen, Denmark.
- Sep 2016: Plenary talk at the [Physics Meeting of the Brazilian Physical Society](#), Natal, Brazil.
- Apr 2016: Invited seminar *Didaktische Implikationen der Mathematisierung der Physik*, Kolloquium der Mathematik- und Physikdidaktik – [Didaktik der Mathematik](#), Universität Siegen, Germany.
- Apr 2016: Invited talk *The roles of complex numbers in physics*, [LISMA](#), Kristianstad University, Sweden
- Apr 2014: Invited talk *Framing the structural role of mathematics in physics: A case study on electromagnetism* Physics Education Research Group at CU Boulder, USA.
- Feb 2014: Invited seminar *Was zu beweisen war: Formelverständnis in der Physik-Lehramtsausbildung*. [Physik und Physikdidaktik](#), TU Braunschweig, Germany.
- Jul 2013: *Was zu beweisen war: Deduktion im Physikunterricht* DPG-Physikzentrum Bad Honnef.
- Jun 2013: Research seminars given at [RELATE](#) MIT ([D. Pritchard](#)), Boston University ([P. Garik](#)), and University of Pittsburgh ([C. Singh](#)), Boston and Pittsburgh, USA.
- Jun 2012: Invited talk given at the Weizmann Institute of Science, Rehovot, Israel.

ACADEMIC SERVICE

- Faculty board member, Department of Science Education, 2024-2025
- Director of the [IHPST](#) council, 2015-2019
- Member of the Editorial Board of the journal [Science & Education](#), 2015-pres.
- Leader of the research group on Didactics of Physics, Department of Science Education, 2015-2022
- Editor of the [thematic issue](#) *The Interplay of Physics and Mathematics* for the journal *Science & Education*
- Secretary Danish Society for the History of Science (<http://www.videnskabshistorisk.dk/bestyrelsen.htm>)
- Member of the International Scientific Committee of IHPST, GIREP and WCPE conferences
- Reviewer for the journals *PR-PER*, *AJP*, *EJP*, *TPT*, *Science & Education*, *RBEF* and *EJMSTE*
- Assistant Editor of the journal [Science & Education](#), 2011-2015.
- Reviewer requests in grant proposals submitted to [GIF](#) (Israel), [FWO](#) (Belgium) and [SRCF](#) (USA)

RESEARCH GRANTS

FUNDING AGENCY	PURPOSE	PERIOD	TOTAL
DAAD/CAPEs	Sandwich PhD scholarship	12/2009 – 4/2011	€ 20.000
FAPESP	PhD scholarship + Travel funds	4/2011 – 4/2012	€ 12.000
ESERA	Travel Award	2010	€ 500
Humboldt Foundation	Postdoctoral grant + Research funds	8/2012 – 8/2014	€ 66.000
VELUX	Visiting Professor to Andrea diSessa	8/2015 – 10/2015	€ 30.000
CAPEs	Postdoctoral grant to Fabiana Kneubil: Tuition fee + living allowance	8/2015 – 7/2016	€ 40.000
University of Copenhagen	PhD course: Educational Implications of the History and Philosophy of Science	19-23/9/2016	€ 8.000
Islamic Development Bank (IDB)	PhD to Yuvita Oktarisa: Tuition fee + living allowance	1/2018 – 6/2021	€ 75.000
ERASMUS +	Staff mobility grant: Dep of Mathematics and Science Ed, University of Stockholm	4/2017	€ 1.000
Ministry of Research, Technology and Higher Education of Indonesia	PhD to M. Aswin Rangkuti: Tuition fee + living allowance	1/2020 – 9/2023	€ 85.000
CAPEs-PRINT	Visiting Professor at UFRGS: Travel allowance and monthly stipend	11/2023	€ 2.500
CAPEs	Postdoctoral grant to Marcia Saito: Tuition fee + living allowance	2/2024 – 1/2025	€ 40.000
ERASMUS +	Staff mobility grant: School of Physics, University of Sydney	2/2025	€ 4.000
University of Bologna	Visiting Professor at the University of Bologna: Travel allowance and honorarium	4/2025	€ 1.000

RESEARCH STAYS ABROAD

4/2025: University of Bologna, Department of Physics and Astronomy, Italy. Hosted by [Olivia Levrini](#).
2/2025: University of Sydney, School of Physics, Australia. Hosted by [Manjula Sharma](#).
11/2022: UC San Diego, Department of Philosophy, USA. Hosted by [Craig Callender](#).
4/2017: University of Stockholm, Department of Mathematics and Science Education, Sweden.
10/2016: University of Lisbon, Dep. of History and Philosophy of Science, Portugal. Hosted by [Ricardo Coelho](#).
3-5/2013: University of Helsinki, Physics Department, Finland. Hosted by [Ismo Koponen](#).
11/2012: Weizmann Institute of Science, Department of Science Teaching, Israel. Hosted by [Bat-Sheva Eylon](#).
4/2011: University of Maryland, Physics Department, USA. Hosted by [Joe Redish](#).
10/2010: University of Limerick (NCE-MSTL), Ireland. Hosted by [John O'Donoghue](#).
9/2010: University of Oslo, Physics Department, Norway. Hosted by [Carl Angell](#).

LANGUAGE SKILLS

- Portuguese: First language
- English: Excellent speaking, reading and writing (TOEFL 570 in 1994)
- German: Excellent speaking, reading and writing (DSH 2 in 2010)
- Danish: Excellent speaking, reading and writing (PD3 10 in 2019)
- Spanish: Good speaking, good reading and regular writing
- French: Regular speaking, good reading and writing

SUPERVISION

Staff

I have supervised more than 30 assistant professors at the Niels Bohr Institute as part of their *University Pedagogy* course. This involved observing their lectures and lab activities, helping with preparation and giving feedback. Among my previous supervisees are prominent physicists like [Irene Tamborra](#), [Jan Haerter](#), [Ferdinand Kuemmeth](#), [Anasua Chatterjee](#), [Markus Ahlers](#), [You Zhou](#), [Kasper Heintz](#), [Amin Doostmohammadi](#), [Charlotte Mason](#), [Morten Kjaergaard](#), [Julius Bier Kirkegaard](#), [Liselotte Jauffred](#), [Mathias Wilhelm](#), [Michele Burrello](#), [Martin Cramer Pedersen](#), [Jean-Baptiste Béguin](#), [Christa Gall](#), [Radoslaw Wojtak](#), and [Michael Küffmeier](#).

Postdoc

[Fabiana Botelho Kneubil](#) (main supervisor), Project title: Physics and epistemology in electromagnetism and relativity. Sponsored by [CAPES](#) (2015-2016)

[Marcia Tiemi Saito](#) (main supervisor), Project title: Pedagogical potential of original sources on Bell's Theorem. Sponsored by [CAPES](#) (2024-2025)

PhD

Muhammad Aswin Rangkuti (main supervisor), Ph.D., Physics Education, University of Copenhagen, 2023. Thesis title: *Learning challenges in the interplay between physics and mathematics: the case of the 1-D wave equation*. Available [here](#).

Yuvita Oktarisa (main supervisor), Ph.D., Physics Education, University of Copenhagen, 2021 Thesis title: *Connecting Newton's Gravitational Law with Kepler's Laws of Planetary Motion: A Teaching and Learning Sequence for Pre-Service Physics Teachers inspired by Newton's Original Formulation*. Available [here](#)

Daniel Souza (co-supervisor), Ph.D., Physics Education, Universidade Federal do Rio Grande do Sul (UFRGS), ongoing. Project title: Implicações didáticas da gênese da interpretação probabilística.

MSc

Simon Arent Vedel (main supervisor), MSc., University of Copenhagen, 2019. Thesis title: *Teaching the Formula of Centripetal Acceleration: A qualitative case study on first year physics students' challenges with mathematical derivations in mechanics*. Available [here](#).

Anders Wolfsberg (main supervisor), MSc., University of Copenhagen, 2017. Thesis title: *A praxeological investigation of divergence – Exploring challenges of teaching and learning math-in-physics*. Available [here](#).

Kuno Rasmussen Harsbo (main supervisor), MSc., University of Copenhagen, 2015. Thesis title: *A qualitative case study on temperature in Danish high school textbooks based on a historic review of the invention of temperature*. Available [here](#).

Despoina Bouzounieraki (main supervisor), MSc., University of Copenhagen, 2017. Thesis title: *The Principle of Least Action: An Explorative Investigation of Learning Difficulties and Teaching Strategies*. Available [here](#).

Ida Marie Monberg Hindsholm (main supervisor), MSc., University of Copenhagen, 2018. Thesis title: *Teaching H. C. Ørsted's Scientific Work in Danish High School Physics*. Available [here](#).

Anders H. Gormsen (main supervisor), MSc., University of Copenhagen, 2018. Thesis title: *Fysikkens historie i fysikundervisningen*.

Lars Tietje (main supervisor), MSc., University of Hamburg, 2014. Thesis title: *Evaluation eines Seminars zum Verstehen und Erklären physikalischer Gleichungen für Lehramtsstudierende*.

Sebastian Klöser (main supervisor), MSc., University of Hamburg, 2013. Thesis title: *Das Verhältnis von Physik und Mathematik, erforscht mit Mitteln des Experteninterviews*. Available [here](#).

PHD COMMITTEES

Mathilde Hitier (external examiner), Université de Montréal, 2025. Thesis title: *Apprentissage de la dérivée au postsecondaire: analyse des pratiques entre les cours de mathématiques et de physique, et identification de rupture et continuités*. Available [here](#).

Mayu Aoki (committee chair), University of Copenhagen, 2024. Thesis title: *Learning fractions in two schools: Case studies on teaching and learning in Japanese supplementary schools*. Available [here](#).

Nathan Lombard (external examiner), Université de Montpellier, 2023. Thesis title: *Phénomènes transpositifs à l'interface entre mathématiques et physique: le cas des structures mathématiques en mécanique quantique*. Available [here](#).

Diego Dias Uzêda (external examiner), Universidade Federal do Rio de Janeiro (UFRJ), 2022. Thesis title: *O éter e a estrutura da matéria: fundamentação dos elementos atômicos de J.J. Thomson*. Available [here](#).

Otávio Bocheco (external examiner), Universidade Federal de Santa Catarina (UFSC), 2021. Thesis title: *Abordagem Matemática no Ensino de Física e sua Qualificação no Viés Semântico*. Available [here](#).

Lucas Marcelo Cavalari Nardi (external examiner of the qualification exam), Universidade de São Paulo (USP), 2021. Thesis title: *A matematização da eletrostática no século XVIII: de rupturas epistemológicas a estilos de matematização*. Available [here](#).

Wiebke Kuske-Janßen (external examiner), Technische Universität Dresden, 2020. Thesis title: *Sprachlicher Umgang mit Formeln von LehrerInnen im Physikunterricht am Beispiel des elektrischen Widerstandes in Klassenstufe 8*. Available [here](#).

Yukiko Asami-Johansson (committee chair), University of Copenhagen, 2019. Thesis title: *Japanese Mathematics Teachers' Professional Knowledge International case studies based on praxeological analysis*. Available [here](#).

Marie-Anette Geyer (external examiner), Technische Universität Dresden, 2019. Thesis title: *Physikalisch-mathematische Darstellungswechsel funktionaler Zusammenhänge. Das Vorgehen von SchülerInnen der Sekundarstufe 1 und ihre Schwierigkeiten*. Available [here](#).

Zetra Putra Hainul (committee chair), University of Copenhagen, 2018. Thesis title: *A Comparative Study of Danish and Indonesian Pre-service Teachers' Knowledge of Rational Numbers*. Available [here](#).

Antje J. Heine (external examiner), Technische Universität Dresden, 2018. Thesis title: *Was ist Theoretische Physik? Eine wissenschaftstheoretische Betrachtung und Rekonstruktion von Vorstellungen von Studierenden und Dozenten über das Wesen der Theoretischen Physik*. Available [here](#).

Diego Fabian Vizcaíno Arevalo (external examiner), Universidade Estadual Paulista (UNESP), 2013. Thesis title: *Papel da "matematização" na evolução das explicações de professores e alunos em disciplinas de física na formação inicial de professores*. Available [here](#).

Ana Raquel Pereira de Ataíde (external examiner), Universidade Federal da Bahia (UFBA), 2012. Thesis title: *O papel da matemática na compreensão de conceitos e resolução de problemas de termodinâmica*. Available [here](#).

FULL LIST OF PEER REVIEWED PUBLICATIONS

Journal articles

- Palmgren, E., & **Karam, R.** (2025). A glimpse of matrix mechanics via the harmonic oscillator. *American Journal of Physics*, 93(1), 21-27. <https://doi.org/10.1119/5.0141573>
- Weber Pereira, R., **Karam, R.**, Heidemann, L. A., & Veit, E. A. (2025). Grounding analytical mechanics in statics: a didactic emphasis on the principle of virtual work. *European Journal of Physics*, 46(1). <https://doi.org/10.1088/1361-6404/ad9c02>
- Souza, D. S., Lima, N. W., & **Karam, R.** (2024). A gênese da interpretação probabilística em livros didáticos de mecânica quântica. *Revista Brasileira de Ensino de Física*, 46. <https://doi.org/10.1590/1806-9126-RBEF-2023-0238>
- Rangkuti, M. A., & **Karam, R.** (2023). Encouraging students to understand the 1D wave equation. *Physical Review Physics Education Research*, 19. <https://doi.org/10.1103/PhysRevPhysEducRes.19.020161>
- Rangkuti, M. A., & **Karam, R.** (2022). Conceptual challenges with the graphical representation of the propagation of a pulse in a string. *Physical Review Physics Education Research*, 18. <https://doi.org/10.1103/PhysRevPhysEducRes.18.020119>
- Lima, N., & **Karam, R.** (2021). Schrödinger's equation from Snell's law. *European Journal of Physics*, 43(1), 1-23. <https://doi.org/10.1088/1361-6404/ac5635>
- Oktarisa, Y., & **Karam, R.** (2021). From a central force to Kepler's area law: Student difficulties and preferences with two derivations. *European Journal of Physics*, 42(1), 1-23. <https://doi.org/10.1088/1361-6404/abbf3d>
- Lima, N., & **Karam, R.** (2021) Particle velocity = group velocity: A common assumption in the different theories of Louis de Broglie and Erwin Schrödinger. *American Journal of Physics*, 89(5), 521. <https://doi.org/10.1119/10.0003165>
- Karam, R.** (2020). Schrödinger's original struggles with a complex wave function. *American Journal of Physics*, 88(6), 433-438. Featured. <https://doi.org/10.1119/10.0000852>
- Karam, R.** (2020). Why are complex numbers needed in quantum mechanics? Some answers for the introductory level. *American Journal of Physics*, 88(1), 39-45. <https://doi.org/10.1119/10.0000258>
- Karam, R.** (2019). O que diferencia as Feynman lectures de livros tradicionais? *Revista Brasileira de Ensino de Física*, 40(4), 1-11. <https://doi.org/10.1590/1806-9126-RBEF-2018-0071>
- Karam, R.** (2018). Fresnel's original interpretation of complex numbers in 19th century optics. *American Journal of Physics*, 86(4), 245-249. Editor's Pick. <https://doi.org/10.1119/1.5011366>
- Assis, A. K. T., & **Karam, R. A. S.** (2018). The free fall of an apple: conceptual subtleties and implications for physics teaching. *European Journal of Physics*, 39(3), 1-14. <https://doi.org/10.1088/1361-6404/aaa91d>
- Karam, R.**, Kneubil, F. & Robilotta, M. (2017). Forces on a current-carrying wire in a magnetic field: the macro-micro connection. *European Journal of Physics*, 38(5). <https://doi.org/10.1088/1361-6404/aa75a0>
- Kneubil, F., & **Karam, R.** (2017). Keyhole: Equal signs as bridges between the phenomenological and theoretical dimensions. *Revista Brasileira de Ensino de Física*, 39 (2). <https://doi.org/10.1590/1806-9126-RBEF-2016-0216>
- Kneubil, F., **Karam, R.**, Gurgel, I. & Robilotta, M. (2017). Electromagnetism as a world view: implications for the teaching of energy. *Revista Brasileira de Ensino de Física*, 39 (4). <https://doi.org/10.1590/1806-9126-RBEF-2017-0119>

- Karam, R.**, Krause, E. (2017). Physikalische Beweise mathematischer Behauptungen? *Der Mathematikunterricht* Nr. 5/2017.
<https://www.friedrich-verlag.de/shop/mwdownloads/download/link/id/100497>
- Coelho, R.; Borges, P.; **Karam, R.** (2016). Atwood and Poggendorff: an insightful analogy. *European Journal of Physics*, 37(6). Selected for the 2016 Highlights. <https://doi.org/10.1088/0143-0807/37/6/065003>
- Krey, O., **Karam, R.** (2016). Mathematik in der Physik – Muss das sein? Und wenn ja, warum und wozu? *Naturwissenschaften im Unterricht Physik*, Bind 153/154, 7-13.
www.friedrich-verlag.de/shop/mathematik-im-physikunterricht-513153
- Karam, R.**, Uhden, O., Höttecke, D. (2016). Das habt ihr schon im Mathe gelernt! Stimmt das wirklich?: Ein Vergleich zwischen dem Umgang mit mathematischen Konzepten in der Mathematik und in der Physik. *Naturwissenschaften im Unterricht Physik*, Bind 153/154, 22-27.
www.friedrich-verlag.de/shop/mathematik-im-physikunterricht-513153
- Zander, S., Dorn, T., **Karam, R.** (2016). Mathematik als Brücke zwischen Makro- und Mikrokosmos : Ein Unterrichtskonzept zur Thermodynamik in der Oberstufe. *Naturwissenschaften im Unterricht Physik*, Bind 153/154, 68-73. www.friedrich-verlag.de/shop/mathematik-im-physikunterricht-513153
- Karam, R.** (2015). Introduction of the thematic issue on the interplay of physics and mathematics. *Science & Education*, 24(5), 487–494. <https://doi.org/10.1007/s11191-015-9763-9>
- Karam, R.**, & Krey, O. (2015). Quod erat demonstrandum: Understanding and explaining equations in physics teacher education. *Science & Education*, 24(5), 661–698. <https://doi.org/10.1007/s11191-015-9743-0>
- Karam, R.** (2014). Framing the structural role of mathematics in physics lectures: A case study on electromagnetism. *Physical Review Physics Education Research*, 10.
<https://doi.org/10.1103/PhysRevSTPER.10.010119>
- Karam, R.** (2014). Book review: *Evidence and Method: Scientific Strategies of Isaac Newton and James Clerk Maxwell* by Peter Achinstein. *Science & Education* 23, 2137–2148. <https://doi.org/10.1007/s11191-014-9717-7>
- Karam, R.**, Coimbra, D. & Pietrocola, M. (2014). Comparing Teaching Approaches About Maxwell's Displacement Current. *Science & Education* 23, 1637–1661. <https://doi.org/10.1007/s11191-013-9624-3>
- Uhden, O.*, **Karam, R.***, Pospiech, G., & Pietrocola, M. (2012). Modelling mathematical reasoning in physics education. *Science & Education*, 20(4), 485–506. * Both authors contributed equally.
<https://doi.org/10.1007/s11191-011-9396-6>
- Karam, R. A. S.** (2010). Minha terra tem palmeiras onde canta o sabiá... Revista do Professor de Matemática, v. 71, p. 27-30. <https://rpm.org.br/cdrpm/71/5.html>
- Karam, R. A. S.**, & Pietrocola, M. (2009). Habilidades Técnicas Versus Habilidades Estruturantes: Resolução de Problemas e o Papel da Matemática como Estruturante do Pensamento Físico. *Alexandria: Journal of Science and Technology Education*, 2, 181-205.
<https://periodicos.ufsc.br/index.php/alexandria/article/view/37960/28988>
- Karam, R. A. S.** (2007). Grandezas físicas para exemplificar a função afim. Revista do Professor de Matemática, v. 63, pp. 29-32. <https://rpm.org.br/cdrpm/63/8.html>
- Karam, R. A. S.**, Souza Cruz, S. M., & Coimbra, D. (2007). Relatividades no ensino médio: o debate em sala de aula. *Revista Brasileira de Ensino de Física*, 29(1). <https://doi.org/10.1590/S1806-11172007000100017>
- Karam, R. A. S.**, Souza Cruz, S. M., & Coimbra, D. (2006). Tempo relativístico no início do Ensino Médio. *Revista Brasileira de Ensino de Física*, 28(3), 373-386.
<https://doi.org/10.1590/S1806-11172006000300014>

Book chapters

Pospiech, G., & **Karam, R.** (2023). Role of Mathematics in Physics from Multiple Perspectives. In *The International Handbook of Physics Education Research: Special Topics* p. 18:1-28. AIP Publishing.

https://doi.org/10.1063/9780735425514_018

Karam, R., & Lima, N. (2022). Using history of physics to teach physics? In: Jenaro Guisasola; Eilish McLoughlin. (Org.). *Connecting Research in Physics Education with Teacher Education* v. 3, p. 22-38.

<https://doi.org/10.5281/zenodo.5792968>

Karam, R., Uhden, O., & Höttecke, D. (2019). The “math as prerequisite” illusion: Historical considerations and implications for physics teaching. In: Pospiech, G., Michelini, M., Eylon, BS. (eds) *Mathematics in Physics Education*, p. 37–52. Springer International Publishing. https://doi.org/10.1007/978-3-030-04627-9_2

Conference contributions

Lehavi, Y., Bagno, E., Eylon, B.-S., Mualem, R., Pospiech, G., Böhm, U., Krey, O., & **Karam, R.** (2016). Classroom evidence of teachers' PCK of the interplay of physics and mathematics. In: *Key competences in physics teaching and learning: Selected contributions from the International Conference GIREP EPEC 2015, Wrocław, Poland, 6–10 July 2015* (pp. 95–104). Springer International Publishing.

<https://link.springer.com/book/10.1007/978-3-319-44887-9>

Kneubil, F., **Karam, R.** (2015). Looking through the keyhole: Physics equations as bridges between the macro and micro worlds. Oral communication. *13th IHPST Conference* – Rio de Janeiro, July 22-25, 2015.

Karam, R., Wolfsberg, A. (2015). Knowledge transfer from fluid dynamics to electromagnetism. Oral communication. *13th IHPST Conference* – Rio de Janeiro, July 22-25, 2015.

Karam, R., Mäntylä, T. (2014). The influence of mathematical representations on students' conceptualizations of the electrostatic field. *GIREP/MPTL 2014 Conference* - Palermo, July 7-12, 2014.

Karam, R. (2014). Analogies and metaphors in teaching Maxwell's equations: Analyzing the didactic discourse of a distinguished physics professor. Oral communication. *9th International Conference on Conceptual Change* - Bologna, August 26-29, 2014.

Karam, R., Uhden, O., Höttecke, D. (2014). Mathematik im Physikunterricht - Ein Entwicklungsprojekt Annual conference of the German Society of Didactics of Physics and Chemistry (*GDCP 2014*), Bremen, September 15-18, 2014. https://www.gdcp-ev.de/wp-content/tagungsbaende/GDCP_Band35.pdf

Karam, R., Krey, O. (2014). Was zu beweisen war: Formelverständnis in der Physik-Lehramtsausbildung. Annual conference of the German Physical Society (*DPG 2014*) - Frankfurt, March 17-20, 2014.

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