

Teaching and Learning Science as Argument

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ABSTRACT: The concept of science as argument, and the view that engaging in scientific argumentation should play a key role in science education, has become widely endorsed. The case is made here that this objective will be enhanced by broad understanding of the nature of argument skills and their directions and patterns of development. A line of research directed to this goal is described. © 2010 Wiley Periodicals, Inc. *Sci Ed* 94:810–824, 2010

INTRODUCTION

A conception of science as argument has come to be widely advocated as a frame for science education (Berland & Reiser, 2009; Bricker & Bell, 2009; Driver, Newton, & Osborne, 2000; Duschl, 2008; Erduran & Jimenez-Aleixandre, 2008; Kelly, Regev, & Prothero, 2008; Kuhn, 1993; Lehrer, Schauble, & Lucas, 2008; Lehrer, Schauble, & Petrosino, 2001; Naylor, Keogh, & Downing, 2007; Nussbaum, Sinatra, & Poliquin, 2008; Osborne, Erduran, & Simon, 2004; Sampson & Clark, 2008; Simon, Erduran, & Osborne, 2006; Zohar & Nemet, 2002). Bricker and Bell (2009) identify argumentation as a “core epistemic practice” of science and accordingly claim that the goal of science education must be not only mastery of scientific concepts but also learning how to engage in scientific discourse. If so, the goal will be attainable only to the extent that we have a well articulated and empirically supported model that identifies the essential characteristics of such discourse and the skills that are needed to partake in it. The work described in this article has had as its goal the establishment of such a model.

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Teaching And Learning Argument

**George Newell, David Bloome, Alan
Hirvela**



Teaching And Learning Argument:

Teaching and Learning Argument Richard Andrews,1995 This text advocates bringing the teaching and learning of argument to the centre of the curriculum based on the understanding that argument is essential to the development of thinking skills Its scope is broad analyzing the function of argument from early childhood education to university study

Teaching Argument Writing, Grades 6-12 George Hillocks Jr,2011 Offers teaching strategies and resources to instruct sixth through twelfth graders on how to prepare and write strong arguments and evaluate the arguments of others providing step by step guidance on arguments of fact judgment and policy and including advice to help students understand how judgments get made in the real world how to develop and support criteria for an argument and related topics

Argumentation Strategies in the Classroom Chrysi Rapanta,2019-06-01 Argumentation as a teaching and learning method in the K 12 curriculum has received increasing attention across the globe The reason for this is simple argumentation helps students develop necessary critical thinking skills However teaching this method is not as straightforward as it may appear Placing the classroom at the centre of the investigation this book seeks to throw light onto argumentation as a teaching practice by asking What does it take to teach as argument What does it mean to be argumentative teachers And how can we create classroom environments that will help and encourage young people to develop their argument skills Based on first hand experience and extensive research this volume guides the reader through argumentation with the focus placed on the relationship between this teaching method and effective learning and the need to investigate the role of teachers in encouraging argumentation in the classroom Although there are a considerable number of tools and techniques that promote argumentation in the K 12 classroom many teachers struggle to successfully implement them in the classroom Aimed at addressing this issue this book endeavours to instruct teachers on how to apply argumentation effectively in their day to day classes and to clarify argumentation as a teaching and learning strategy As an important contribution to the field of argumentation and education this book will be of interest to researchers post graduate students and secondary school teachers alike

Argumentation in Higher Education Richard Andrews,2009-09-10 Argumentation in Higher Education offers professors lecturers and researchers informative guidance for teaching effective argumentation skills to their undergraduate and graduate students This professional guide aims to make the complex topic of argumentation open and transparent Grounded in empirical research and theory but with student voices heard strongly throughout this book fills the gap of argumentation instruction for the undergraduate and graduate level Written to enlighten even the most experienced professor this text contributes to a better understanding of the demands of speaking writing and visual argumentation in higher education and will undoubtedly inform and enhance course design The book argues for a more explicit treatment of argument the product and argumentation the process in higher education so that the ground rules of the academic discipline in question are made clear Each chapter concludes with practical exercises for staff development use Topics discussed

include The importance of argument The current state of argumentation in higher education Generic skills in argumentation The balance between generic and discipline specific skills Information communication technologies and visual argumentation How can we best teach argumentation so that students feel fully empowered in their academic composition Professors new and experienced lecturers researchers professional developers and writing coaches worldwide grappling with this question will find this accessible text to be an extremely valuable resource Richard Andrews is Professor in English at the Institute of Education University of London

Teaching and Learning Argumentative Writing in High School English Language Arts Classrooms George Newell, David Bloome, Alan Hirvela, 2015-06-05 Focused on the teaching and learning argumentative writing in grades 9-12 this important contribution to literacy education research and classroom practice offers a new perspective a set of principled practices and case studies of excellent teaching The case studies illustrate teaching and learning argumentative writing as the construction of knowledge and new understandings about experiences ideas and texts Six themes key to teaching argumentative writing as a thoughtful multi-levelled practice for deep learning and expression are presented teaching and learning argumentative writing as social practice teachers epistemological beliefs about argumentative writing variations in instructional chains instructional conversations in support of argumentative writing as deep learning and appreciation of multiple perspectives contextualized analysis of argumentative writing and the teaching and learning of argumentative writing and the construction of rationalities

The Importance of Argument in Education Richard Andrews, 2009 Examines argument and the process of argumentation in relation to primary secondary and tertiary education Considers the importance of argument in research and research training

Argumentation in Science Education Sibel Erduran, María Pilar Jiménez-Aleixandre, 2007-12-14 Educational researchers are bound to see this as a timely work It brings together the work of leading experts in argumentation in science education It presents research combining theoretical and empirical perspectives relevant for secondary science classrooms Since the 1990s argumentation studies have increased at a rapid pace from stray papers to a wealth of research exploring ever more sophisticated issues It is this fact that makes this volume so crucial

Argumentation in Science Education Sibel Erduran, María Pilar Jiménez-Aleixandre, 2007-12-06 Our conversations about arguments began in Nashville in the Spring of 1996 in Richard Duschl's doctoral seminar that we were both attending Marilar Jiménez-Aleixandre as a visiting scholar at Vanderbilt University Jiménez-Aleixandre and Duschl were designing authentic problems in genetics for the University of Santiago de Compostela based RODA project aimed at engaging high school students in argumentation Erduran and Duschl had been working on Project SEPIA extending their work in Pittsburgh schools to the design of curricula that support epistemological aspects of scientific inquiry including argumentation In that spring we attended a NARST session in St Louis where Gregory Kelly Steven Druker and Catherine Chen presented a paper about argumentation As a consequence a symposium about argumentation was organised possibly the first of its kind at the 1997 NARST meeting in Chicago including papers from Kelly and colleagues and from Jiménez

Alexandre Bugallo and Duschl The symposium was attended among others by Rosalind Driver who had just submitted an application for funding of an argumentation project based at King s College London a project Erduran would incidentally work on after Driver s untimely death From this time frame in the 1990s to the present day argumentation studies in science education have increased at a rapid pace from stray papers for which we were unable to find an appropriate strand in a conference to a wealth of research base exploring ever more sophisticated issues [AI in Language Teaching, Learning, and Assessment](#) Pan, Fang,2024-02-12 The introduction of Artificial Intelligence AI has ignited a fervent academic discourse AI s role is as both a powerful ally and a potential adversary in education For instance ChatGPT is a generative AI which mimics human conversation with impressive precision Its capabilities span the educational spectrum from answering questions and generating essays to composing music and coding Yet as with any innovation its advent has sparked a spirited academic dialogue AI in Language Teaching Learning and Assessment seeks to address these concerns with rigor and thoughtfulness It explores the undeniable drawbacks of AI in language education and offers strategic insights into their prevention It scrutinizes the resources and safeguards required to ensure the ethical and secure integration of AI in academic settings This book lays out the multifaceted benefits of incorporating AI into language teaching learning and assessment Its chapters dissect the transformative impact of AI on pedagogy teaching materials assessment methodologies applied linguistics and the broader landscape of language education development This book is a valuable resource for language learners educators researchers and scholars alike It beckons to those who are keen on exploring and implementing AI in education as well as AI developers and experts seeking to bridge the chasm between technology and language education **Cognitive Science in Education and Alternative Teaching Strategies** Boris Aberšek,2017-06-20 Cognitive science deals with such questions as How do we think and How do we learn memorize dream It tackles the subject of human mentality by connecting discoveries from a range of disciplines that shed light on cognitive occurrences and the learning process Cognitive science unites the fields of neuroscience psychology philosophy linguistics artificial intelligence and social sciences This book aimed mostly at teachers will provoke cognitive dissonance and intellectual unease as it explores cognitive theories and allows teachers to update and internalise their in head theories embedded from their own school years In order for this to happen this volume provides information on new experiences of alternative teaching practices Creating conditions for gaining these teaching experiences is the primary function and fundamental mission of politics in the field of education **The On-Your-Feet Guide to Teaching Argument Writing** Michael W. Smith,Jon-Philip Imbrenda,2019-07-25 [Encyclopedia of Language and Education](#) Leo van Lier,P. Corson,2013-11-01 ENCYCLOPEDIA OF LANGUAGE AND EDUCATION This is one of eight volumes of the Encyclopedia of Language and Education published by Kluwer Academic The publication of this work signals the maturity of the field of language and education as an international and interdisciplinary field of significance and cohesion These volumes confirm that language and education is much more than the preserve of any single discipline In designing

these volumes we have tried to recognise the diversity of the field in our selection of contributors and in our choice of topics. The contributors come from every continent and from more than 40 countries. Their reviews discuss language and education issues affecting every country in the world. We have also tried to recognise the diverse interdisciplinary nature of language and education in the selection of the editorial personnel themselves. The major academic interests of the volume editors confirm this. As principal volume editor for Volume 1, Ruth Wodak has interests in critical linguistics, sociology of language and language policy. For Volume 2, Viv Edwards has interests in policy and practice in multilingual classrooms and the sociology of language. For Volume 3, Bronwyn Davies has interests in the social psychology of language, the sociology of language and interdisciplinary studies. For Volume 4, Richard Tucker has interests in language theory, applied linguistics and the implementation and evaluation of innovative language education programs.

Critical Thinking in Science Education and Teacher Training Antonio Joaquín Franco-Mariscal, 2024-12-29. This edited volume explores the challenge of fostering critical thinking (CT) skills in science education, presenting the ENCIC CT model as a framework for development. Named after the Science Education and Competences Enseñanza de las Ciencias y Competencias ENCIC research group at the University of Malaga, Spain, this model emphasizes cultivating CT through socio-scientific issues and daily life problems. It includes three key domains: knowledge, skills, and dispositions, each encompassing various dimensions addressed through scientific practices like argumentation, inquiry, and modeling. Teaching strategies such as gamification, role playing, micro-debates, augmented reality, controversy mapping, and digital storytelling are highlighted. Spanning theoretical perspectives and practical experiences from early childhood to higher education, this book consolidates findings from the Spanish R D project *Citizens with Critical Thinking: A Challenge for Teachers in Science Education*. It is an essential resource for educators, researchers, and practitioners, offering valuable insights and practical applications for all educational levels.

Dialogue, Argumentation and Education Baruch B. Schwarz, Michael J. Baker, 2016-12-22. New pedagogical visions and technological developments have brought argumentation to the fore of educational practice. Whereas students previously learned to argue, they now argue to learn. Collaborative argumentation-based learning has become a popular and valuable pedagogical technique across a variety of tasks and disciplines. Researchers have explored the conditions under which arguing to learn is successful, have described some of its learning potentials such as for conceptual change and reflexive learning, and have developed Internet-based tools to support such learning. However, the further advancement of this field presently faces several problems which the present book addresses. Three dimensions of analysis—historical, theoretical, and empirical—are integrated throughout the book. Given the nature of its object of study—dialogue, interaction, argumentation, learning, and teaching—the book is resolutely multidisciplinary, drawing on research on learning in educational and psychological sciences as well as on philosophical and linguistic theories of dialogue and argumentation.

Developing Writers of Argument Michael W. Smith, Jon-Philip Imbrenda, 2017-12-22. The ability to make effective arguments is not only necessary in students' academic lives; it is a

transferable skill that is essential to students' future success as critical thinkers and contributing members of society. But in the here and now, how do we engage students and ensure they understand argument writing's fundamental components? How do we take them from "Here's what I think" to "Here's what I think. Here's what makes me think that. And here's why it matters." This stunning full-color book by Michael Smith and Jon Philip Imbrenda shows the way with ready-to-implement lessons that make argument writing topical and relevant. Students are first asked to form arguments about subjects that matter to them and then to reflect on the structure of those arguments—a process that provides learners with valuable, reusable structural models. Throughout the book, the authors provide helpful instructional tools, including literary nonfiction and author-created simulated texts that inspire different points of view. Essential questions to create a context that rewards argumentation. Lessons introducing students to the three essential elements of an argument: claim, data, and warrant, and how to make each effective. Questioning probes, semantic differential scales, and other innovative instructional approaches. Samples of writing from the authors' own students and enlightening details on how this work informed the authors' subsequent teaching approach. Complete with guidance on applying the lessons' techniques in a broader, unit-wide context. *Developing Writers of Argument* offers a practical approach for instructing students in this crucial aspect of their lifelong development.

Argumentation and Education Nathalie Muller Mirza, Anne-Nelly Perret-Clermont, 2009-06-19. During the last decade, argumentation has attracted growing attention as a means to elicit processes: linguistic, logical, dialogical, psychological, etc. that can sustain or provoke reasoning and learning. Constituting an important dimension of daily life and of professional activities, argumentation plays a special role in democracies and is at the heart of philosophical reasoning and scientific inquiry. Argumentation, as such, requires specific intellectual and social skills. Hence, argumentation will have an increasing importance in education, both because it is a critical competence that has to be learned and because argumentation can be used to foster learning in philosophy, history, sciences, and in many other domains. *Argumentation and Education* answers these and other questions by providing both theoretical backgrounds in psychology, education, and theory of argumentation and concrete examples of experiments and results in school contexts in a range of domains. It reports on existing innovative practices in education settings at various levels.

Good Thinking Erik Palmer, 2023-10-10. Our daily communication involves argumentation and reasoning, but how well do we prepare students for these tasks? Are they able to persuade others, make solid purchasing decisions, or analyze the messages in the media? In his new book *Good Thinking: Teaching Argument, Persuasion, and Reasoning*, Erik Palmer shows teachers of all subject matters how to transform the activities they already use into openings for improving student thinking. He demonstrates how to critically evaluate a point of view, understand rhetorical devices, apply logic, and build an effective argument, written or oral. Blending theory with practice, Palmer shares a wide range of classroom-tested lessons, including: How to understand argument in paintings and images; Addressing ad hominem attacks using a traveling debate; Creating a class comedy club where students write syllogisms and analyze

character and plot development Teaching logic through a class Booger Patrol Palmer explains complex concepts in simple practical language that gives teachers a deft understanding of the principles of good arguments proper use of evidence persuasive techniques and rhetorical tricks He reveals how all students not just those in advanced classes can begin developing sophisticated reasoning skills that will improve their oral and written communications both in and outside of the classroom

The Argument Writing Toolkit Sean Runday,2015-07-16 In order for students to write effective arguments they need to read good arguments In this practical book you ll find out how to use mentor texts to make writing instruction more meaningful authentic and successful Author Sean Runday demonstrates how you can teach middle school students to analyze the qualities of effective arguments and then help them think of those qualities as tools to improve their own writing You ll learn how to Introduce high interest topics to students to get them interested and engaged in argument writing Teach students to look at multiple sides of an issue and critically evaluate evidence to construct informed defensible arguments Make argument writing an interactive student driven exercise in which students pursue their own writing projects Use mentor texts to help students learn the core concepts of argument writing and apply those skills across the curriculum The book is filled with examples and templates you can bring back to the classroom immediately as well as an annotated bibliography which links the concepts in this book to the corresponding Common Core State Standards Blank templates are also available as printable eResources on our website <http://www.routledge.com> 9781138924390 *Higher Education*

Learning Methodologies and Technologies Online Giovanni Fulantelli,Daniel Burgos,Gabriella Casalino,Marta Cimitile,Giosuè Lo Bosco,Davide Taibi,2023-04-30 This book constitutes the thoroughly refereed post conference proceedings of the 4th International Conference on Higher Education Learning Methodologies and Technologies Online HELMeTO 2022 held in Palermo Italy in September 2022 The 59 revised papers presented were carefully reviewed and selected from a total of 126 submissions The papers present recent research on challenges of implementing emerging technology solution for online online learning pedagogical frameworks online learning technologies in practice online learning strategies and resources etc

Educational Technologies for Teaching Argumentation Skills Niels Pinkwart,Bruce M. McLaren,2012 Considerable efforts have been made in developing and assessing educational technology to support and teach argumentation These efforts have culminated in the form of techniques which include Intelligent Tutoring Systems and Computer Supported Collaborative Learning Many of these techniques have been shown to be effective for specific argumentation domains At the same time the general design problem of how to support a learner s acquisition of argumentation skills through computer aided tools has not yet been perfected This e book presents a collection of current approaches in educational technologies for argumentation Technological approaches underlying successful argumentation systems are presented along with their relation to the success of these tools

Uncover the mysteries within its enigmatic creation, Discover the Intrigue in **Teaching And Learning Argument** . This downloadable ebook, shrouded in suspense, is available in a PDF format (*). Dive into a world of uncertainty and anticipation. Download now to unravel the secrets hidden within the pages.

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