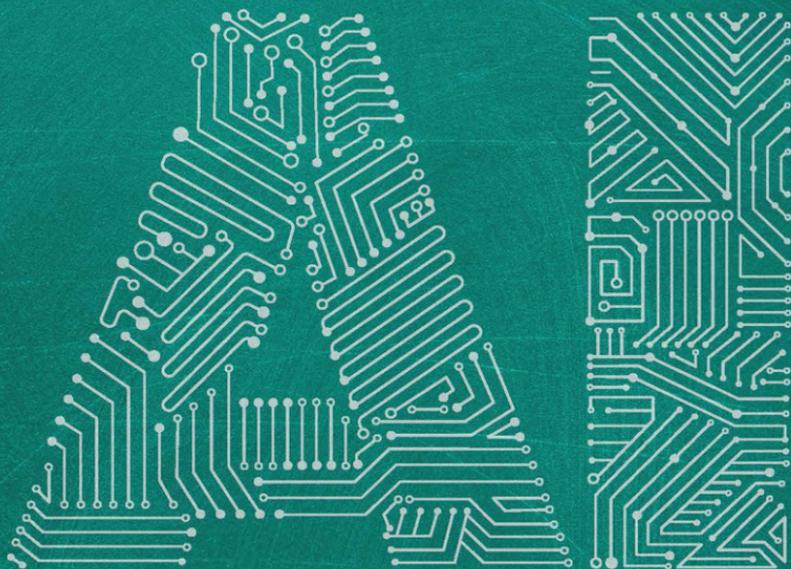


ROSE LUCKIN • KARINE GEORGE
MUTLU CUKUROVA



FOR
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TEACHERS

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AI FOR SCHOOL TEACHERS

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AI FOR SCHOOL TEACHERS

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CRC Press

Taylor & Francis Group
Boca Raton London New York

CRC Press is an imprint of the
Taylor & Francis Group, an **informa** business

CRC Press
Boca Raton and London

First Edition published 2022
by CRC Press

6000 Broken Sound Parkway NW, Suite 300, Boca Raton, FL 33487-2742

and by CRC Press

4 Park Square, Milton Park, Abingdon, Oxon, OX14 4RN

CRC Press is an imprint of Taylor & Francis Group, LLC

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Library of Congress Cataloging-in-Publication Data

Names: Luckin, Rosemary, author. | George, Karine, author. | Cukurova, Mutlu, author.

Title: AI for school teachers / Rose Luckin, Karine George, Mutlu Cukurova.

Description: First edition. | Boca Raton : CRC Press, 2022. | Series: AI for everything | Includes bibliographical references and index.

Identifiers: LCCN 2021045710 | ISBN 9781032044354 (hardback) | ISBN 9781032037714 (paperback) | ISBN 9781003193173 (ebook)

Subjects: LCSH: Educational technology. | Artificial intelligence. | Education--Effect of technological innovations on. | Computer-assisted instruction.

Classification: LCC LB1028.3 .L82 2022 | DDC 371.33--dc23/eng/20211109

LC record available at <https://lcn.loc.gov/2021045710>

ISBN: 978-1-032-04435-4 (hbk)

ISBN: 978-1-032-03771-4 (pbk)

ISBN: 978-1-003-19317-3 (ebk)

DOI: 10.1201/9781003193173

Typeset in Joanna

by Deanta Global Publishing Services, Chennai, India

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FOREWORD

We are all using products powered by Artificial Intelligence (AI) every day, whether we're searching for the route with the least traffic, translating foreign language websites, or playing our favourite songs using voice commands. But AI technologies go far beyond making life more convenient; its development makes breakthroughs in seemingly Herculean tasks like folding proteins to better understand the human body to optimising data centres and sequestering carbon to meet net-zero emissions. The achievement of these innovations hinges on AI technologies being built responsibly – slowly, safely, securely, and in the public interest.

There are risks to this technology, as well as rewards: risks which need to be regulated and risks which the industry must mitigate and ultimately root out. Governments and businesses typically need public pressure in order to act and when it comes to technology, citizens aren't yet shouting from the rooftops for change.

The public's relationship with AI technology is complicated. This is understandable as the sector can feel opaque, perceived as a "tech bro's" domain, driven by the 1% and rushing at an unbearably fast pace.

On the one hand, the public are given vague promises of social benefit. Starting simply, it will recognize your face and unlock your

phone; it will help you find the perfect movie. Escalating further, it will do the dirty, dangerous, dull jobs you don't want to; it will also drive your car and look after your pets. This can lead to people picking convenience over privacy – citizens accepting the immediate benefits and not questioning the impacts, not taking a breath to ask why. Who was this made for? What do I unwittingly give up when I use these technologies? What is that worth? And then moments like the 2020 A-Level grading fiasco occur and we have students screaming “f**k the algorithm” outside 10 Downing Street. Regardless of the fact that experts on the matter believe this to be a case of basic maths (not AI) used inappropriately, asking the wrong question in a setting it had no place being, the press and the public saw this as a mutant AI algorithm causing a whole cohort, and maybe generation, to be disadvantaged.

The consequence? At best – public scepticism about AI. At worst – a rejection of its potential for good entirely.

Too many people are getting left behind. The digital divide is widening with increased inequality and the AI ecosystem is failing to inspire or earn the trust of the public. This new technology feels inaccessible or is inaccessible. It's believed to be overhyped or unclear and ultimately people end up believing that it isn't for them.

In order for AI to bring around benefits for society and the economy, everyone needs to be involved in some way. Whether that's building, living with, working with or playing with this technology, it's now clear, everyone needs to have basic AI and Data Literacy to consciously engage safely.

As chair of the UK Government AI Council, I've made it my mission to encourage the progress of AI to be made in lockstep with the public. I believe the ecosystem should engage the public, listen, and act based on their views.

In June 2020, the AI Council agreed we needed to set out our collective vision for how AI should develop in the UK. One of the key pillars was dedicated to skills and diversity. We suggested the government double down on initiatives to grow, welcome and retain the best AI research and engineering talent in the UK. Alongside

this we highlighted the need to ensure the workforce is ready for an AI-enabled future and that the nation feels prepared for a life permeated by this technology.

So how will we inspire people to careers in AI – in the UK and worldwide? How will we help people learn how to learn and work ethically and effectively alongside smarter digital tools driven by AI? Public campaigns will surely play a part, but education – school-age education, national curriculums, and initiatives for lifelong learning – will be critical channels for this engagement.

That is why this book, by Rose Luckin, Karine George, and Mutlu Cukurova, all talented and accomplished educators in their own right, is so very timely and so well focused. Focusing on teachers, the front line, those with the toughest jobs, those preparing people to build and operate in our increasingly AI-supported societies is invaluable.

Up until now, teachers have been in a position similar to the majority of the general public. AI was a “too busy to bother” area that they did not understand or particularly trust, and given competing priorities, they did not feel great pressure to understand. But with education technologies being thrust front and centre during the pandemic, there has been a shift. AI is now increasingly seen as a valuable tool for teaching and learning, *and* a critical component of the knowledge people will need to flourish. The pressure for teachers to understand and shape this new arena has well and truly arrived.

With this volume, Rose, Karine, and Mutlu have written an accessible, very human, handbook to help any teacher become “AI-ready”. After a brief review of the definitions, origins, and history of AI, they swiftly dive into the practicalities of why and how a teacher might engage with AI technologies in their teaching practice. Useful guiding questions and frameworks are interspersed with examples and explanations drawn from schools and the learning sciences. Advice on the smart and ethical collection of data is also included, to help teachers more easily surface evidence to that seemingly elusive

question of what will work in their classrooms for their students, in keeping with the learning outcomes they hope to achieve.

Importantly, the authors assure us we don't need to be experts or data scientists to be substantively engaged with AI, which is a relief as I myself am not and, indeed, most people won't be. And this is pointedly not a book solely for STEM teachers – the influence of AI will touch teaching and learning tools across the piste, and the implications of its use have bearing across all subjects whether it be English, maths, geography, or philosophy. What is needed is a *general understanding* of the ingredients that comprise AI, and the ways we are able to combine them for the realisation of human potential. It's this general understanding that unlocks the gateway to the AI debate. And with this book, Rose, Karine, and Mutlu have provided teachers an all-access pass to one of the most important public conversations of our era. Jump right in, enjoy the ride, and then take everyone on it with you!

Tabitha Goldstaub

London, UK

August 2021

INTRODUCTION: UNDERSTANDING THE INGREDIENTS

In the firm belief that an introduction to the authors is an important complement to an introduction to the book that they have written, we begin with a bit about ourselves.

I am Rose and I love Artificial Intelligence (AI), but I love people more. I imagine that you already love people – well, some people at least – but perhaps not AI. I hope that when you reach the end of this short book, you will at least feel that you have made friends with AI.

Love takes a little longer.

A TALE OF LOVE AND LEARNING TO START OUR STORY ABOUT AI

When I was a small girl I loved spending time with my grandfather in his garden, he had been a market gardener all his working life, and whilst now retired, he still had an amazing garden. It was the sort of garden that you could imagine Peter Rabbit¹ and his pals bounding about in and having fun.

There were two green houses, one for tomatoes and the other for cucumbers, plus just a few glasshouse strawberries, so that he

could be sure there would be a punnet of glorious, jewel-like Royal Sovereign berries popping with sweet flavour, just waiting to burst out on my tongue and leave me with scarlet juice running down my chin when my birthday came along in June.

Throughout most of the rest of the garden, there were neat rows where flourished potatoes, and peas, carrots and onions, soft fruits and berries, plus a few rows of flowers to be cut for the house and for friends. He tended them daily until the day he died, with care and attention, and a little love too, I am sure.

I adored helping him with the hoe, planting seedlings and feeling the earth between my fingers or deadheading the flowers. He even showed me how to prune the roses, although I was not actually allowed to use the secateurs until I was quite a lot older. But, most of all I loved taking out the side shoots from the tomato plants in the greenhouse, because the smell was simply divine. The greenhouse was whitewashed, and, in addition to a range of tomato plants organised in carefully tied trusses, it also contained French marigolds to keep away the black and white fly. The smell was hot, spicy, musky, and tangy, the air tasted of the plump fruit that the plants would bear, with a hint of citrus and pepper from the marigolds. To this day, the smell of a hot tomato glasshouse, or a bed of marigolds on a sunny day, immediately evokes strong emotions and memories for me.

This may sound idyllic, and I believe that it was, but I was not an angelic or perfect gardener who always worked hard. I also liked to play of course and my grandfather created a swing for me by looping a rope over a big branch of the plum tree that provided welcome shade for the small lawn. I would swing and play imaginary games, daydreaming the afternoon away. I would also spend many hours simply watching my grandfather as he worked away.

I learned so much in so many ways; I was shown, trained, practised, and I watched and watched the expert as he toiled away happily. I loved him, I loved his garden, and I loved the way that he set me up for life to love nature, plants, nurturing growth, and

watching things develop and transform themselves with the changing seasons each year.

AI is clever, but it can only scratch the surface of the learning experience that I describe here. As you read on, you will discover the way in which AI gains its expertise and learns from experience. You will not find anything at all about how it smells, tastes, hoes, deadheads, experiences the breeze as a swing moves through the air, feels love, or the warmth of the earth, or wonder at the memories that have shaped its mind. Never forget that human intelligence is amazing and far richer than anything even the canniest computer can muster.

THE NOT-A-‘DIGITAL NINJA’ HEADTEACHER

For me (Karine), as a co-author of this book and a headteacher for more than 20 years in state-funded schools, understanding AI was a pathway to seizing back the reins of a curriculum that had become overly prescriptive and rigid. In AI I saw the promise of mechanisms to alleviate the burden of iterative, preparation, administrative, evaluation, and feedback tasks so that teachers could reconnect with young people to support and enhance their learning in more meaningful ways. And now, with the benefit of more experience, I see AI as the enabler that will allow every school, in its own unique context, to develop a strategy that will improve the educational opportunities for each student in new and exciting ways with evidence-informed practice.

At this point, you may be thinking that I must be one of those rare digital ninja headteachers. This could not be further from reality. In fact, when I first discussed the development of a technology strategy with the staff of my school, they fell about laughing, which perhaps gives you a sense of my relative level of expertise. But no matter: I went into teaching, and then headship to make a difference to the life chances of the children in my care and to support them