

The Elements of Education for **TEACHERS**

50 Research-Based Principles Every Educator Should Know

C

CREATIVITY

Dp

DELIBERATE
PRACTICE

Pe

PARENT
ENGAGEMENT

IN

INTERLEAVING

I

INTELLIGENCE

Ef

EXECUTIVE
FUNCTIONS

Mc

METACOGNITION

F

FEEDBACK

Dm

DECISION
MAKING

Pd

PROGRESSIVE
DISCLOSURE

Ag

ABILITY
GROUPING

Sp

SPACING

P

PERSONALITY

Co

CHOICE
OVERLOAD

Rl

READING
LEVELS

T

TRANSFER

Er

ERRORS

Cd

CLASSROOM
DESIGN

Pt

PEER
TUTORING

St

STUDY
TACTICS

Ex

EXERCISE
EFFECTS

Cm

CLASSROOM
MANAGEMENT

M

MOTIVATION

Pl

PLAY

Hw

HOMEWORK

Sl

SLEEP
STRATEGIES

Rp

RETRIEVAL
PRACTICE

Fa

FORMATIVE
ASSESSMENT

Sc

SCAFFOLDING

Pf

PRODUCTIVE
FAILURE

An **Eye On Education** Book

AUSTIN VOLZ
JULIA HIGDON
WILLIAM LIDWELL



The Elements of Education for Teachers

What makes some teachers more effective than others? What pedagogies and practices are fads and which are backed with quality evidence? Which teaching strategies give teachers the biggest learning bang for their buck?

The authors have surveyed the research literature and carefully curated 50 elements of effective teaching—elements such as direct instruction, executive functions, metacognition, motivation, and scaffolding—to answer such questions and demystify the secrets of master teachers.

Designed specifically for clarity and ease of use, this book is perfect for both new and experienced educators. Each element uses a consistent architecture: a simple definition, concise overview of the research, practical Dos and Don'ts for the classroom, and a select quote to inspire reflection.

The Elements of Education for Teachers is an essential addition to any teacher's library and important reading for teachers' professional development.

Austin Volz is Senior Learner-Experience Designer on the “Tiger Works” Research and Development team at Avenues: The World School. A recipient of both a Fulbright scholarship and Foreign Language and Area Studies Fellowship, Austin holds a bachelor's from St. John's College and a master's from the Harvard Graduate School of Education.

Julia Higdon is Senior Research Scientist on the “Tiger Works” Research and Development team at Avenues: The World School. Julia began her career as a teacher and holds a doctorate in education research from the Harvard Graduate School of Education.

William Lidwell is Vice President of the “Tiger Works” Research and Development team at Avenues: The World School. He is the author of several books, including the best-selling *Universal Principles of Design*.

**Also Available from
Routledge Eye on Education**
(www.routledge.com/k-12)

Your First Year:

How to Survive and Thrive as a New Teacher
Todd Whitaker, Katherine Whitaker, Madeline Whitaker Good

**What Great Teachers Do Differently, 2nd Edition:
17 Things That Matter Most**
Todd Whitaker

**Passionate Learners, 2nd Edition:
How to Engage and Empower Your Students**
Pernille Ripp

Rigor and Assessment in the Classroom
Barbara R. Blackburn

**101 Answers for New Teachers and Their Mentors, 3rd Edition:
Effective Teaching Tips for Daily Classroom Use**
Annette Breaux

**Motivating Struggling Learners:
10 Ways to Build Student Success**
Barbara R. Blackburn

**Rigor and Differentiation in the Classroom:
Tools and Strategies**
Barbara R. Blackburn

**Teacher-Made Assessments, 2nd Edition:
How to Connect Curriculum, Instruction, and Student Learning**
Christopher R. Gareis and Leslie W. Grant

**Intentional Innovation:
How to Guide Risk-Taking, Build Creative Capacity, and Lead Change**
A.J. Juliani

The Elements of Education for Teachers

50 Research-Based Principles
Every Educator Should Know

Austin Volz, Julia Higdon and William Lidwell

First published 2019
by Routledge
52 Vanderbilt Avenue, New York, NY 10017

and by Routledge
2 Park Square, Milton Park, Abingdon, Oxon, OX14 4RN

Routledge is an imprint of the Taylor & Francis Group, an informa business

© 2019 Taylor & Francis

The right of Austin Volz, Julia Higdon, and William Lidwell to be identified as authors of this work has been asserted by them in accordance with sections 77 and 78 of the Copyright, Designs and Patents Act 1988.

All rights reserved. No part of this book may be reprinted or reproduced or utilised in any form or by any electronic, mechanical, or other means, now known or hereafter invented, including photocopying and recording, or in any information storage or retrieval system, without permission in writing from the publishers.

Trademark notice: Product or corporate names may be trademarks or registered trademarks, and are used only for identification and explanation without intent to infringe.

Library of Congress Cataloging-in-Publication Data

Names: Volz, Austin, author. | Higdon, Julia, author. | Lidwell, William, author.

Title: The elements of education for teachers : 50 research-based principles every educator should know / Austin Volz, Julia Higdon, William Lidwell.

Description: New York, NY : Routledge, 2019. | Includes bibliographical references.

Identifiers: LCCN 2018058872 (print) | LCCN 2019006432 (ebook) | ISBN 9781315101002 (ebook) | ISBN 9781138294639 (hbk) | ISBN 9781138294653 (pbk) | ISBN 9781315101002 (ebk)

Subjects: LCSH: Effective teaching. | Instructional systems—Design. | Learning.

Classification: LCC LB1025.3 (ebook) | LCC LB1025.3 .V65 2019 (print) | DDC 371.102—dc23

LC record available at <https://lccn.loc.gov/2018058872>

ISBN: 978-1-138-29463-9 (hbk)

ISBN: 978-1-138-29465-3 (pbk)

ISBN: 978-1-315-10100-2 (ebk)

Typeset in Palatino
by Apex CoVantage, LLC

Proof

Dedicated to
Bill and Tamara Volz
Zac and Katrina Van Alst

Copyright © 2013
Not for distribution

Proof

Contents

<i>Acknowledgments</i>	x
<i>Introduction</i>	xi
1 80/20 Rule	2
2 Ability Grouping	4
3 Assessment, Formative	6
4 Assessment, Self	8
5 Assessment, Summative	10
6 Choice Overload	12
7 Chunking	14
8 Classroom Design	16
9 Classroom Management	18
10 Creativity	20
11 Decision Making	22
12 Deliberate Practice	24
13 Depth of Processing	26
14 Direct Instruction	28
15 Discussion-Based Learning	30
16 Dual Coding	32
17 Engagement, Parent	34
18 Engagement, Student	36

19	Errors	38
20	Executive Functions	40
21	Exercise Effects	42
22	Expectation Effects	44
23	Feedback	46
24	Flexibility Tradeoffs	48
25	Homework	50
26	Intelligence	52
27	Interleaving	54
28	Metacognition	56
29	Mnemonic Devices	58
30	Motivation	60
31	Peer Tutoring	62
32	Performance Load	64
33	Personality	66
34	Play	68
35	Productive Failure	70
36	Progressive Disclosure	72
37	Project-Based Learning	74
38	Reading Levels	76
39	Retrieval Practice	78
40	Scaffolding	80

41	Serial Position Effects	82
42	Sleep Strategies	84
43	Social-Emotional Learning	86
44	Spacing	88
45	Student-Directed Learning	90
46	Student-Teacher Relationship	92
47	Study Tactics	94
48	Teach-to-Learn	96
49	Technology-Based Instruction	98
50	Transfer	100

Acknowledgments

The authors would like to thank numerous people who have made this work possible.

First, Connie Chen for that first tumultuous writing feedback to late-night parallel work sessions and all the meals, canceled plans, and pick-me-ups in between. Bill and Tamara for passing on the educator spirit and supporting a rampant consumption of books. Filip: So much sleep sacrificed between Lamont and Shanghai. Thank you for always encouraging a critical eye, good adventures, and pausing conversations to appreciate a well-crafted phrase.

We would also like to thank John Van Alst for his constant support and friendship during this project, as well as Jan Boyce, Al Boyce, and Pat Higdon for their abundant encouragement. And, of course, Jill Butler for her patient reviews, emotional support, and design wisdom.

Second, our colleagues at Avenues: The World School provided both direct and indirect support that helped bring this book into existence, especially Alison Mackey, Jeff Clark, Ty Tingley, Isil Çelimli, Charlie Xavier, Daniel Saniski, and all members of the “Tiger Works” R&D team.

Third, we would like to thank everyone at Routledge, especially Lauren Davis, for their patient commitment and professionalism in support of this work.

Not for distribution

Introduction

We shape our tools, and then our tools shape us.

—John Culkin

Despite the great importance of education to families, industry, and society, we've not done particularly well giving teachers the tools for success. Much of education research remains in the confines of academia, hidden from teachers behind paywalls, dense tomes, or obscure, jargon-y language. The goal of this book is to bridge this gap with a concise, intentional translation of how to apply this research in practice.

Research, of course, changes. The criticism that schools still follow a factory model of education from 18th century Prussia is so common as to be nearly cliché. And yet, the need for change is not because centuries have passed, but because we now have a much deeper understanding of how students learn than in the 18th century. Psychology, sociology, economics, cognitive science, and numerous other disciplines have all contributed ways to promote students' learning. Similarly, in the coming decades, our understanding will continue to grow and change. Our current knowledge is likely imperfect, but teachers have to decide the best way to foster students' learning regardless of how imperfect the current state of knowledge. We provide teachers guidance to make good decisions grounded in the best available evidence.

The 50 elements in this book consist of laws, principles, guidelines, and proven heuristics. They were selected based on the strength of the research supporting them, their practical value to teaching, and their fundamental importance in the lives of teachers. Teaching is an exceptionally busy profession, yet much of the relevant writing is dense, the research quality varied, and the practical implications unclear. Thus, in this book, brevity and utility have been paramount. Arranged in alphabetical order, teachers can quickly reference each principle and within a few minutes take away valuable practices without having to wade through hundreds of pages of text.

Our goal is to provide teachers with a "heuristic toolbox" (see **Decision Making**) from which teachers can choose judiciously. This approach complements the meta-synthesis and meta-analysis approaches, popularized by John Hattie, Robert Marzano, and others. A meta-analysis combines the results from multiple studies so as to obtain an effect size: a standardized measure of a teaching strategy's effectiveness. While the resulting effect size offers a valuable way to compare and rank teaching strategies, it has its limits. First, a meta-analysis may include studies with teaching strategies that are poorly defined or difficult to implement. This variability results in a low overall effect size that can undervalue potentially powerful teaching strategies. Second, teaching strategies that are more highly ranked are not always preferable. Teaching is an art of selecting the right tool for the job, whether it be increasing engagement or enabling

students to apply their knowledge in a range of contexts. Research cannot replace a teacher's judgment, but it can empower it.

Each element has a consistent two-page structure. The left-hand page provides the definition, an overview of the research, why the principle matters, and how it works. These paragraphs are followed by a "see also" section of related principles. The page ends with selected research for those who want to dive in more deeply. The right-hand page extracts guidelines in the form of "DOs" and "DON'Ts" for applying the principle in practice. These guidelines are not exhaustive. Rather, they are meant to demonstrate concrete applications and prevent possible misinterpretations, sketching the boundaries for you to apply the element in other ways. While following the guidelines will increase the probability of successful learning, they are not absolute: context, logistical constraints, priorities, and other factors may influence what the right decision is. The element wraps up with a quote to inspire reflection.

The use of research-based elements in teaching puts excellent, effective teaching in reach. Use *The Elements of Education for Teachers* as a resource to increase your knowledge of education, as a tool for problem solving and brainstorming, and as a way to discover less frequently referenced education tools. Perhaps most importantly, use it to increase the effectiveness of your instructional practice, creating a research-based foundation to the art of teaching.

Austin Volz
Julia Higdon
William Lidwell

1

80/20 Rule

The majority of effects in any large system are caused by a few causes.

The 80/20 rule, also known as the Pareto principle, asserts that approximately 80 percent of the effects in large systems are caused by 20 percent of the variables in that system. The person who first recognized the ubiquity of the 80/20 distribution, the Italian economist Vilfredo Pareto, observed that 80 percent of the land in Italy was owned by 20 percent of the population. After some additional analysis, he realized this distribution described not only wealth in Italy, but in all countries—and astonishingly, in large, complex systems generally, including those in economics, management, quality control, and education, to name a few. He reputedly even discovered that 80 percent of the peas from his garden came from 20 percent of the peapods. A few examples of the 80/20 rule in education include the following:

- ◆ Twenty percent of school activities account for 80 percent of the academic results.
- ◆ Twenty percent of what is taught represents 80 percent of what is learned.
- ◆ Twenty percent of students require 80 percent of the time and resources.
- ◆ Twenty percent of learning outcomes underpin 80 percent of learning standards.
- ◆ Twenty percent of words in a language are used 80 percent of the time in conversation.

The specific percentages 80/20 are unimportant—it could be 70/30, 90/10, and so on. What is important is that a small number of variables drive the bulk of performance, and focusing on these high-leverage variables is the most efficient way to change a system. For example, 80/20 analysis has been used to identify the critical 20 percent of errors made by writing students. Using the results of this analysis, teachers were able to then target their instruction, practice, and grading on areas that produced the most improvement with the least effort. Similar 80/20 applications can be applied to enacting curriculum. Focusing instruction on a Pareto subset of a comprehensive curriculum runs contrary to coverage-driven approaches found in many schools today, but it will yield superior outcomes with less effort than exhaustive approaches.

Note that knowing what not to focus on is equally important. The time, energy, and money spent optimizing (i.e., improving system performance a small amount) are often as costly or costlier than that required to improve the critical 20 percent. Similarly, when redesigning processes and systems to increase efficiency (e.g., classroom activities, school schedules, professional development) focusing on aspects beyond the critical 20 percent yields diminishing returns. And not only do improvements beyond the critical 20 percent result in nominal gains, these gains are also often offset by the introduction of errors and new problems. In other words, efforts that can only achieve nominal gains come with risks that they can actually make things worse.

See also Decision Making; Errors; Intelligence; Performance Load; Personality

The seminal work on the 80/20 Rule is *Quality Control Handbook* by Joseph Juran (Ed.), 1951, McGraw-Hill; *The 80/20 Principle: The Secret to Achieving More With Less* by Richard Koch, 1999, Doubleday; “Applying the Pareto Principle to the Analysis of Students’ Errors in Grammar, Mechanics and Style” by Kathryn O’Neill, *Research in Higher Education Journal*, May 2018, 34, 1–12.

✓ DO

- ◆ Do use the 80/20 rule to assess the value of programs, target areas of redesign and improvement, and focus time and resources in an efficient manner.
- ◆ Do apply the 80/20 rule to admissions processes, curriculum design, lesson planning, learning activities, and examinations.
- ◆ Do formalize conferences and feedback to identify critical and noncritical content, skills, behaviors, and work.
- ◆ Do consider cutting or minimizing investment in noncritical elements that are part of the noncritical 80 percent.
- ◆ Do limit the application of the 80/20 rule to systems that are influenced by many small and unrelated effects.

✗ DON'T

- ◆ Don't assume or treat all variables in a system as if they are equal.
- ◆ Don't optimize noncritical variables when time and resources are limited, or when the risk of setting performance back is unacceptable.
- ◆ Don't be discouraged by political resistance: getting organizations of all types to focus on the critical 20 percent is hard.

“ REFLECT

The 80/20 Principle can and should be used by every intelligent person in their daily life, by every organization, and by every social grouping and form of society. It can help individuals and groups achieve much more, with much less effort. The 80/20 Principle can raise personal effectiveness and happiness. It can multiply the profitability of corporations and the effectiveness of any organization. It even holds the key to raising the quality and quantity of public services while cutting their cost.

—Richard Koch

2

Ability Grouping

Grouping students for instruction according to abilities, aptitude, or achievement.

Ability grouping is the grouping of students by ability or attainment to optimize student achievement and simplify the planning and delivering of instruction. There are two basic types: within-class and between-class. Within-class ability grouping is forming small groups of students with similar abilities or attainment within a classroom. Between-class ability grouping is forming different classrooms of students with similar abilities or attainment.

Both forms of ability grouping are popular, but also perilous: popular because they make instruction more efficient for teachers, but perilous because this simplification comes at a price. Students grouped into low- or moderate-ability levels often internalize lowered expectations from teachers and peers, and this reduced self-concept can continue for years. Additionally, these students lose the opportunity to access higher-level content and learning processes and to learn from their higher-achieving peers. In extreme cases, ability grouping can lead to persistent student groupings (sometimes referred to as *streaming* or *tracking*), which creates strata in achievement and lifetime outcomes that are stark and often biased with regard to race, class, and gender.

Given these perils, the general rule should be to favor mixed-ability groups and adapt teaching practices accordingly. For example, teachers working with mixed-ability groups can make use of cooperative, peer-to-peer learning processes. Providing cooperative activities for a mixed-ability group enables students of higher abilities to recognize the gaps between their own abilities and those of students of lower abilities, observe instruction that reviews and consolidates content, and engage in peer-instruction. These learning processes deepen understanding, particularly when students are aware of these benefits. Students of low- and moderate-abilities also benefit from their higher-ability peers and gain exposure to students who may have higher levels of interest, investment, and enthusiasm for the content. With mixed-ability groups, there are two keys: accurate knowledge of students' abilities and a sufficient number of students of low-, moderate-, and high-abilities to evenly distribute across groups to prevent students from feeling isolated.

There is one exception to this general rule: students of very high ability—i.e., one year or more above grade level—benefit from between-class grouping to provide accelerated or enriched curricula. But these prodigies aside, the rule should be to mix and match.

See also Classroom Management; Expectation Effects; Intelligence; Peer Tutoring

"What One Hundred Years of Research Says About the Effects of Ability Grouping and Acceleration on K-12 Students' Academic Achievement: Findings of Two Second-Order Meta-Analyses" by Saiying Steenbergen-Hu et al. *Review of Educational Research*, 2016, 86(4), 849-899; "Meta-Analytic Findings on Grouping Programs" by James Kulik and Chen-Lin Kulik, *Gifted Child Quarterly*, 1992, 36(2), 73-77.

✓ DO

- ◆ Do generally favor mixed-ability groups both within and between classes.
- ◆ Do structure groups so that students work together and help each other.
- ◆ Do ensure that groups are temporary and appropriate for the unit of instruction.
- ◆ Do ensure that groups are constituted only for brief periods, one or two class meetings or the duration of one project.
- ◆ Do use formative and summative assessment evidence to accurately understand student ability and attainment.
- ◆ Do group high-ability students who are more than a grade level above their peers and have the interest to participate in accelerated or enriched classes.

✗ DON'T

- ◆ Don't generally form classes based on student ability.
- ◆ Don't establish rules that prevent students from switching between groups.
- ◆ Don't create long-term ability groups since it can result in tracking.
- ◆ Don't label groups of students by ability level.
- ◆ Don't form "advanced" versions of courses for students who are less than one grade level above their peers.
- ◆ Don't communicate low expectations in any groups.

“ REFLECT

Ability grouping rarely benefits overall achievement, but it can contribute to inequality of achievement, as students in high groups gain and low-group students fall farther behind. The more rigid the tracking system, the more likely these patterns are to emerge.

—Adam Gamoran

"Synthesis of Research: Is Ability Grouping Equitable?" by Adam Gamoran, *Educational Leadership*, October 1992, 50(2), 11–17.