

SpringerBriefs in Education

More information about this series at <http://www.springer.com/series/8914>

Jacqueline Sack · Irma Vazquez

A 3D Visualization Teaching-Learning Trajectory for Elementary Grades Children



Springer

Jacqueline Sack
University of Houston-Downtown
Houston, TX
USA

Irma Vazquez
Houston Independent School District
Wharton Dual Language Academy
Houston, TX
USA

ISSN 2211-1921
SpringerBriefs in Education
ISBN 978-3-319-29798-9
DOI 10.1007/978-3-319-29799-6

ISSN 2211-193X (electronic)
ISBN 978-3-319-29799-6 (eBook)

Library of Congress Control Number: 2016932513

© The Author(s) 2016

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made.

Printed on acid-free paper

This Springer imprint is published by Springer Nature
The registered company is Springer International Publishing AG Switzerland

Contents

1	Introduction and Project Background	1
1.1	The Start of a Task-Design Journey in the Context of Block Buildings	1
References		3
2	Theoretical Frameworks and School Context	5
2.1	Why Are Visualization Skills Important?	5
2.2	The Spatial Operational Capacity Framework	6
2.3	Research Methodology	8
2.4	School and Classroom Context	8
2.5	Pre-program Interview	9
References		10
3	Introductory Activities	13
3.1	Four Block Houses	13
3.2	The Soma Puzzle Pieces	16
3.3	The Coordinate Grid	17
References		18
4	The Geocadabra Construction Box Dynamic Geometry Interface	19
4.1	Learning to Use the Construction Box	19
4.2	Supporting Learners with Relatively Weak Visual Skills	22
4.3	Front-Side-Top Views	25
Reference		27
5	3D to 2D via Top-View Plans	29
5.1	Self-created Task Card Puzzles	29
5.2	Extended Construction Box	32
5.3	Rectangular Prisms and Their Volumes	35
References		36

6 Connections to Numeracy	37
6.1 Scaling up the Soma Cube	37
6.2 Permutations Within Cake Patterns	41
6.3 Conclusions	43
References	44