
DRONES IN EDUCATION

Let Your Students' Imaginations Soar

Christopher Carnahan, Laura Zieger, Kimberly Crowley



Contents

Introduction	1
CHAPTER 1	
Teaching and Learning in the Digital Age	5
Engagement and Motivation	5
Incidental Learning	10
SOAR Model	11
Common Core State Standards	14
Essential Questions	17
ISTE Standards for Teachers	18
CHAPTER 2	
Introducing Drones in the Classroom	19
Two Teachers' Stories	20
CHAPTER 3	
Safety, Legal, and Ethical Issues	31
Indoor Use	32
FAA Regulations	33
Athletics	36
Privacy and Image Usage	36
Institutional Policies	37
Liability	39
CHAPTER 4	
Selection and Operation of a Drone	41
Applications	42
Cost	42
Controls	43
Stability	45
Media Quality	47
Data	49
Batteries and Replacement Parts	50

CHAPTER 5

Active Learning: Classroom Implementation	53
Safety	54
Beginner Models	56
Intermediate Models	57
Advanced Models	59
User Training	61
Storyboards	64
Common Issues and Resolutions	66

CHAPTER 6

Integrating Drones into the Curriculum	69
Sample Lesson Plans	70
Extracurricular Applications	99

CHAPTER 7

Funding Opportunities	107
Title I	108
Title II	109
Crowdfunding	110

CHAPTER 8

Real-World Applications	113
--------------------------------------	-----

References	117
-------------------------	-----

APPENDIX A

Policy for Unmanned Aircraft Systems Usage	122
---	-----

APPENDIX B

Drone Safety Checklist	123
-------------------------------------	-----

APPENDIX C

Drone Objective Sheet	124
------------------------------------	-----

Introduction

“You are the coolest teacher in the school!”

That’s what you are going to hear when you walk into the classroom. Simply by purchasing this book, you have demonstrated your level of coolness. Who doesn’t want to fly an unmanned aircraft with remote video and photographic capabilities? And who wouldn’t want to see the wonder on students’ faces as they fly a drone and apply the concepts learned? The answer is a no-brainer.

This book was written for educators who want to incorporate drones into their curriculum but have no idea where to start. It will cover all that you need to know to get off of the ground (puns are intentional!) with a drone program in your school. It covers such basic but important information as which drones need to be registered and where you can fly them. It also provides recommendations as to the drones that are best for specific age levels and subject areas. The information provided here will offer you everything you need to know to start using drones in the classroom.

When incorporating a new cutting-edge technology into any school setting, you need to know whether it is useful. You do not want to undertake the time and expense of incorporating drones if there is not support that they will have an impact on teaching and learning.

So, the organization of the book is logical. Chapter 1 discusses the rationale for using drones in education and offers data to support your goals. You might want to quote the research here to support your budget proposal or curriculum unit, for example.

In Chapter 2, you will learn about other teachers like yourself who have successfully integrated drones into their classroom teaching. Their stories will inspire you and dissuade your fears about this undertaking. When you see the smiles and enthusiasm on the faces of your students, you will know that it is all worthwhile.

Chapter 3 gets into the nitty-gritty of the laws and ethical issues surrounding drones. You've probably heard stories in the news about drone crashes in football stadiums and regulations about pilot licenses. This chapter covers the policies and rules as they pertain to teachers and the use of drones in education. Your principal will be happy to know that you understand the rules and laws, and have complied with all federal and state regulations.

This book will also help you to determine which drone is right for you and your school. Not all drones are created equal. While the more expensive drones have more capabilities, you might find that a less expensive and smaller version is better suited to your needs. Chapter 4 discusses how drones work in different settings (classroom, gymnasium, playground) and which drones are best for varying ages and technical expertise.

And what about the big question: how do you fly a drone and, more importantly, teach students to fly? If you have never flown a drone, do not worry. There are spider drones that are perfect for you. Chapters 4 and 5 offer tips to get you up and running, and troubleshooting tricks for when you are not. Both chapters focus on selecting the right drone and keeping them operational. A drone is not worth anything if it is not flying!

Once you have mastered flying, the work begins: integrating drones in the curriculum. In Chapter 5, we discuss classroom implementation through our SOAR (safety, operation, active learning, and research) model. SOAR is a conceptual model to provide teachers with the technical and theoretical knowledge they need to include drone and robotic technology in their classrooms, and to engage learners. It offers a simple formula to ensure safe operation and maximize engagement and learning in every classroom.

A key element of the SOAR model is to provide a curriculum-based program that excites students in STEM (science, technology, engineering, and math) pathways. Unmanned aerial vehicles (UAVs) offer the ideal tool for developing invaluable STEM skills, and Chapter 6 translates what teachers learn about UAVs into sample lesson plans for the classroom and across the curriculum. You can improve learning by utilizing hands-on activities with current