

EGU, Vienna. April 11, 2018

A CASE STUDY IN INNOVATIVE GEOSCIENCE EDUCATION:

USING EBOOKS AND INTERACTIVE SOFTWARE TO ENHANCE STUDENT
LEARNING AND PREPARE THEM FOR AN EVER-CHANGING,
TECHNOLOGICALLY-BASED SOCIETY



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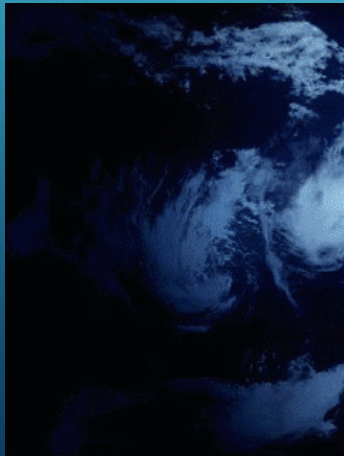
JERUSHA LEDERMAN

- **H. B.Sc. Space & Communications Science**
- **M.Sc. Astrophysics**
- **Ph.D. Atmospheric Physics**

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- **B.Sc. Physics & Astronomy**
- **M.Sc. Astronomy**
- **Ph.D. Geophysics (in Progress)**

York University's DIVISION OF NATURAL SCIENCE, "NATS"



PHYSICS ♦ CHEMISTRY ♦ BIOLOGY ♦ EARTH & SPACE SCIENCE

- All non-science undergrads required to take one NATS Gen. Ed. Course
- Online course offerings using new technologies are increasingly popular
- NATS 1570: "Exploring the Solar System"

EBOOK STUDY MOTIVATION

- In the sciences, cost of textbooks is often prohibitive.
- eBooks → up to 50% cheaper than print books.
- Many textbook companies moving away from printed texts toward digital resources.
- For the course in this study, no single hardcopy or custom text was suitable to the material when study began in 2016.
- W.W. Norton & Company Inc. → 2 physical texts
(1 Geology, 1 Astronomy) as a digital package
- Package included Norton's "Smartwork5" software.

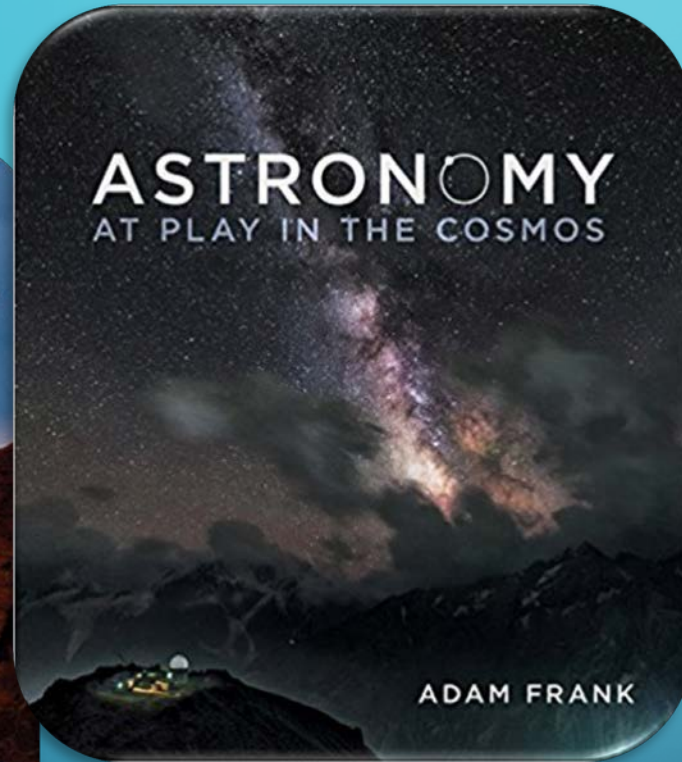
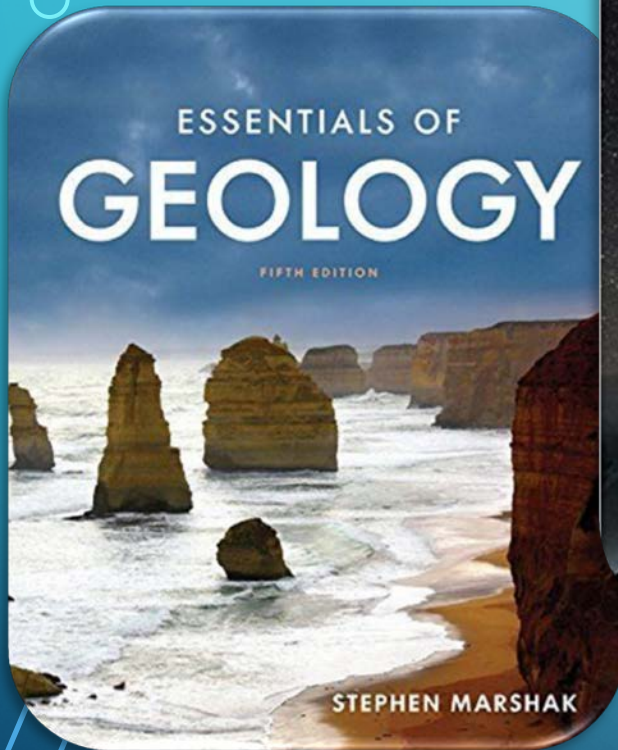
EBOOK STUDY MOTIVATION (CONT'D)

- **Little literature present on required course text being in *electronic format ONLY*.**
- **Same course offered 3 times from 2016-2018: in-class & fully online versions.**
 - ability to conduct longitudinal study across multiple course sections
- **Unique student enrolment: diverse population from various programs & ALL years of undergraduate study.**

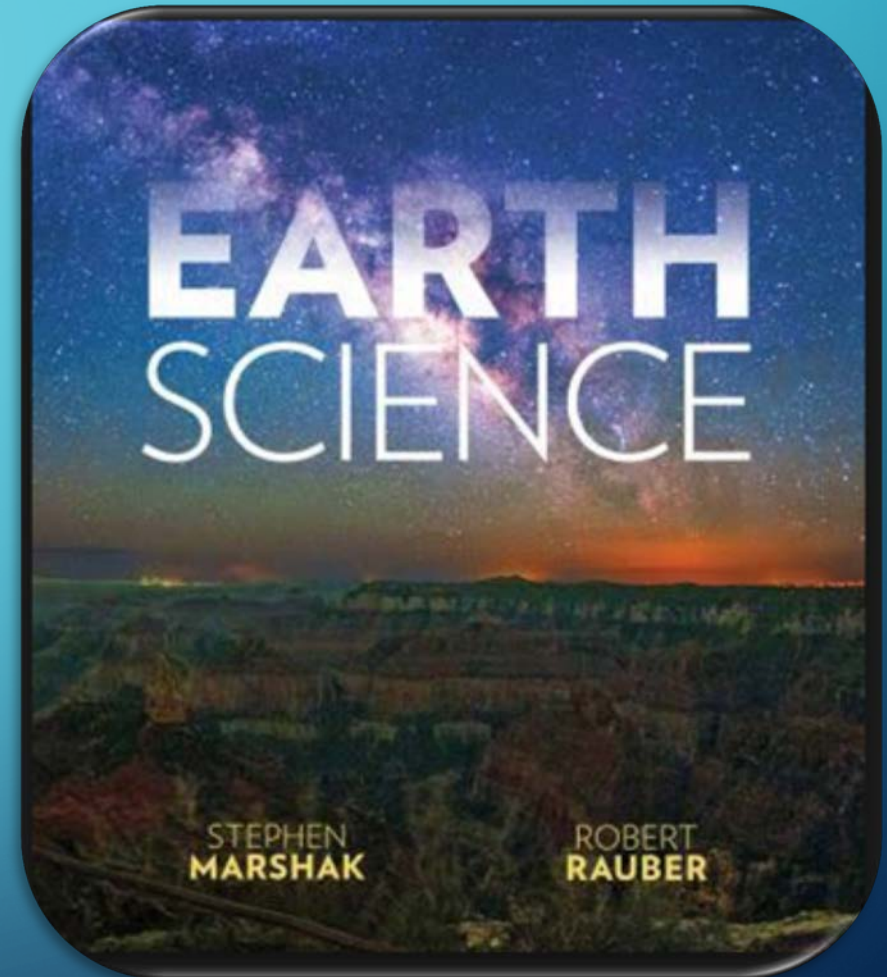
Rare opportunity to gauge student reaction to:

- ebook format as mandatory course text
- additional ebook features to promote active learning, deeper retention, accessibility
- cost & economic savings to students
- Tech issues associated with ebook & associated software, including LMS integration
- Use of technological tools for student preparedness in an increasingly digital world

EBOOKS PACKAGES & ASSOCIATED “SMARTWORK5” SOFTWARE USED




2016-2017



2018

SMARTWORK5 INTERACTIVE SOFTWARE


- Included with 1-year student ebook subscription purchase
- Instructor software tracks student activity, reading time, quiz completion
- Integrates directly with LMS (Moodle)



W. W. Norton & Company, Inc.
INDEPENDENT PUBLISHERS SINCE 1923

SMARTWORK5

lederman@yorku.ca



32866 (COPY OF SC/NATS1570 A - Exploring the Solar System (Sum ▾

Export Report Data


Create New Assignment

ACTIVITY TITLE		PUBLISHED	GRADES ACCEPTED UNTIL	EXTRA CREDIT	SUBMITTED GRADES	AVG. TIME SPENT (MM:SS)	AVG. GRADE	
Ch 1 Reading Quiz	EDIT COPY	<input checked="" type="checkbox"/>	05/11/17 11:59 PM	<input type="checkbox"/>	43	—	7%	Report
Smartworks 1 (Geology) - Introduction to the Solar System	EDIT COPY DELETE	<input checked="" type="checkbox"/>	05/16/17 11:59 PM	<input type="checkbox"/>	53	—	61%	Report
Smartwork Reading Quiz 2 - (Geology, Chps. 2 & 5)	EDIT COPY DELETE	<input checked="" type="checkbox"/>	05/29/17 11:59 PM	<input type="checkbox"/>	56	—	57%	Report
Smartwork Reading Quiz 3	EDIT COPY	<input checked="" type="checkbox"/>	06/05/17 11:59 PM	<input type="checkbox"/>	73	66:21	68%	Report
Smartwork Reading Quiz 4 (Geology)	EDIT COPY DELETE	<input checked="" type="checkbox"/>	06/13/17 11:59 PM	<input type="checkbox"/>	65	37:06	66%	Report

A caldera is which of the following?

Choose one:

- ☐ A. a long ridge formed by planet shrinkage
- ☐ B. the depression at the top of a volcano
- ☐ C. a crest formed by the meeting of two crustal plates
- ☐ D. a channel dug by the glancing blow of an asteroid
- ☐ E. a depression that filled with lava

 Hint

What feature is a caldera specifically associated with?

SMARTWORK5 ASSIGNMENTS & QUIZZES

STUDENT RESULTS			lederman@yorku.ca	⚙
			Grades	Time Spent
Smartwork5 Avg. Grade ⓘ	Smartwork5: Smartwork Reading Quiz 5 (Astronomy) 06/16/17	Smartwork5: Smartwork Reading Quiz 6 (Astronomy) 06/21/17		
79% 2 activities	67%	90%		
92% 2 activities	83%	100%		
0% 2 activities	0%	0%		
79% 2 activities	58%	100%		
92% 2 activities	83%	100%		
83% 2 activities	75%	90%		
88% 2 activities	75%	100%		
50% 2 activities	0%	100%		

**Suggested /
Corresponding
reading pages in
ebook interactively
linked to each quiz
question**

STUDY DESIGN

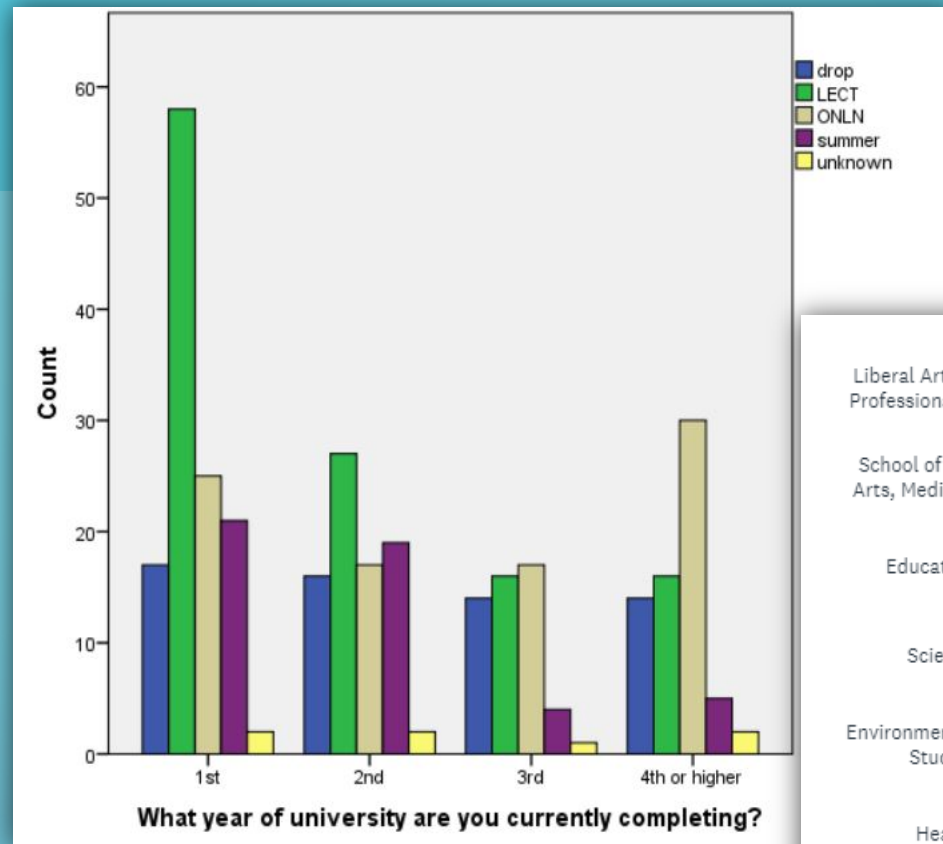
- **3 years / 5 sections of NATS 1570, “Exploring the Solar System”**
(1 term long, General Education requirement for all non-science majors)

Date	Format	Approximate Enrollment
FALL 2016	<i>In-class</i>	270
“	<i>Online</i>	150
Summer 2017	<i>In-class</i>	80
WINTER 2018	<i>In-class</i>	285
”	<i>Online</i>	165
TOTAL		950

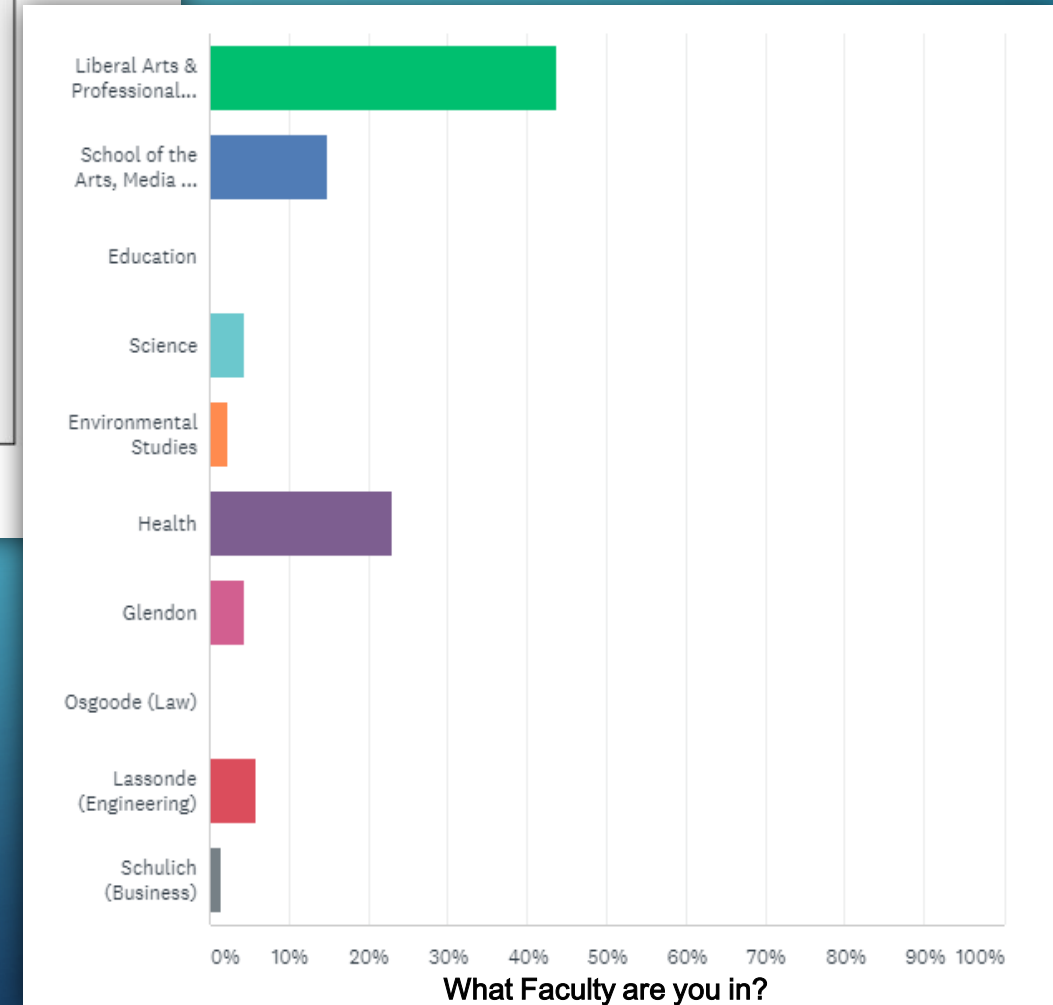
- **3 online surveys (beginning, middle, end of term) of 20-25 questions each**
- **Responses: typically over 200 students per survey**

Each survey consisted of basic demographics:

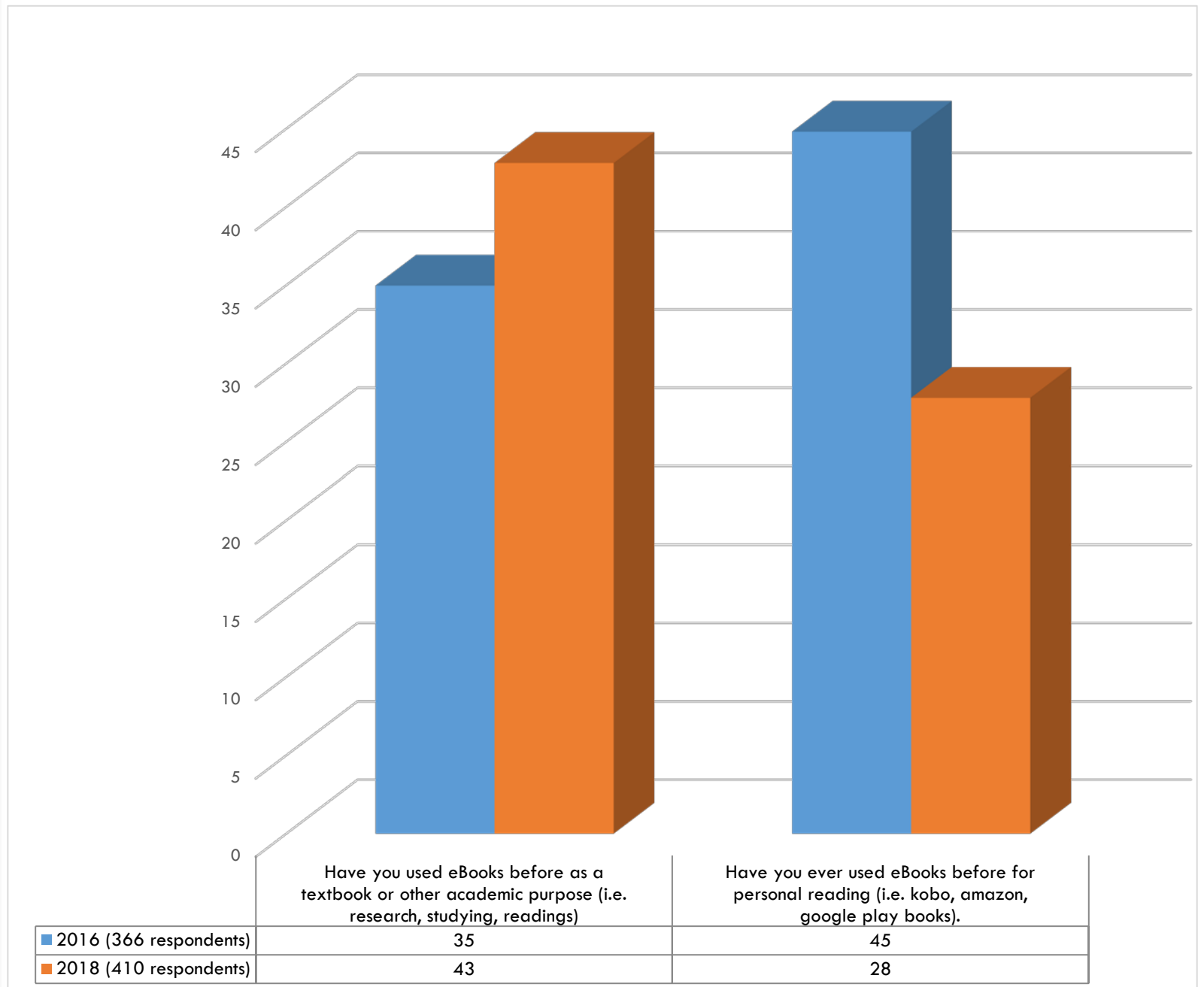
- gender
- program of study
- year of study
- part/full-time
- international/domestic



STUDY DESIGN



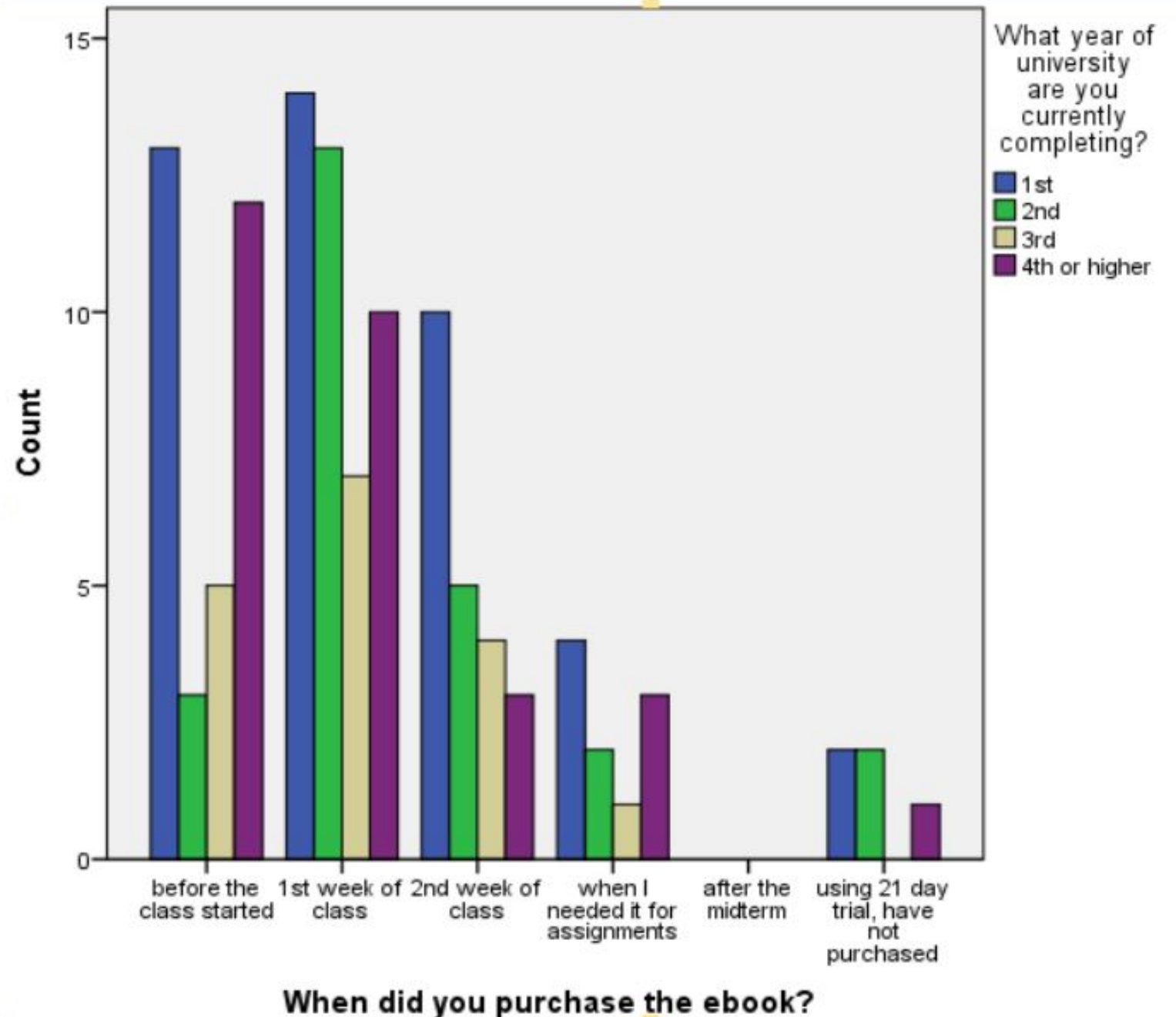
ACADEMIC EBOOK USAGE: ON THE RISE



EBOOK PACKAGE ADOPTION

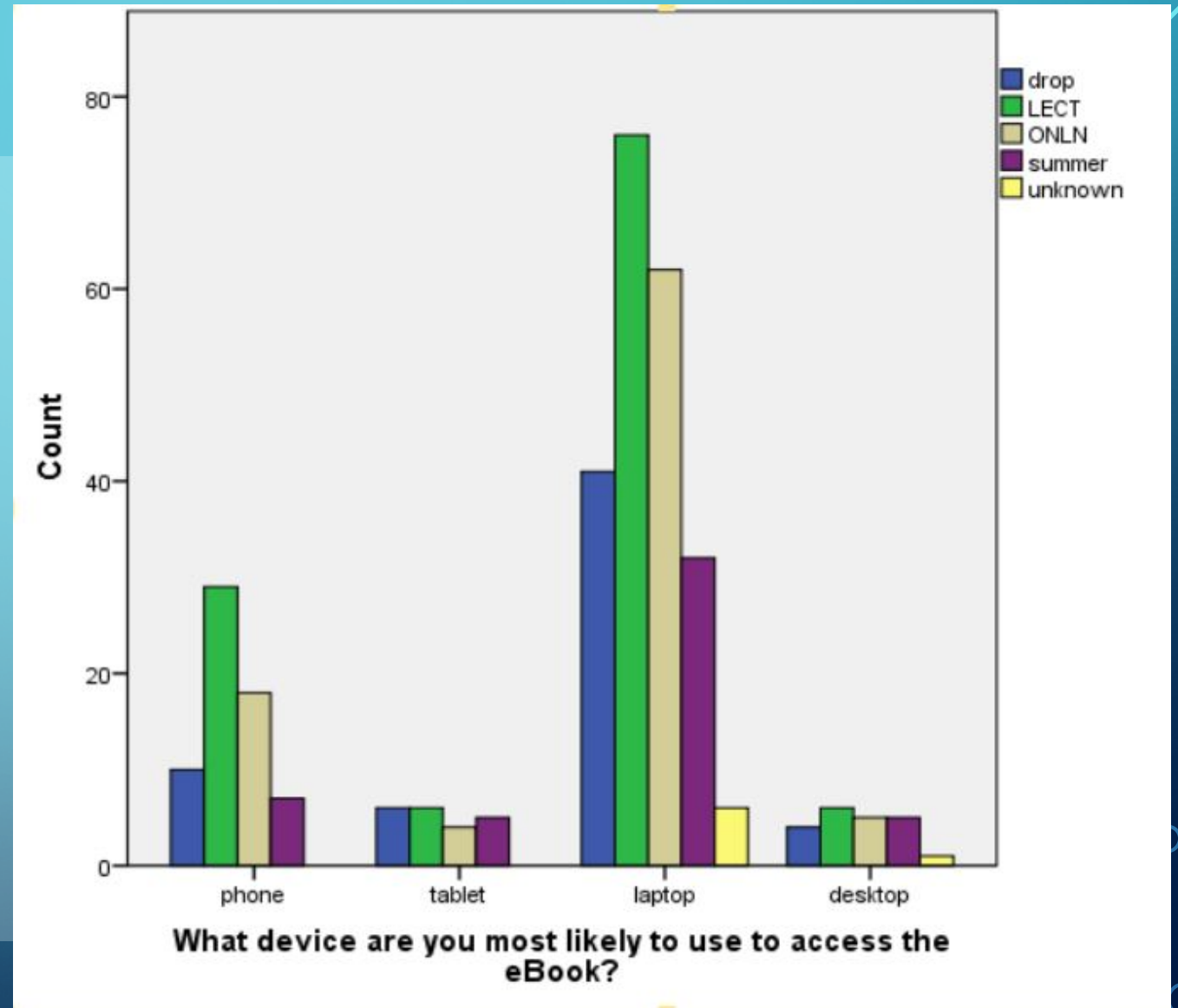
Timing of student purchase of e-package varied across:

- year of study
 - course section (i.e. in-class vs. online)
- > 80% adoption rate (larger for online sections)



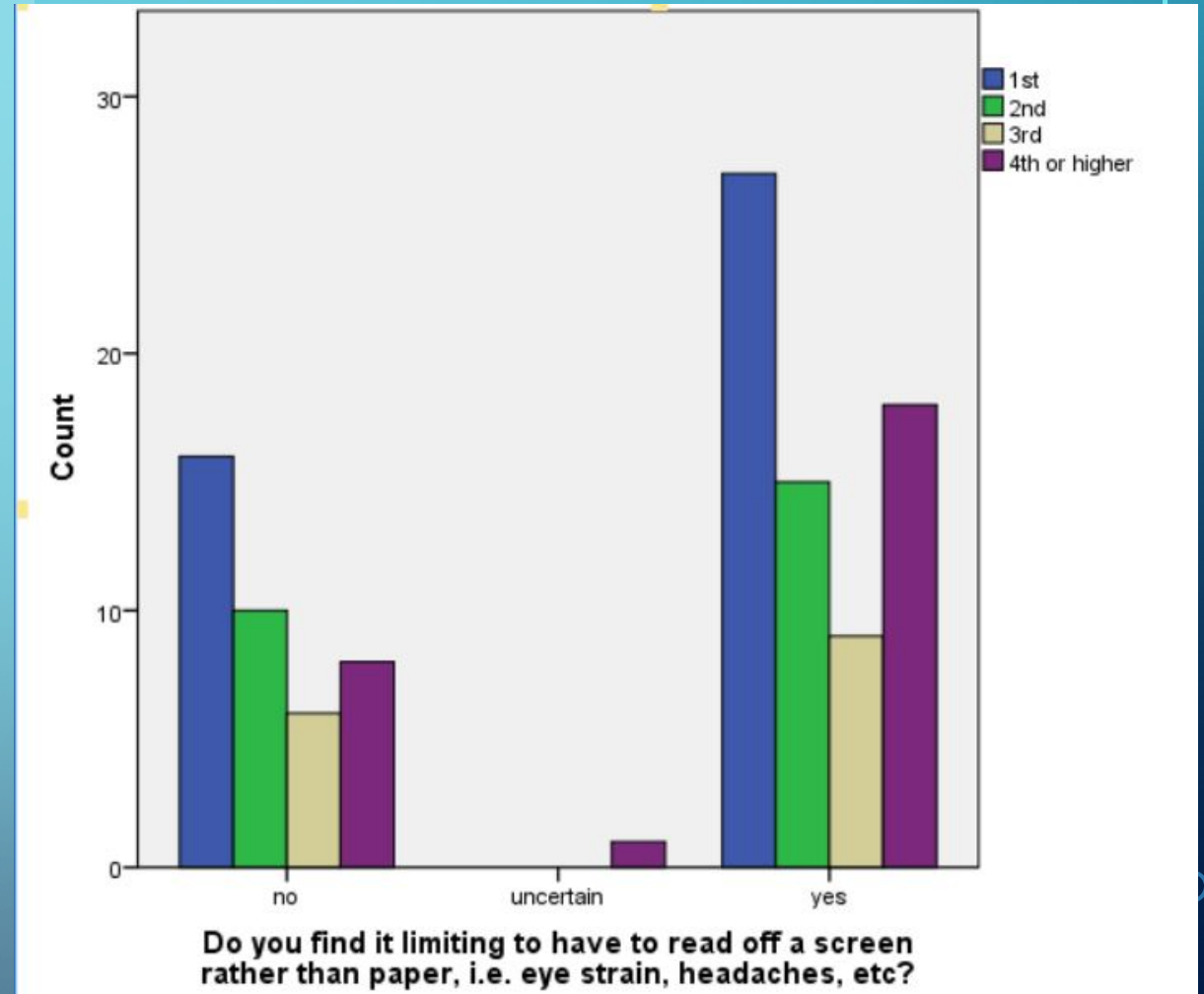
STUDENT ACCESS TO EBOOK / ASSOCIATED SOFTWARE

- Students in all years indicated likeliness to access materials from multiple devices
- Most common devices used: laptops & phones (apple preference)
- Most infrequently used devices: tablets & desktop computers.



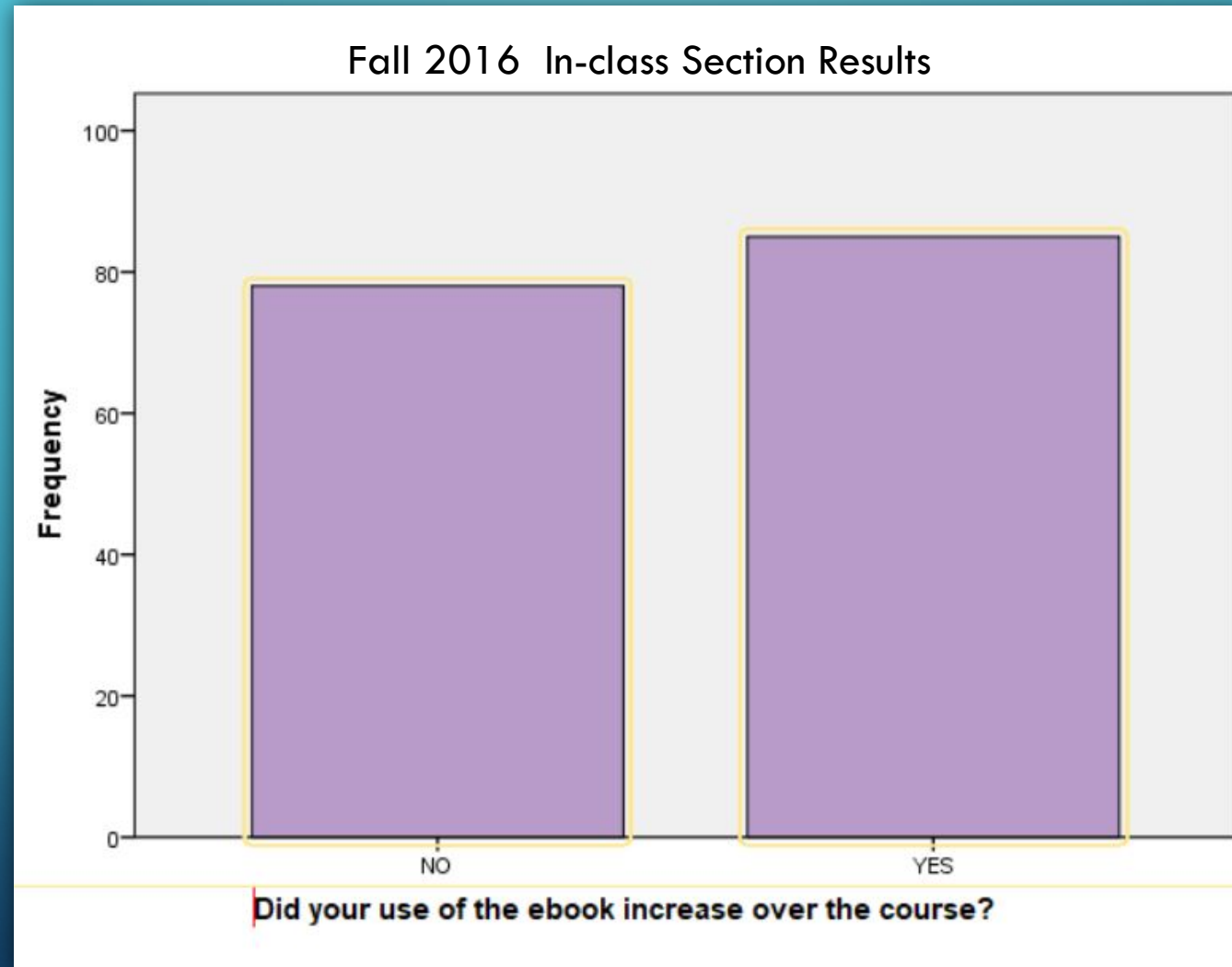
SCREEN READING

- **Common concern with digital materials: screen reading**
- **Technological issue that is being addressed by industry → continual improvement**
- **Focus group discussions: students found work around for common screen reading issues:**
 - adjusting screen brightness
 - using 'night mode'

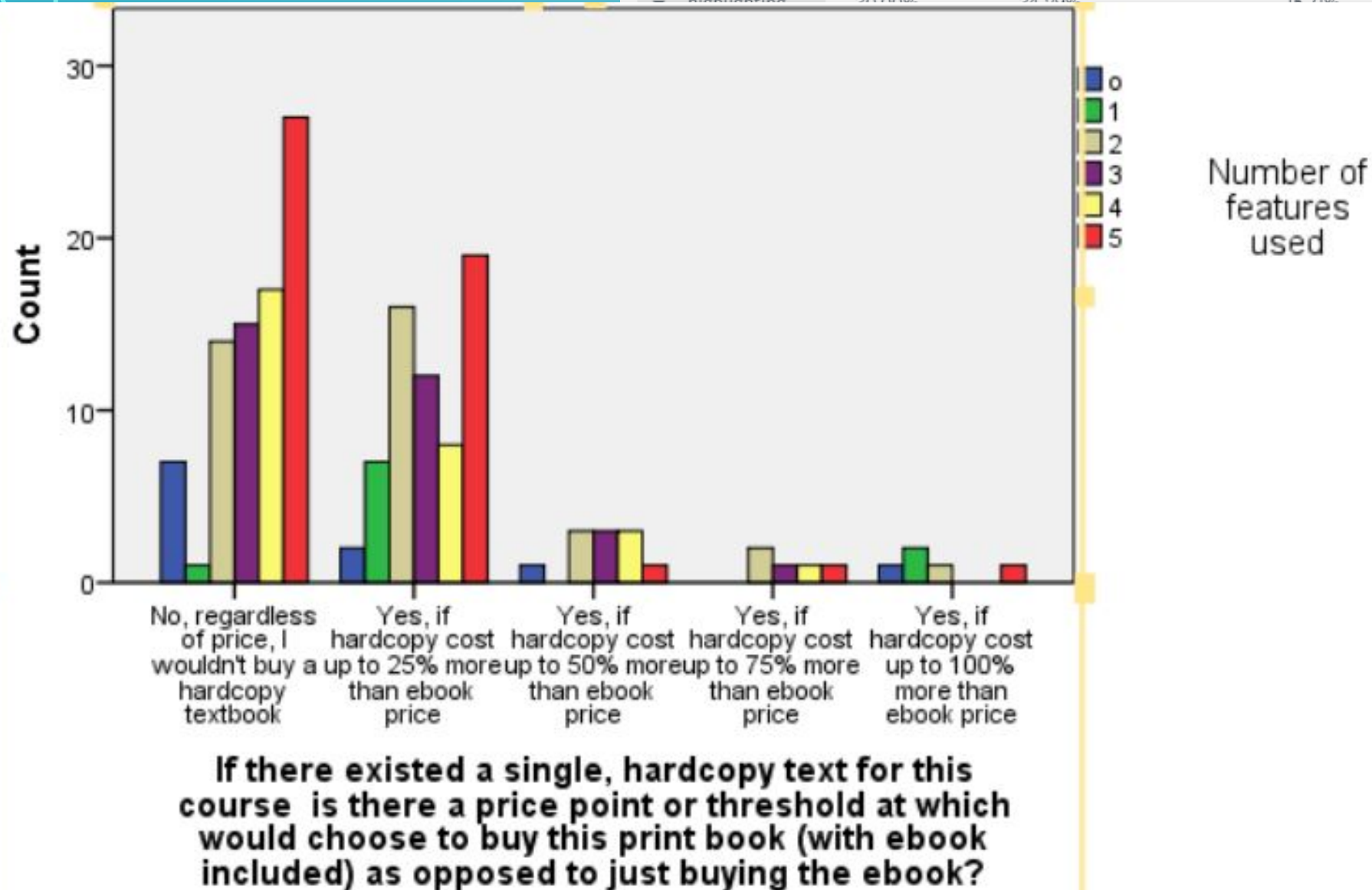


STUDENT EBOOK USAGE OVER TIME

- More than 50% of respondents (> 400) from all sections felt their usage increased over the course



EBOOK FEATURES



	YES A LOT	YES SOMWHAT	DOESN'T ADD MUCH VALUE	ADDS NO VALUE AT ALL	TOTAL	WEIGHTED AVERAGE
highlighting	20.00%	24.00%	15.71%	20.00%	70	2.26
	14	12	12	12	70	2.36
	8.70%	6	6	6	69	2.12
	4.29%	3	3	3	70	1.47
	7.14%	5	5	5	70	1.66

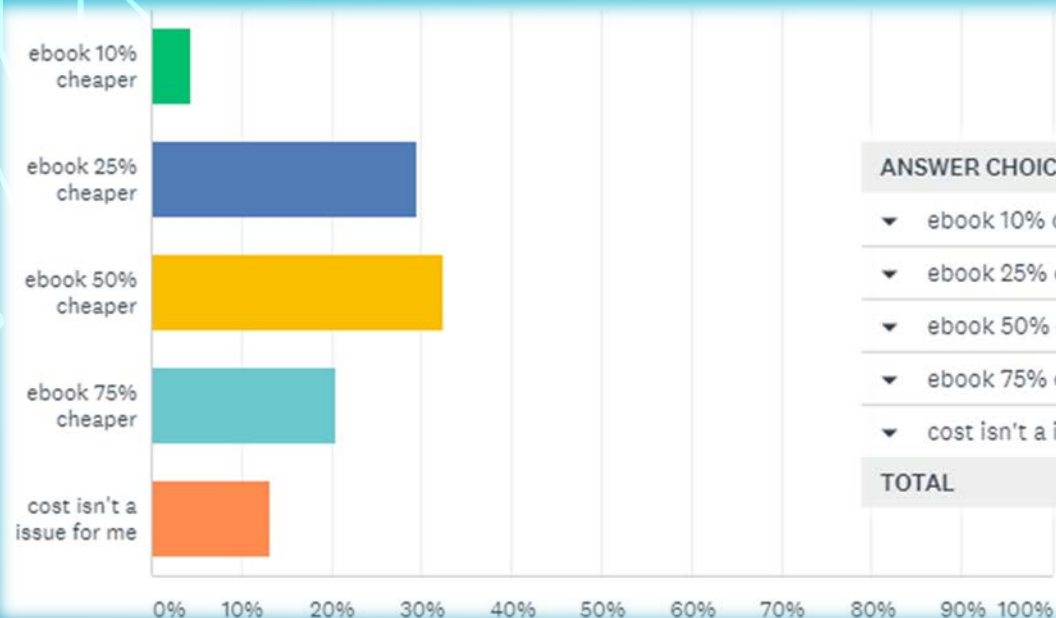
or more interactive features.

IS

ecturer's embedded notes in

nts reported still taking their

COST OF EBOOK



ANSWER CHOICES	RESPONSES
ebook 10% cheaper	4.41%3
ebook 25% cheaper	29.41%20
ebook 50% cheaper	32.35%22
ebook 75% cheaper	20.59%14
cost isn't a issue for me	13.24%9
TOTAL	68

- Most students indicated they would be happy to buy ebook at 25% - 50% of the print book cost
- Most said they didn't see the value of having both
- Many said use of the ebook would prompt them to take a course like this again

STUDENTS DISLIKES

- **Screen reading more difficult than print reading**
- **Subscription model: resentment at 'renting' an online book for 1 year period.**
- **Trying to flip back and forth between pages**

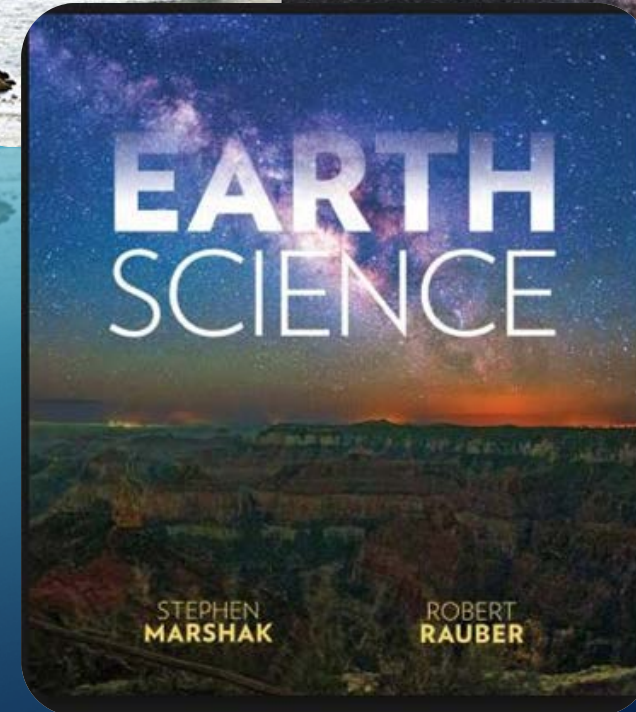
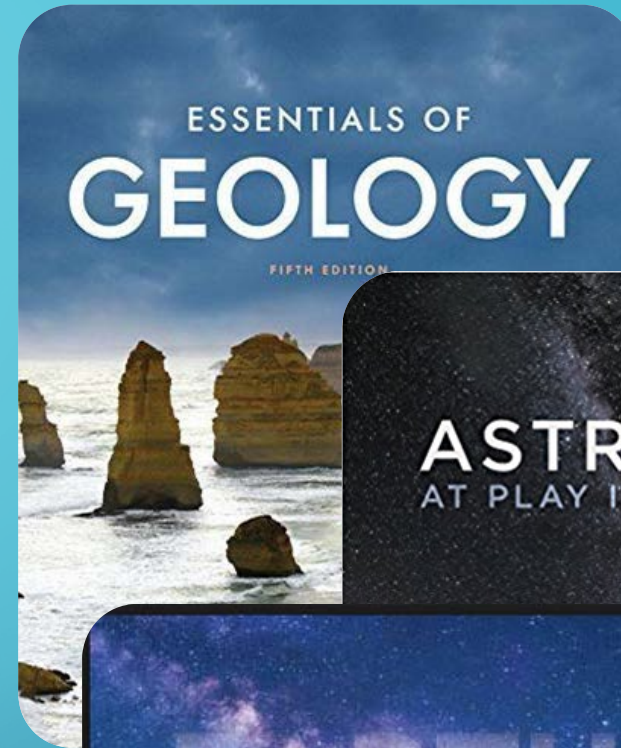
STUDENT LIKES

- **Portability**
- **Features, i.e. highlighting, searching**
- **SMARTWORK5 software with links to text & interactive knowledge testing**
- **Lower cost**

FURTHER WORK

Detailed longitudinal analysis of 2016-2018 data for students who answered 2 or 3 of the surveys to see how attitudes may have changed:

- **over the student's specific course section**
- **over the years between sections as software, ebooks improved**



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