

# Education Excellence

- A comparative analysis of the quality of Germany's Federal State Education



Analysis by the Research Center  
of Germany's Education

Wednesday 10.05.2023

David Rothmaier | Kamil Karim | Naoufal Znati | Johannes Welsch

# Our Team:



**David Rothmaier**

B. Sc. Physics  
M. A. Peace and Security Studies



**Kamil Karim**

Google Data Analytics  
IBM Data Science  
IT Solutions



**Naoufal Znati**

Management Assistant for Wholesale and Foreign Trade  
Subject Area: Wholesale  
Founder:  
tutorscout Nachhilfe

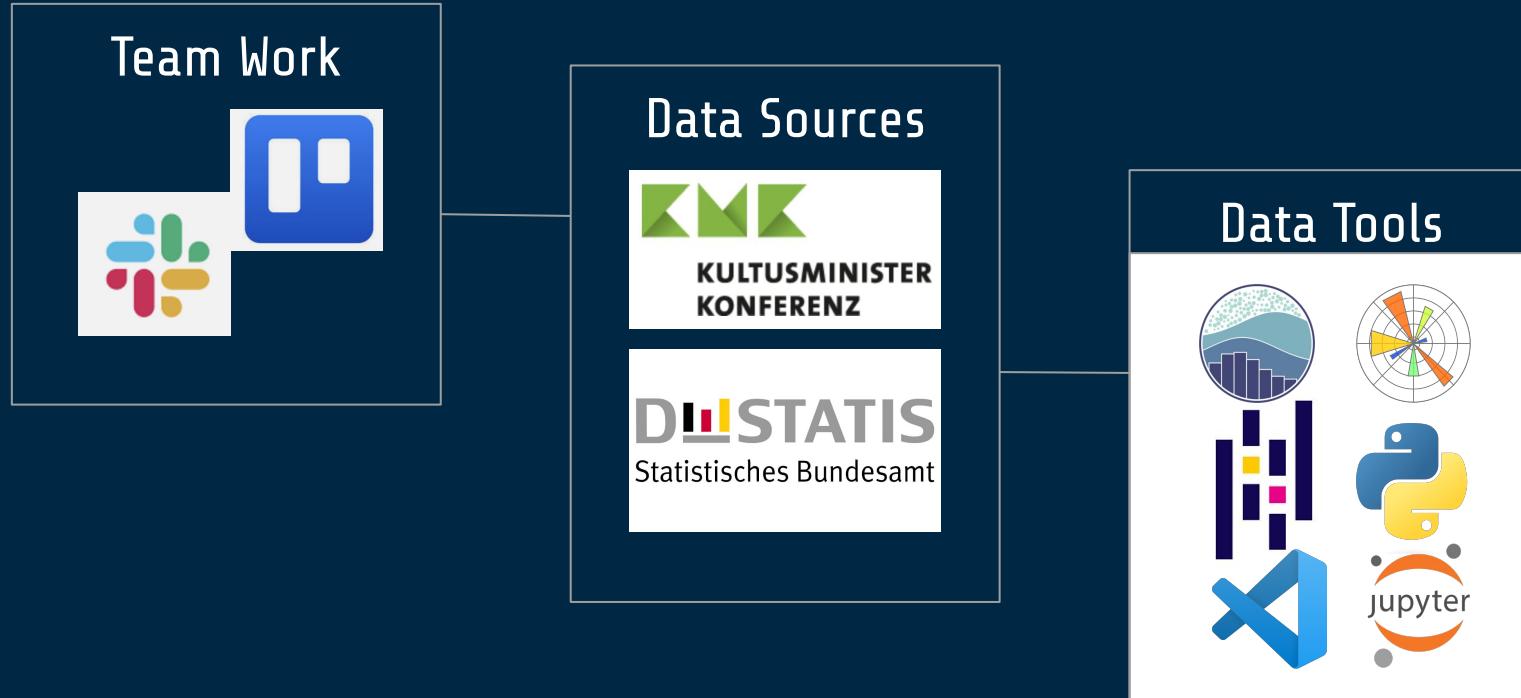


**Johannes Welsch**

B. Sc. Interdisciplinary health care and management

Physiotherapist

# Tech & Tools



Team

Tech & Tools

Overview

Key Indicators

Hypothesis 1

Hypothesis 2

Hypothesis 3

Findings

Conclusion

# Overview



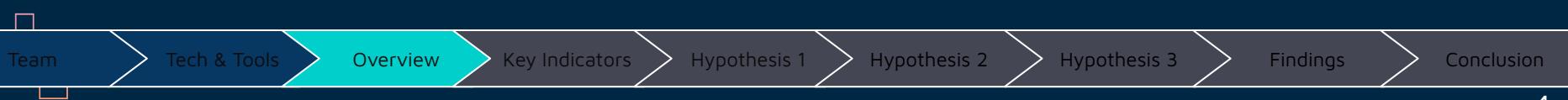
## Time period

2010 - 2022



## Data

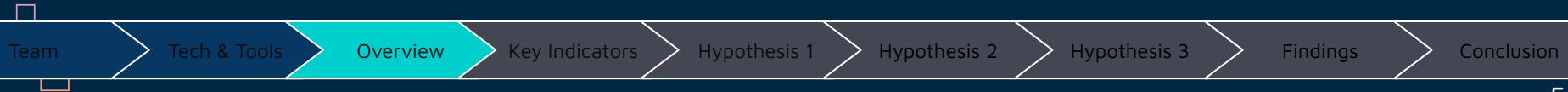
- Abitur grades / passing rates in a country comparison
- Students, classes, teachers and school graduates
- Expenditure for public schools per student



# Hypothesis

1

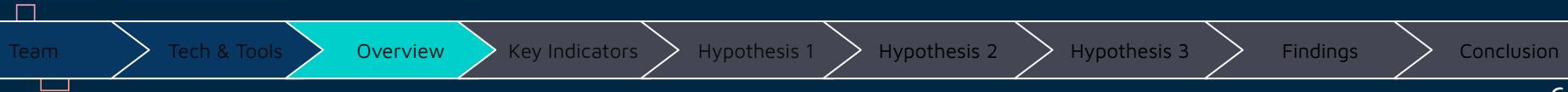
Federal states with more investment in education and more teachers for students have higher graduation rates.



# Hypothesis

2

Students in states with longer lesson hours may experience higher exam passing rate and lower dropouts.



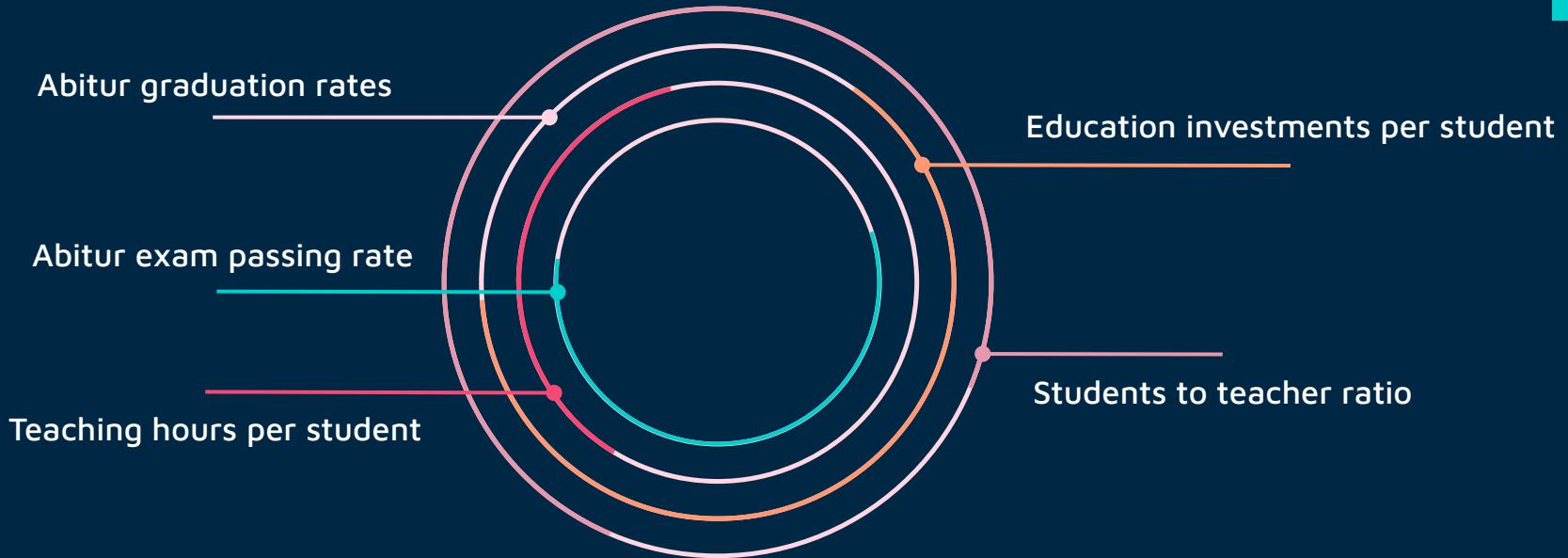
# Hypothesis

3

The quality of education in schools across the country is declining.



# Key Indicators



# Hypothesis

1

Federal states with more investment in education and more teachers for students have higher graduation rates.

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# Highest Investment on Education

Max

**Berlin: 10,081 €**

**Hamburg: 10,027 €**

**Bayern: 8,909 €**

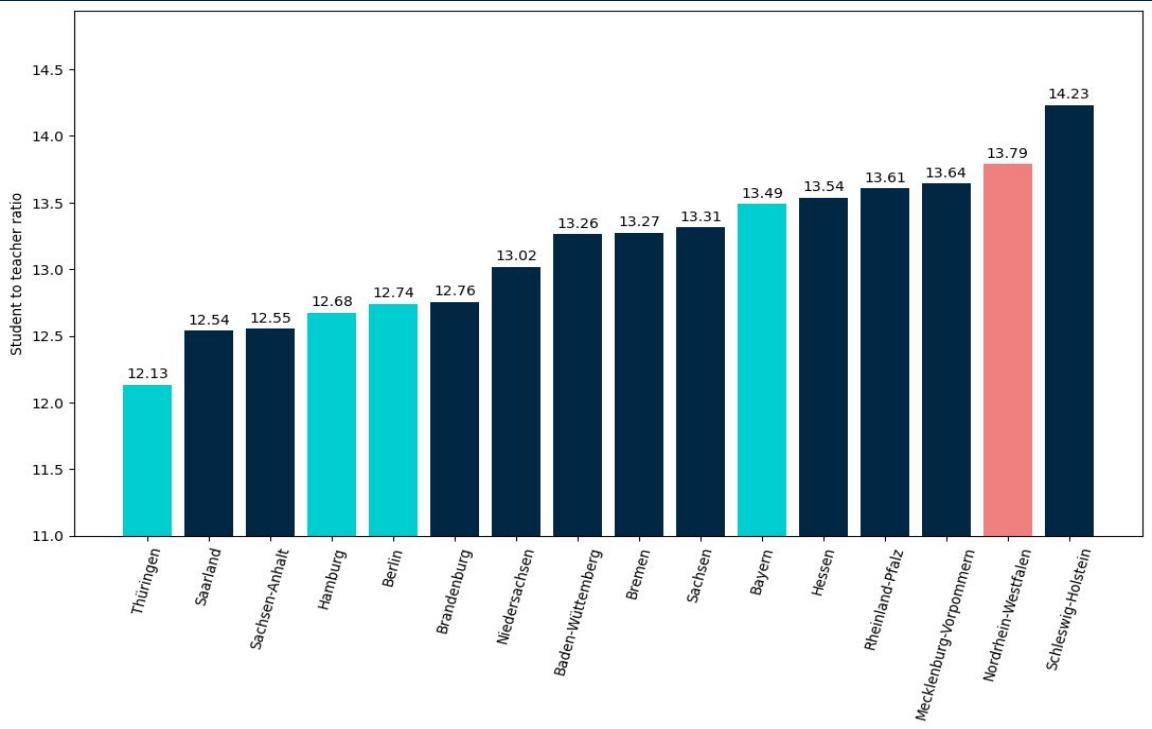
**Thüringen: 8,900 €**

**NRW: 6,854 €**

Min

- Berlin and Hamburg Top 2 investing states
- Lowest investment: Nordrhein-Westfalen

# Where do Students Have More Access to Teachers?



- Students in **Thüringen** have the best access to teachers, followed by **Saarland** and **Sachsen-Anhalt**
- **Hamburg** and **Berlin** have good values (Top 5)
- **Bayern** has a mediocre value, the high investment is not visible here

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Hypothesis 1

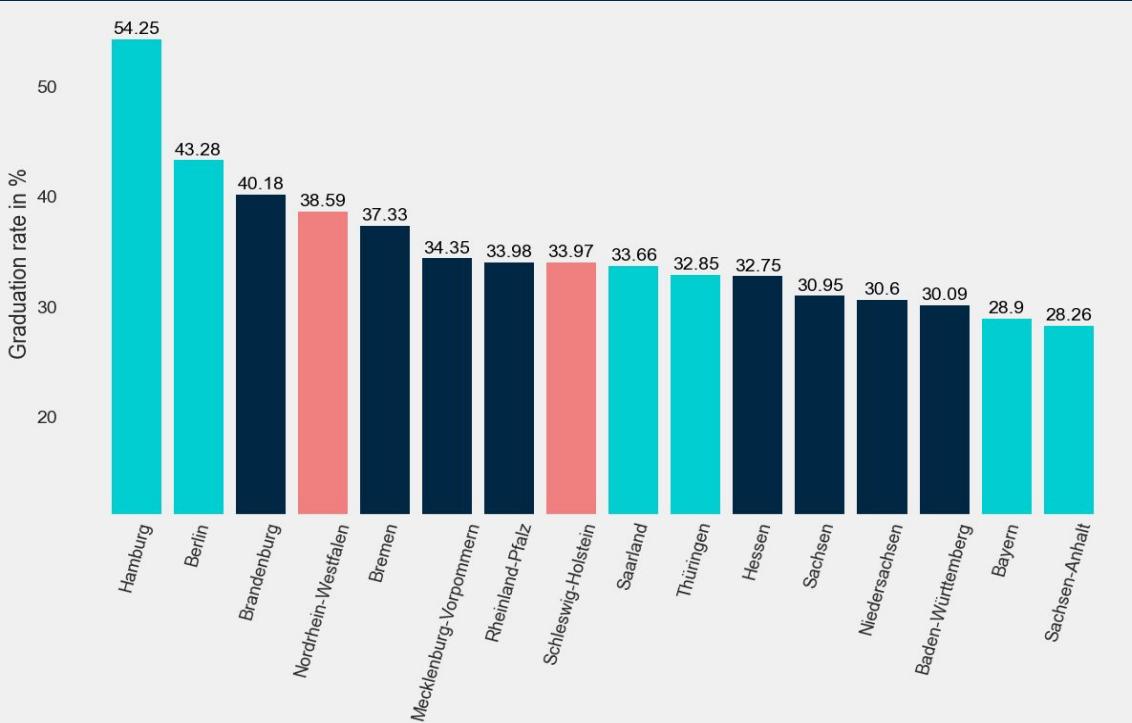
Hypothesis 2

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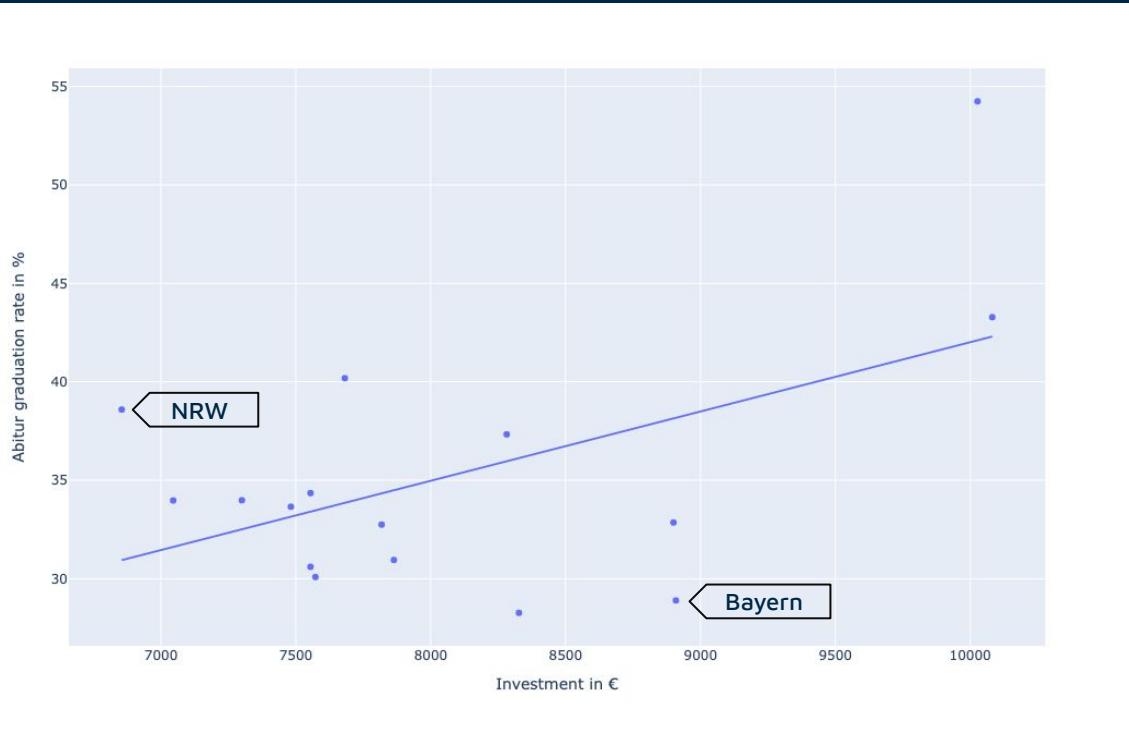
Conclusion

# Abitur Graduation Rates Vary Widely



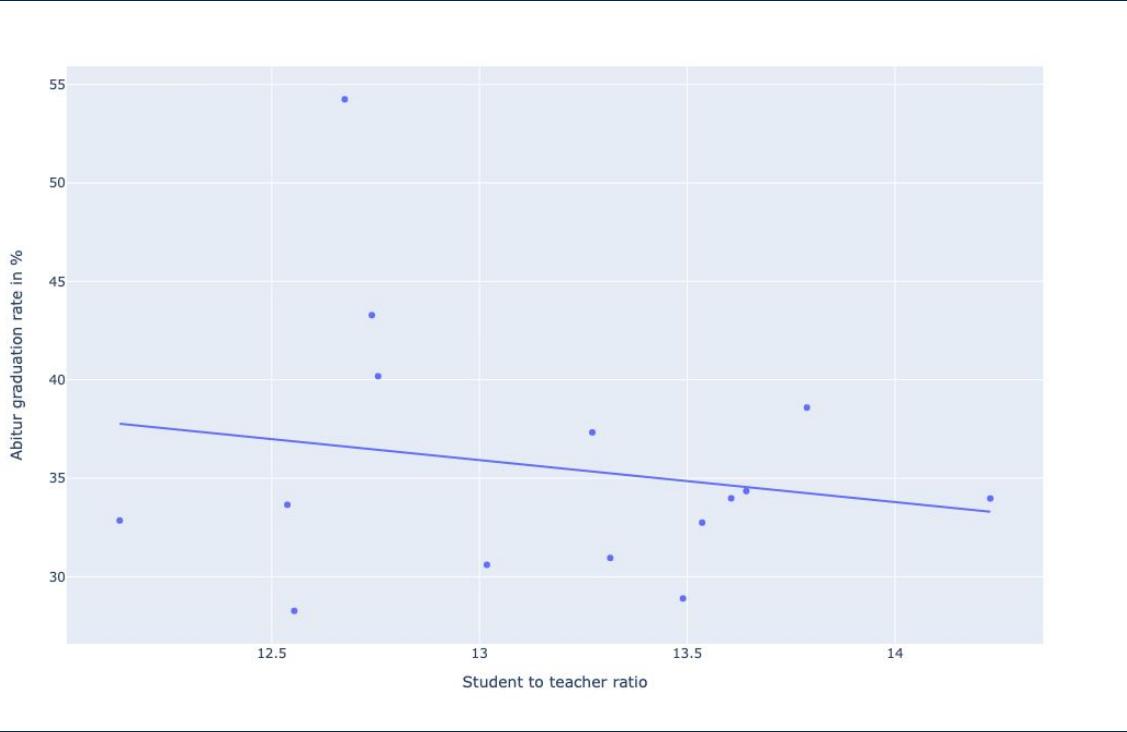
- Hamburg has by far the highest graduation rate of all federal states, followed by Berlin
- High investment in education or a good student to teacher ratio does not always result in a high graduation rate.
- Despite low investment, NRW has a high graduation rate

# Graduation Rates Increase with Investment



- **positive correlation** supporting the hypothesis
- **Outliers confirm:** high graduation rates are **not** only a question of **money**

# Graduation Rates Decline with Less Access to Teachers



- Only a smaller impact on the graduation rate
- Nevertheless, the negative correlation corresponds with our expectations
- Considering both correlations, we decide to accept the hypothesis

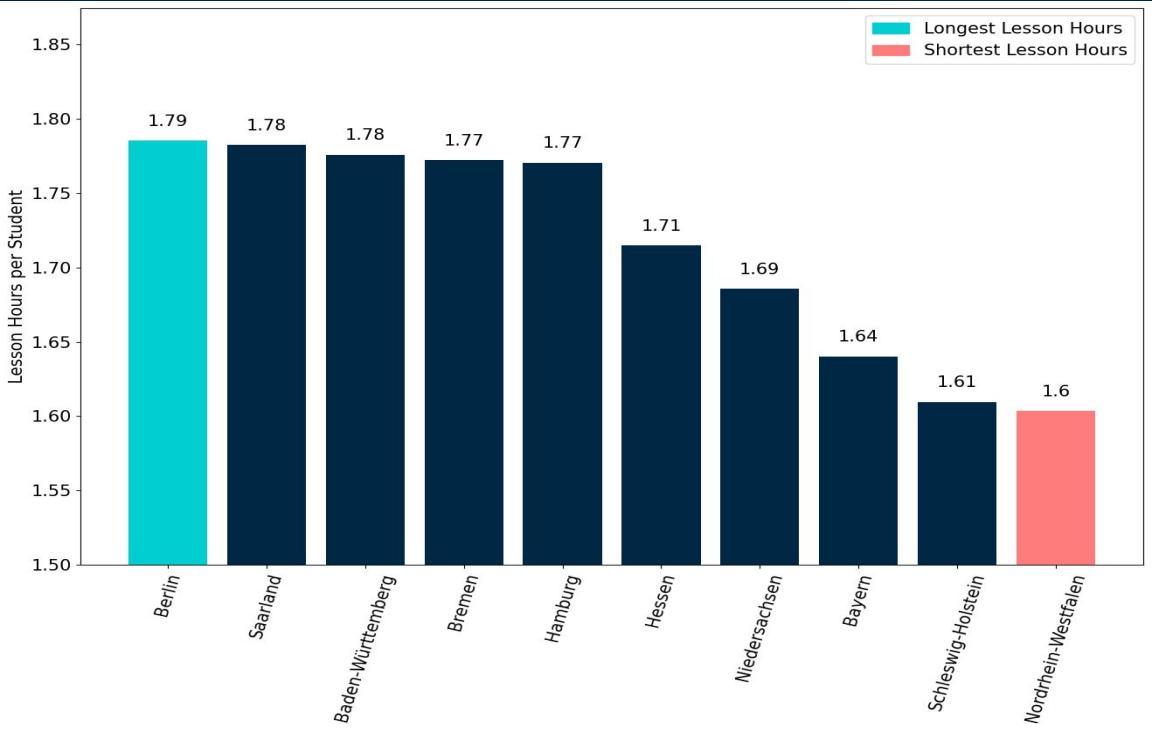
# Hypothesis

2

Students in states with longer lesson hours  
may experience higher exam passing rate  
and lower dropouts.

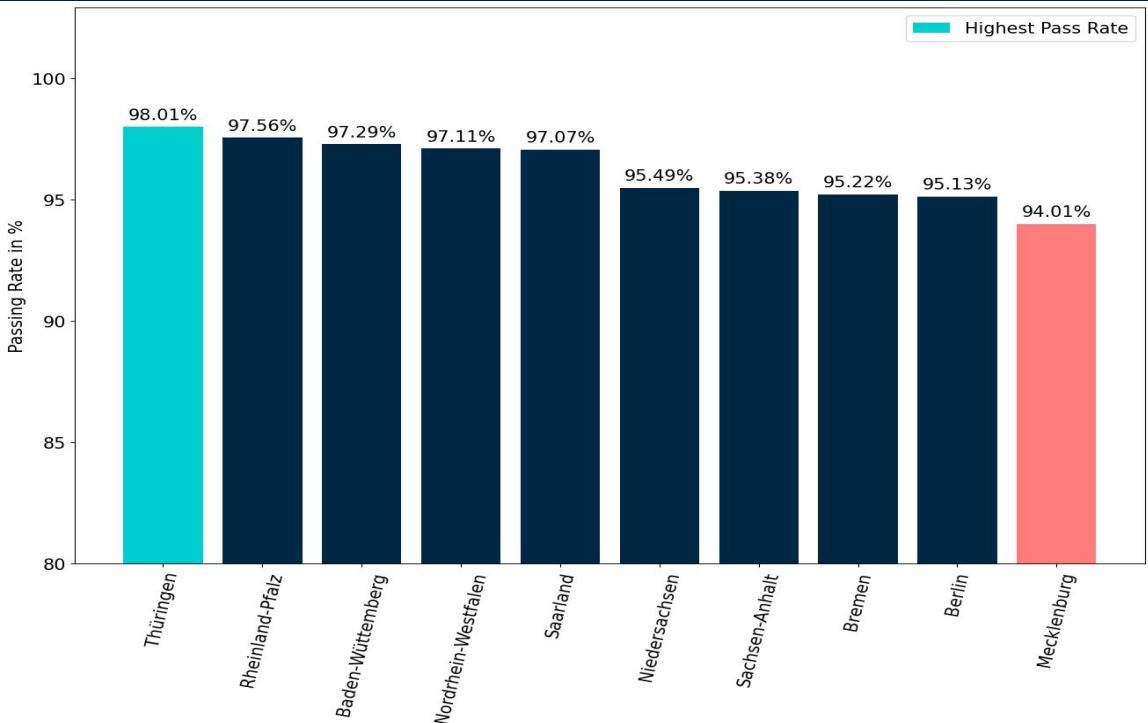


# No Significant Difference in Lesson Hours



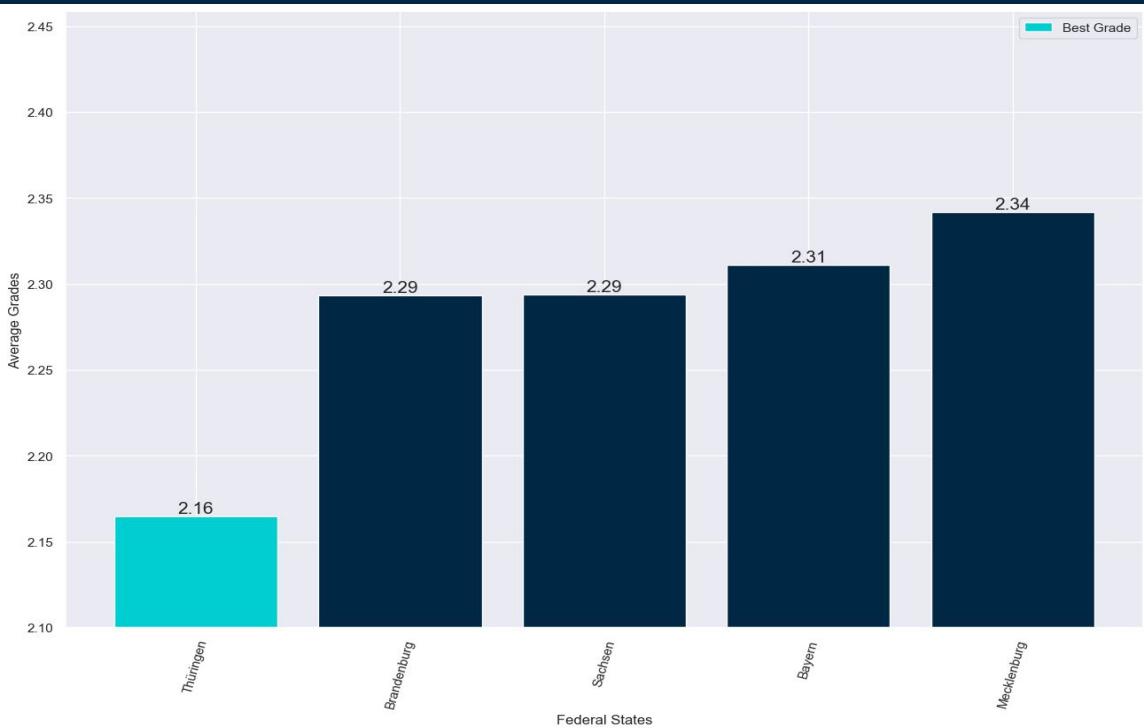
- No correlation between state size/population and lesson hours
- NRW (largest state) has lowest lesson hours, while Berlin (small state) has high lesson hours
- Difference between longest and shortest lesson hours is 10 minutes (0.18 hours)

# Thüringen has the Highest Exam Passing Rate



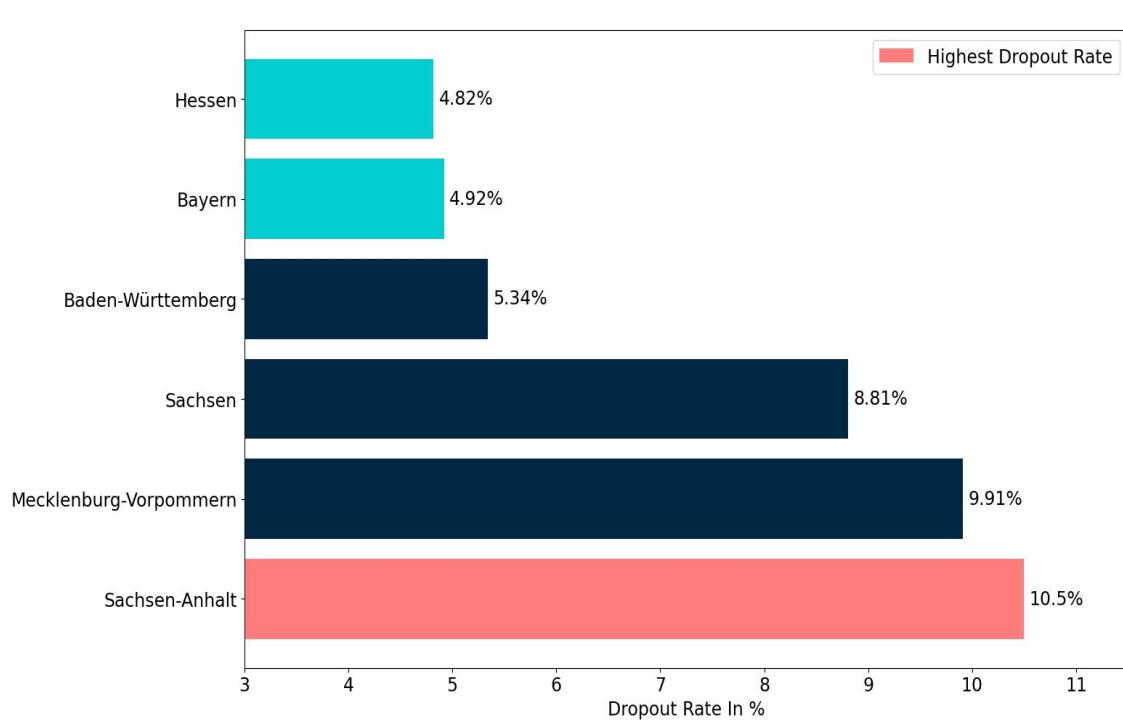
- **Thüringen has the highest Abitur exam passing rate by far with 98% passing rate**
- RP, BW, NRW, and SL are the **top states** with passing rates above 97%.
- In comparison Mecklenburg has the **lowest exam passing rate 94%**

# Thüringen has the best Average Abitur Grade



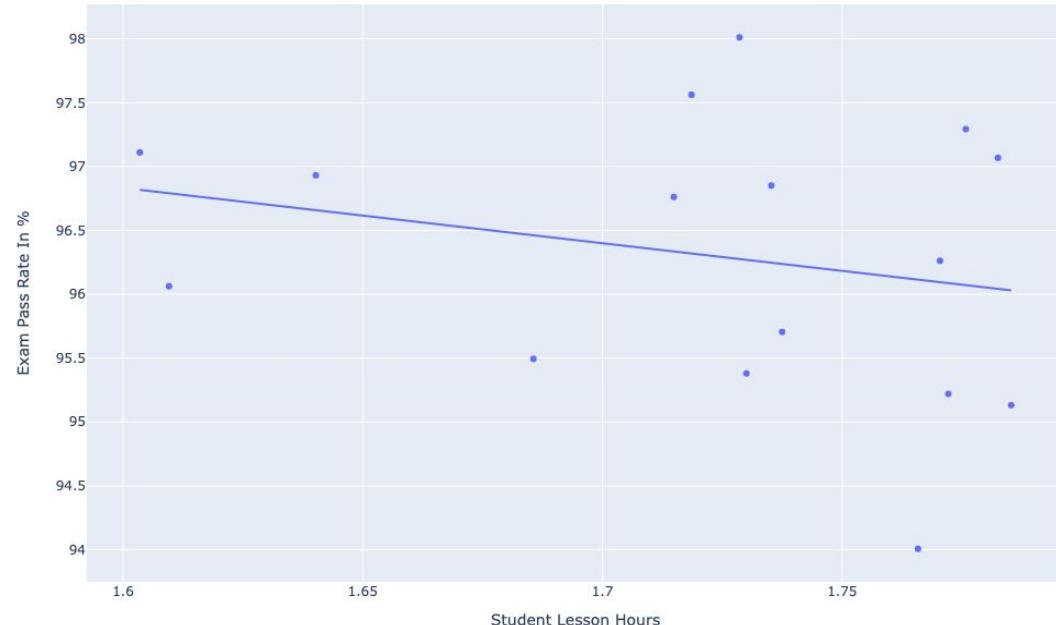
- Thüringen also has the best average exam grade by far
- States that come close are Brandenburg, Sachsen, Bayern, and Mecklenburg Vorpommern

# Hessen & Bayern have the Lowest Dropout Rate



- Hessen and Bayern have the lowest dropout rate with less than 5% of students dropping out
- States including Sachen, M.V., and Sachsen-Anhalt have the highest dropout rate

# Exam Passing Rate Decrease with Longer Lesson Hours



- A **negative** linear relationship between the lesson hours and the exam pass rate
- Indicating that as the lesson hours **increase**, the exam pass rate tends to **decrease**

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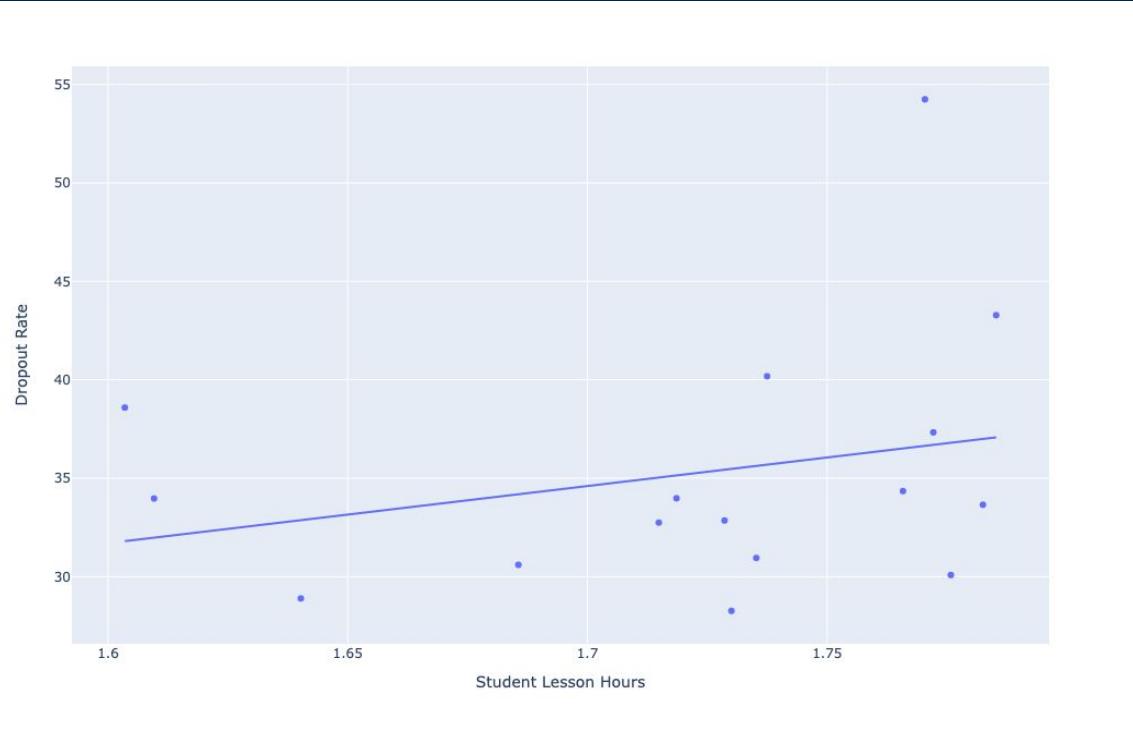
Hypothesis 2

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# Dropout Rate Increase with Longer Lesson Hours



- Positive linear relationship between the student lesson hours and the average dropout rate
- As the lesson hours increase, the dropout rate also tends to increase
- Our analysis refutes the hypothesis

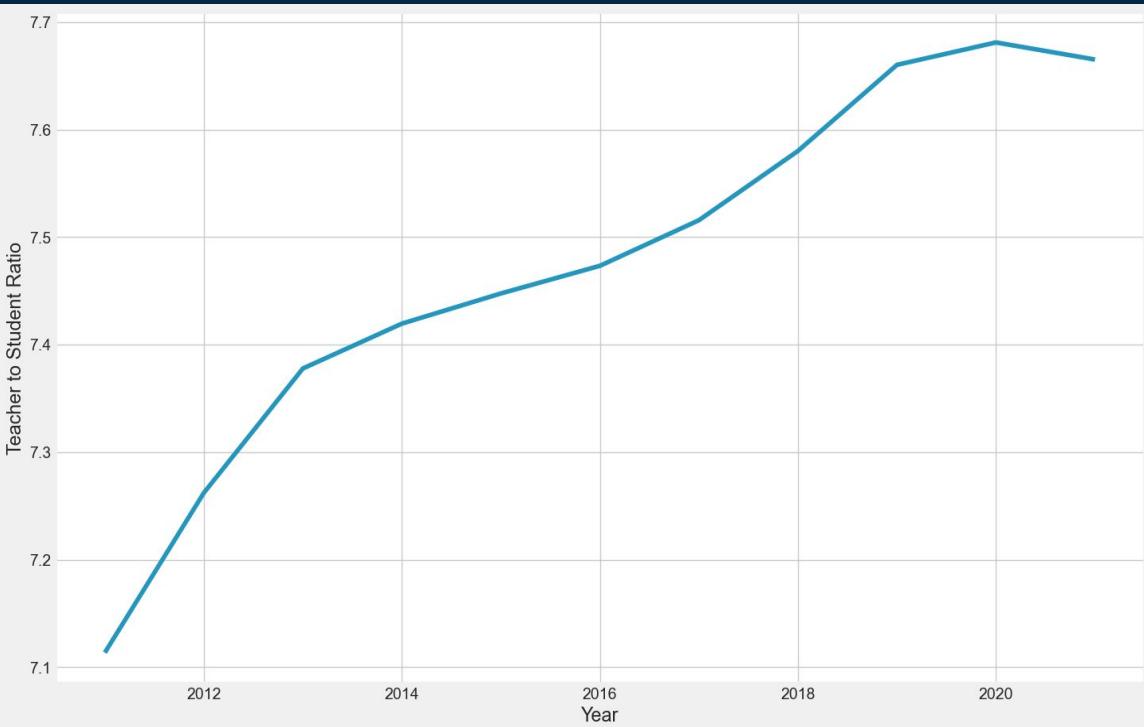
# Hypothesis

3

The quality of education in schools across the country is declining.



# Access to Teachers Increase Over Time



- Number of teachers has been **increasing** reaching its **peak** in 2020 at almost **8%**
- From **14** students per teacher to **12** students per teacher
- Access to teachers has improved over the years, **refuting the hypothesis**

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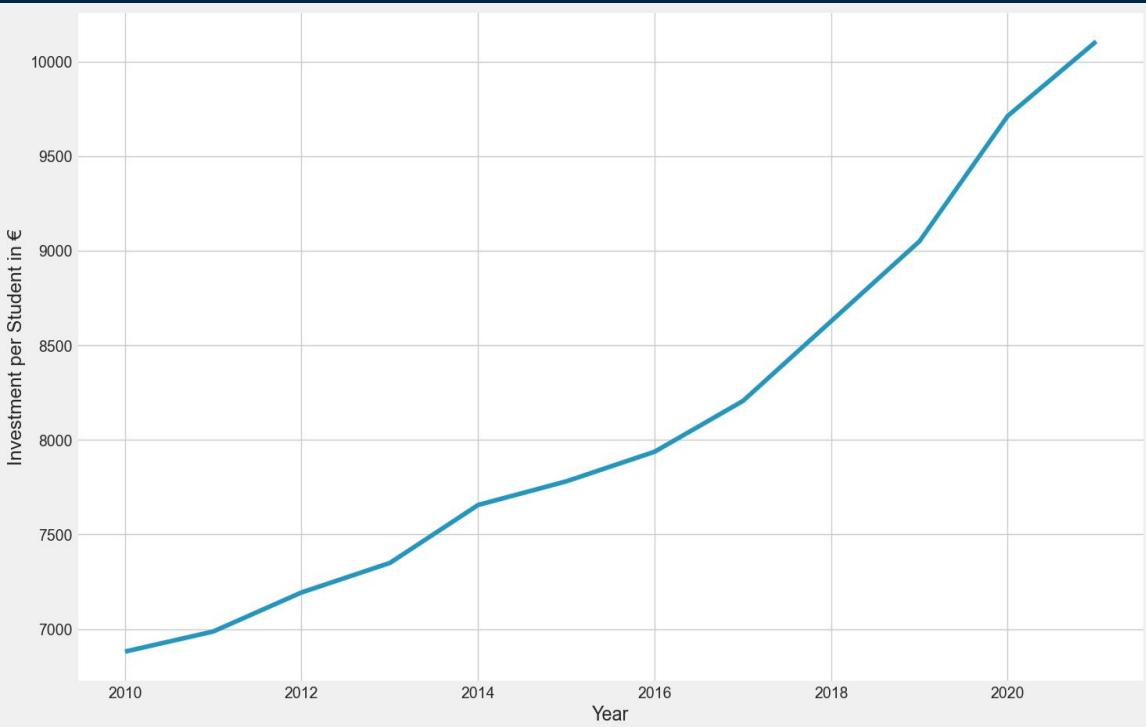
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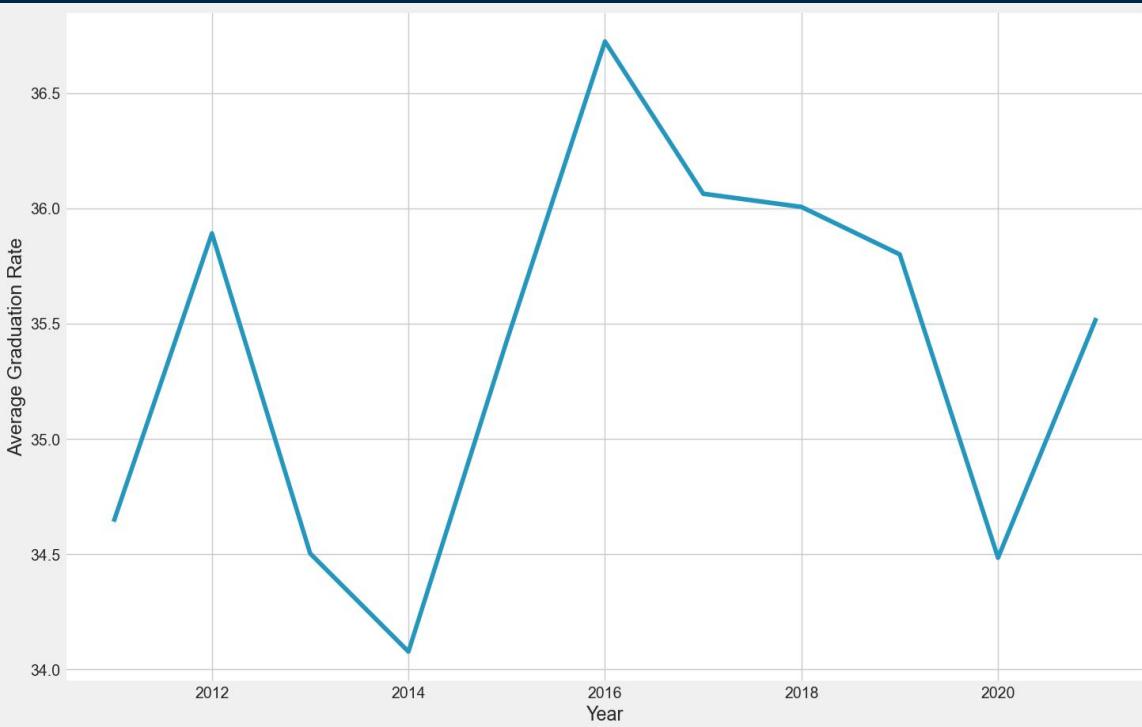
# Investment per Student Increase Over Time



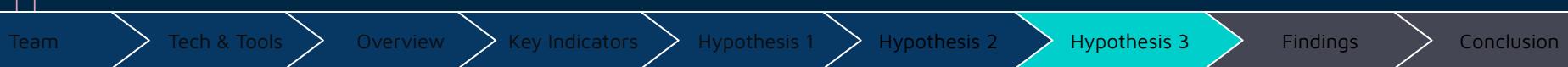
- Investment per student increased from 6k in 2010 to 10k in 2021
- Positive impact on the quality of education providing necessary resources
- Can result in better teaching and a more effective learning experience for students



# Graduation Rate Increase Over Time



- Graduation rate peaked in 2016 with **over 36% students** graduating
- Besides the two dips in 2014 and 2020 the graduation rate does show **a positive trend over time**



# Hypotheses and Findings

H1

States with more investment in education and more teachers for students have higher graduation rate.



Qualitatively, the picture is mixed, but the correlations support the hypothesis

H2

Students in states with longer hours of lesson may experience higher passing exam rate and lower dropouts.



Longer lesson hours do not equate to less dropout and high pass rate, the data does not support this hypothesis

H3

The quality of education in schools across the country is declining.



The quality of education in Germany has not declined, it has improved.

# Key Indicators Breakdown:

Abitur graduation rate

Hamburg

Abitur exam passing rate

Thüringen

Investments In education

Berlin

---

Student to teacher ratio

Thüringen

Lowest dropout  
rate

Hessen

"There is only one thing more expensive  
in the long run than education:  
no education."



(John F. Kennedy)

# Which State has the Highest Passing Rate Over the Years?

Year	Federal States	Exam Passing Rate
2010	Bayern	99.09%
2011	Rheinland-Pfalz	98.61%
2012	Rheinland-Pfalz	98.64%
2013	Rheinland-Pfalz	98.73%
2014	Thüringen	98.15%
2015	Thüringen	97.88%
2016	Baden-Württemberg	97.35%
2017	Thüringen	97.90%
2018	Thüringen	97.99%
2019	Thüringen	97.66%
2020	Thüringen	98.40%
2021	Thüringen	98.28%
2022	Thüringen	98.33%

- Thüringen has consistently been one of the best-performing states in terms of pass rates, with the exception of 2010 when Bayern had the highest pass rate
- Thüringen had the highest exam pass rate from 2014 till 2022 except 2016 where it was taken by B.W.

# Key Indicators Breakdown

Hamburg



Abitur  
graduation  
rates

Abitur exam  
passing rate



Thüringen

Berlin



Education  
investments  
per student

Student to  
teacher ratio



Thüringen

Hamburg



Abitur  
graduation  
rates

Abitur exam  
passing rate



Thüringen

# Key Findings

Berlin: High investment per student, high passing rate

Thüringen: High investment per student, high passing rate, more teachers for students

Hamburg: High investment per student, high graduation rate

Bayern: High investment per student, low dropout rate

## Conclusion

Our analysis of the quality of education in Germany's federal states reveals a range of strengths and weaknesses across the system. By focusing on investment per student, student-teacher ratios, we can improve educational outcomes and help students reach their full potential.



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# Main challenges and Brink of Capstone change

Just keep one thing in mind:

**Never give up. NEVER !**



# Main challenges and Brink of Capstone change



## Data sourcing

The data acquisition was unclear,  
search yielded little success  
Only after the second stakeholder  
meeting were more  
comprehensive datasets found

## Data quality

smaller data differences = error tolerance  
Larger differences = outliers and  
tries to clarify these with the institutions

---

inquiry about grade distribution  
(Hauptschule, Realschule)

lack of documentation in the DF of  
the federal statistical office

## Communication with institutions

## Proper documentation



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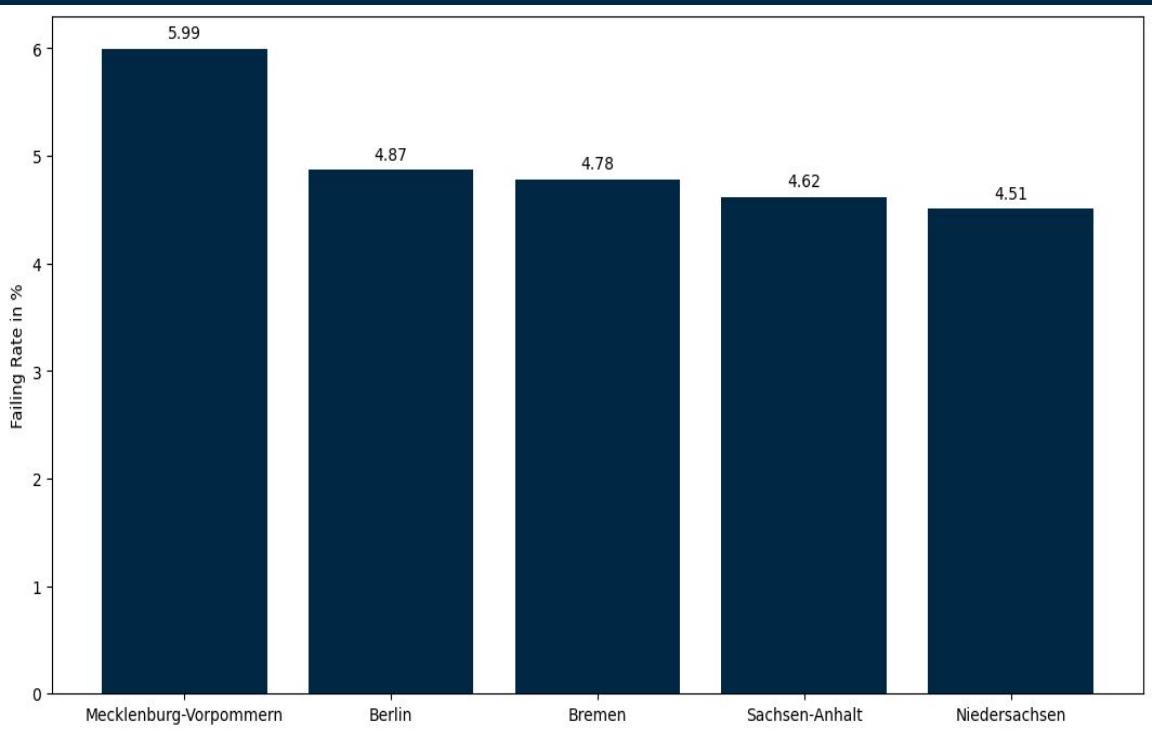
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# Top 5 States With The Highest Exam Failing Rate



- **Mecklenburg Vorpommern** has the highest failing rate with almost **6%** of students failing the exam on average
- **Other States** are always below **5%** no other State ever went beyond **except for MV**

# Which State has the Highest Failing Rate Over the Years?

Year	Federal States	Fail Rate
2010	Sachsen-Anhalt	7.37%
2011	Sachsen-Anhalt	5.32%
2012	Niedersachsen	5.51%
2013	Mecklenburg-Vorpommern	6.45%
2014	Mecklenburg-Vorpommern	6.52%
2015	Mecklenburg-Vorpommern	6.85%
2016	Mecklenburg-Vorpommern	6.58%
2017	Mecklenburg-Vorpommern	6.99%
2018	Berlin	9.28%
2019	Mecklenburg-Vorpommern	7.31%
2020	Mecklenburg-Vorpommern	6.07%
2021	Mecklenburg-Vorpommern	5.57%
2022	Mecklenburg-Vorpommern	6.92%

- M.V. had the highest fail rate for most of the years, except for 2010 and 2011, where Sachsen-Anhalt had the highest fail rate
- In 2018, Berlin had the highest fail rate at 9.28%. However, in, M.V. took back the lead with a fail rate of 7.31% in 2019

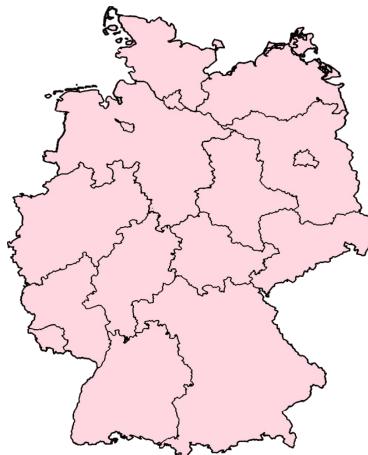
# Conclusion

Our analysis of the quality of education in Germany's federal states reveals a range of strengths and weaknesses across the system. By focusing on investment per student, student-teacher ratios, we can improve educational outcomes and help students reach their full potential.



# Education Excellence

- A comparative analysis of the quality of Germany's Federal State Education



# Education Excellence

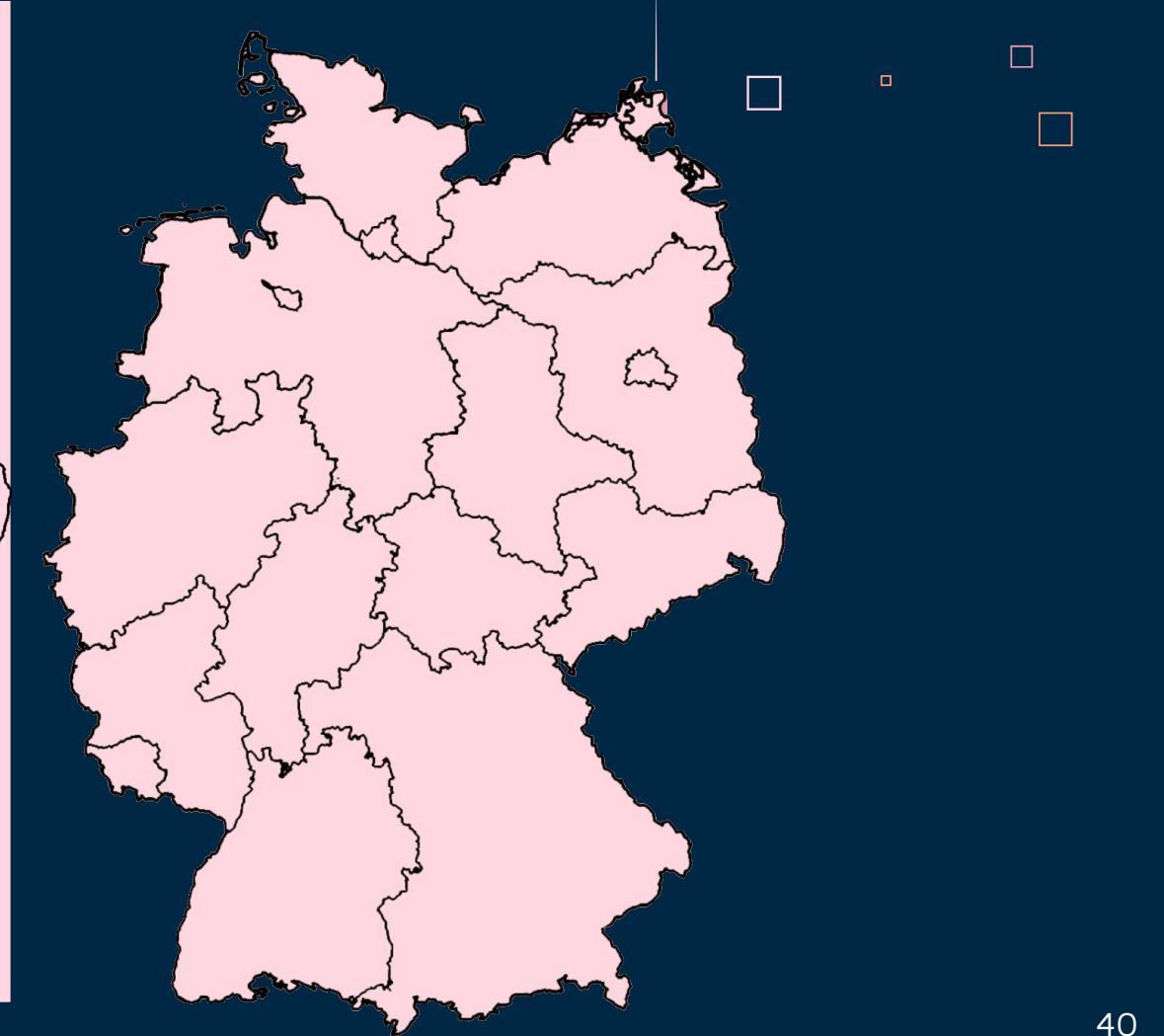
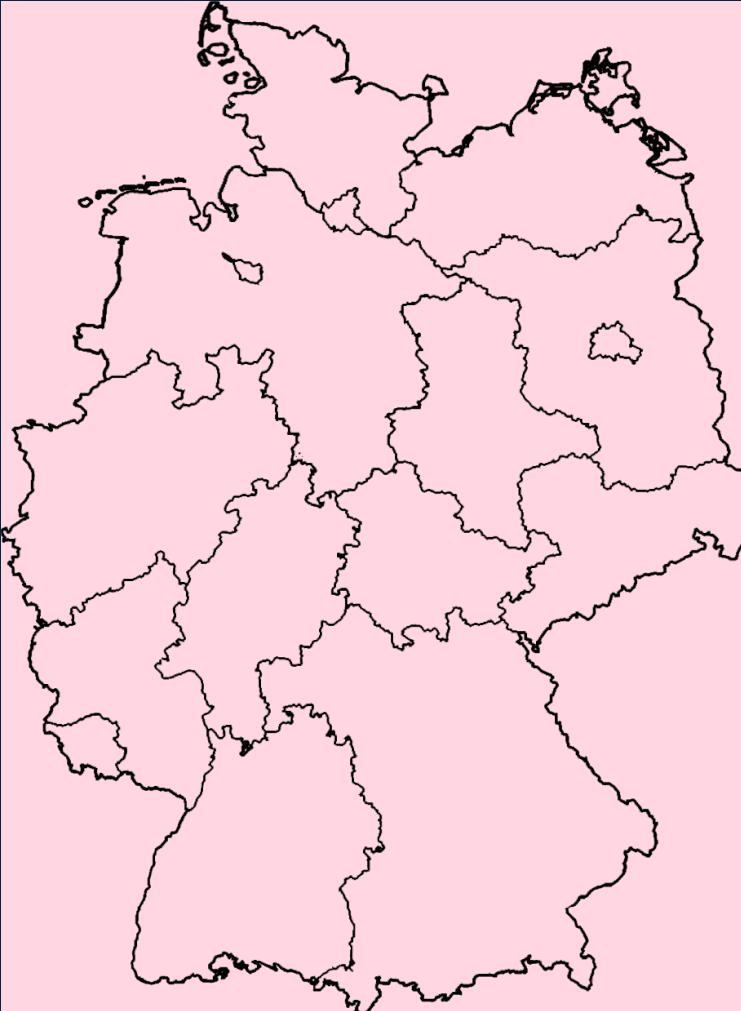
- A comparative analysis of the quality of Germany's Federal State Education



# Education Excellence

- A comparative analysis of the quality of Germany's Federal State Education





# States with the Lowest Dropout Rate

Federal States	Dropout rate
Hessen	4.82%
Bayern	4.92%
Baden-Württemberg	5.34%
Nordrhein-Westfalen	5.44%
Niedersachsen	5.78%

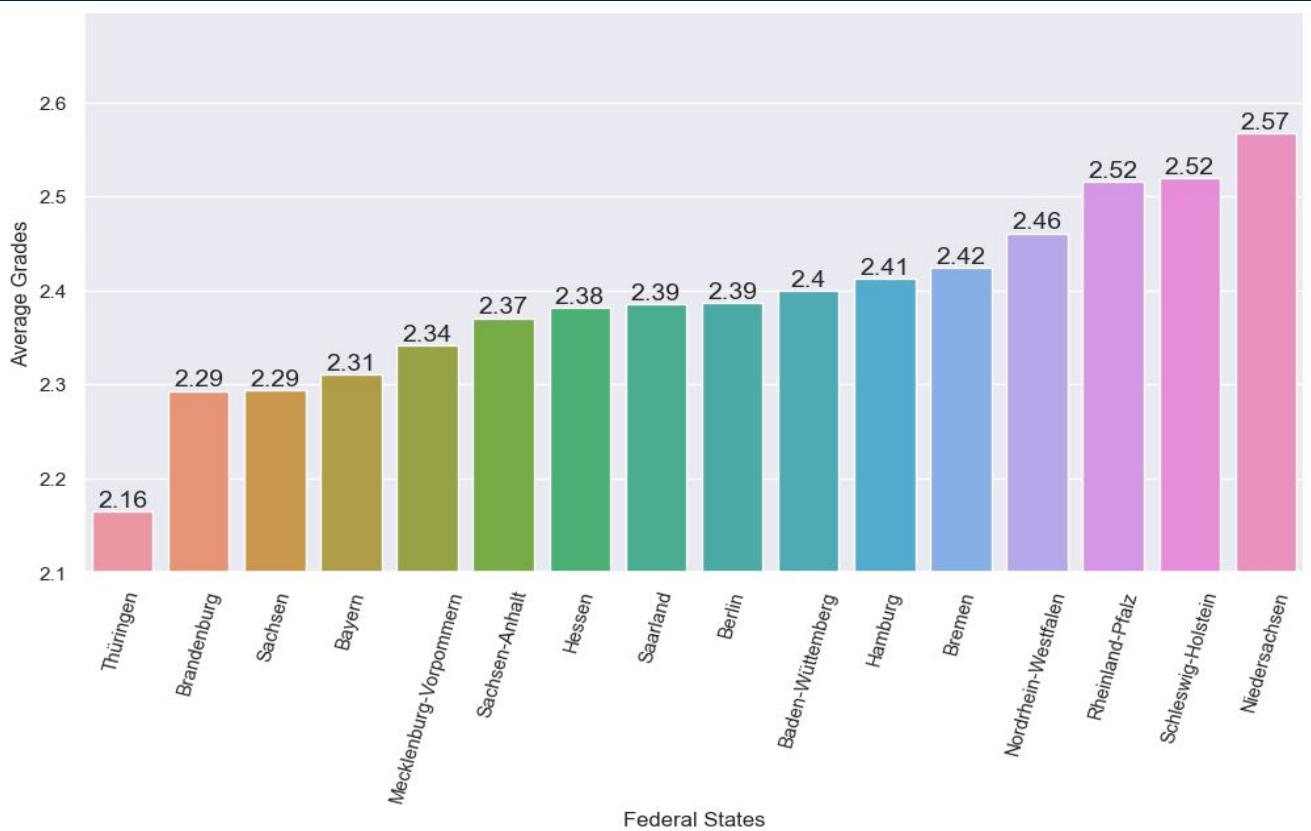
- Hessen has by the lowest dropout rate with less than 5% students finishing their high school diploma including Bayern.
- States with low dropout rate include BW, NRW, and Niedersachsen.

# Highest Investment In Each Year

Year	Federal States	Investment per Student
2010	Thüringen	8,600 €
2011	Thüringen	8,500 €
2012	Thüringen	8,500 €
2013	Hamburg	8,900 €
2014	Hamburg	9,500 €
2015	Berlin	9,700 €
2016	Hamburg	10,100 €
2017	Hamburg	10,700 €
2019	Berlin	12,100 €
2020	Berlin	13,100 €
2021	Berlin	14,200 €

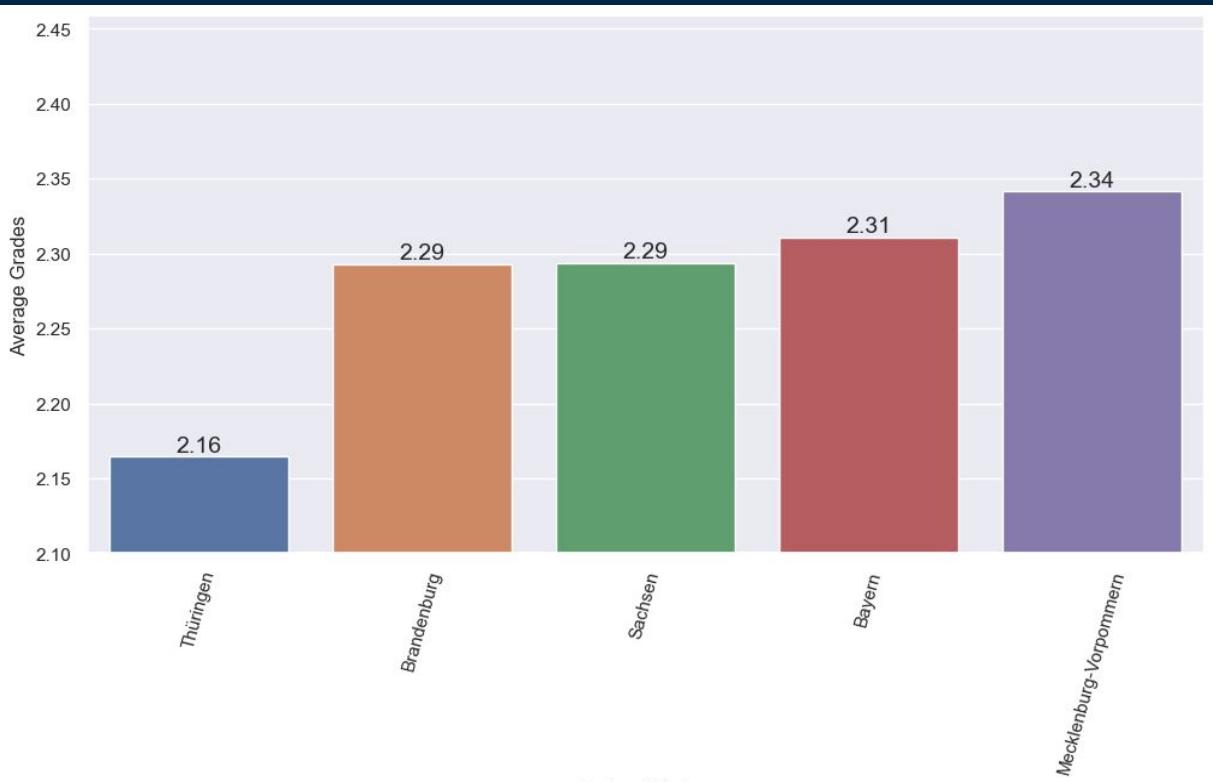
- Investment has increased over the years in some Federal States, which could indicate a positive trend in the country's education system.
- Berlin, Hamburg and Thüringen as Top 4 are represented in this table, only Bayern is not.

# Which State has the best grade on average?



# Hypothesis

Which State has the best grade on average?



- **Thüringen has the best grade by far with 2.16 grade on average**
- **No State has ever came close to Thüringen in Abitur exam overall grades**

# Preschool and the effect on grades

Hypothesis

Federal States	Preschool
Bayern	No
Berlin	No
Brandenburg	No
Bremen	No
Mecklenburg-Vorpommern	No
Sachsen	No
Sachsen-Anhalt	No
Schleswig-Holstein	No
Thüringen	No

- Thüringen, Brandenburg, Sachsen -> no preschooling

Federal States	Preschool
Baden-Württemberg	Yes
Hamburg	Yes
Hessen	Yes
Niedersachsen	Yes
Nordrhein-Westfalen	Yes
Rheinland-Pfalz	Yes
Saarland	Yes

- Hessen the first federal state with the availability of preschooling

# The problem

## Company

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Ut enim ad minim veniam, quis nostrud

## Context

Ut enim ad minim veniam, quis nostrud exercitation

- Duis aute irure dolor in reprehenderit in voluptate velit

## Problem statement

Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

# Hypothesis

04

States with higher investment in education  
and more resources dedicated to students  
tend to have higher graduation rates  
learning and success.

# Challenges deep-dive

## Challenge 1

### Expand audience

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

## Challenge 2

### Up 30-day actives

Ut enim ad minim veniam, quis nostrud exercitation

- Duis aute irure dolor in reprehenderit in voluptate velit

## Challenge 3

### Increase conversion

Excepteur sint occaecat cupidatat non proident, sunt in culpa qui officia deserunt mollit anim id est laborum.

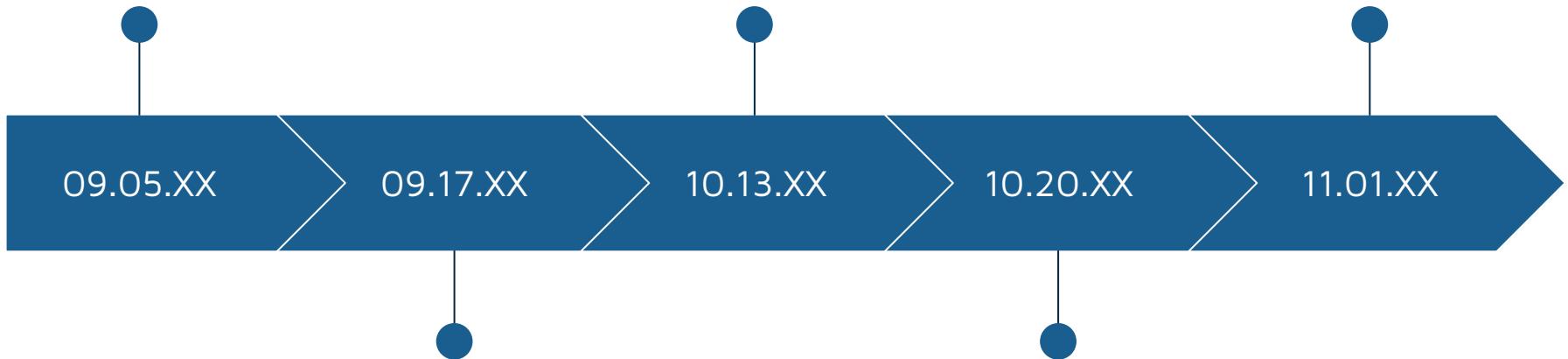
# Solution

More premium subscribers

*Lorem ipsum dolor sit amet,  
consectetur adipiscing elit, sed do  
eiusmod tempor incididunt ut  
labore et dolore magna aliqua.*







# The team



# THANK YOU

# Impact

XX% sales increase

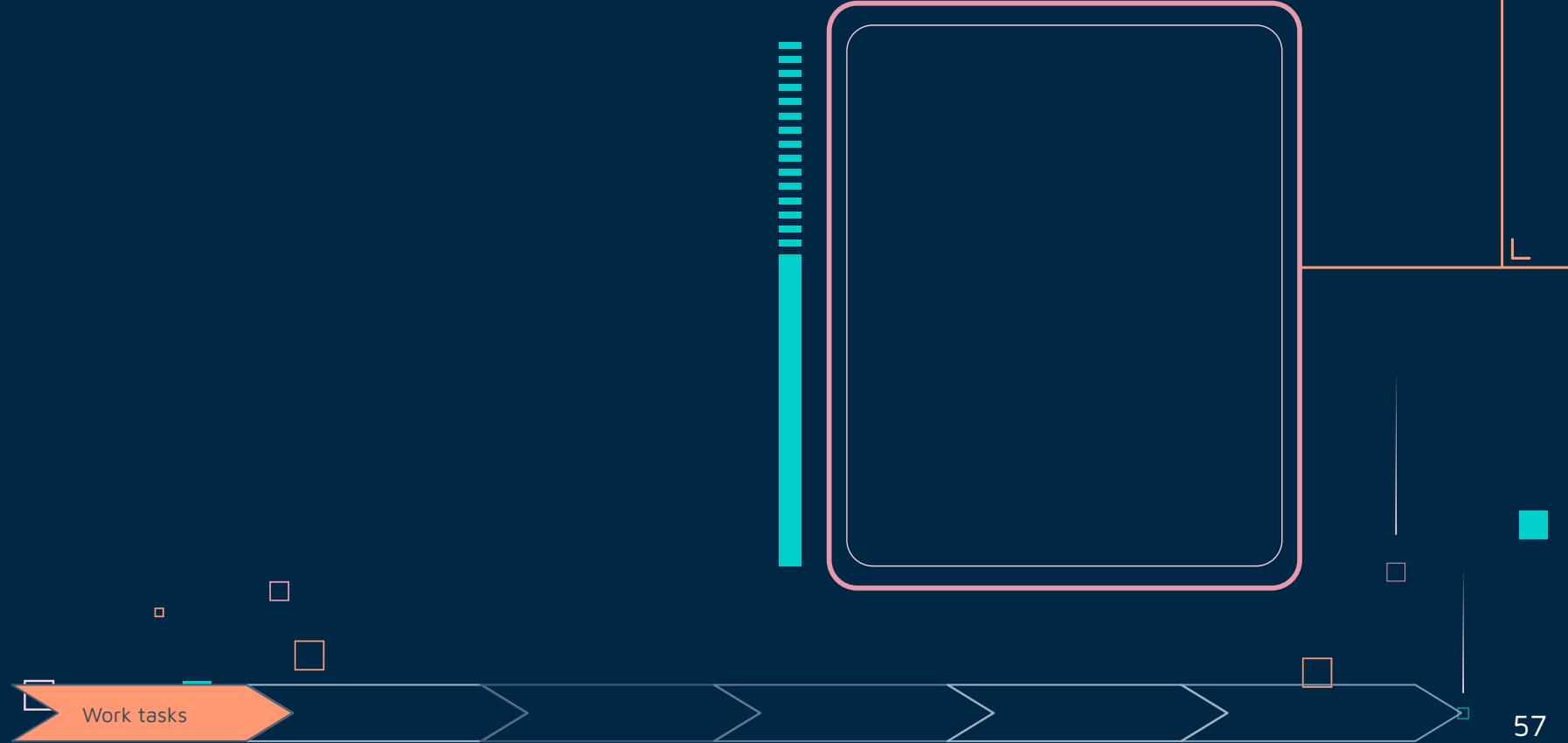


## Which State has the Highest Student Investment Over the Years?

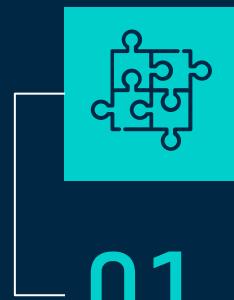
Year	Federal States	Investment per student
2010	Thüringen	8,600€
2011	Thüringen	8,500€
2012	Thüringen	8,500€
2013	Hamburg	8,900€
2014	Hamburg	9,500€
2015	Berlin	9,700€
2016	Hamburg	10,100€
2017	Hamburg	10,700€
2019	Berlin	12,100€
2020	Berlin	13,100€
2021	Berlin	14,200€

- We see the States with the highest investment per student
-

# WORK TASKS



# TABLE OF CONTENTS



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## PROBLEM & SOLUTION

Here you could  
describe the topic  
of the section



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## OUR PROCESS

Here you could  
describe the topic  
of the section



03

## TARGET

Here you could  
describe the topic  
of the section

# OUR COMPANY

Mercury is the closest planet to the Sun and the smallest one in the Solar System—it's only a bit larger than the Moon. The planet's name has nothing to do with the liquid metal



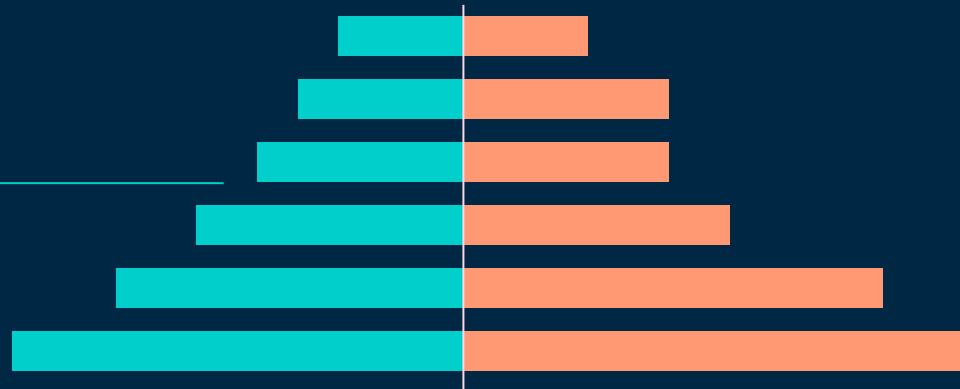
# UNDERSTANDING THE PROBLEM

## MARS

Despite being red, Mars is a cold place. It's full of iron oxide dust, which gives the planet its reddish cast

## VENUS

Venus has a beautiful name and is the second planet from the Sun. It's terribly hot, even hotter than Mercury



# MAIN COMPETITORS

## NEPTUNE

It's the farthest planet from the Sun

## MARS

Despite being red, Mars is a cold place

## VENUS

Venus is the second planet from the Sun

## SATURN

It's composed mostly of hydrogen and helium

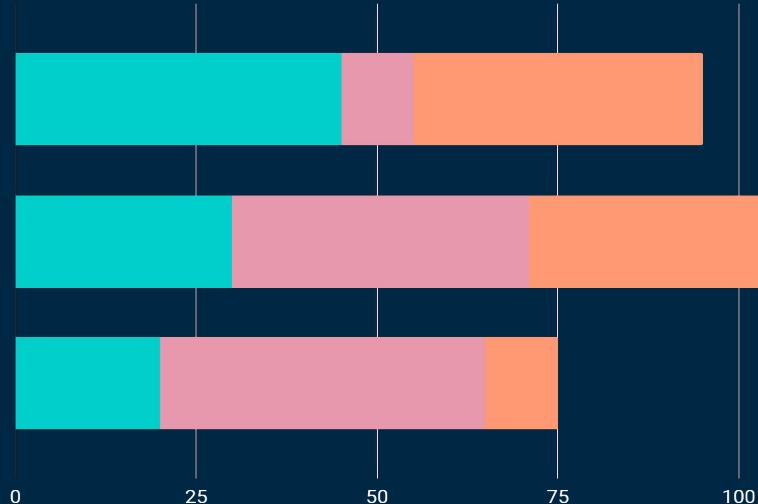


# COMPANY

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here if you need it

01

# MARKET RESEARCH



## NEPTUNE

It's the farthest planet from the Sun



## MERCURY

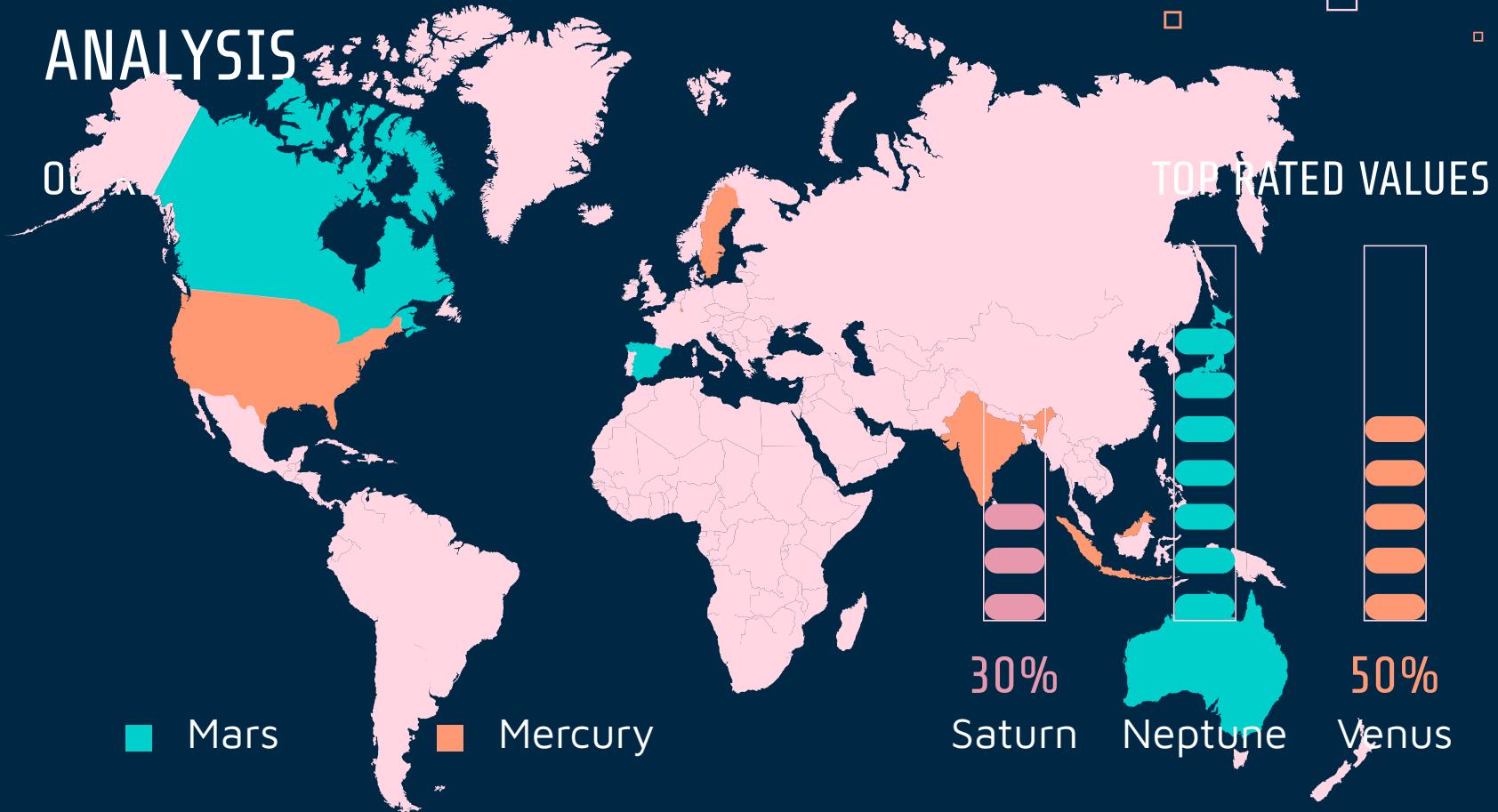
Mercury is the closest planet to the Sun



## SATURN

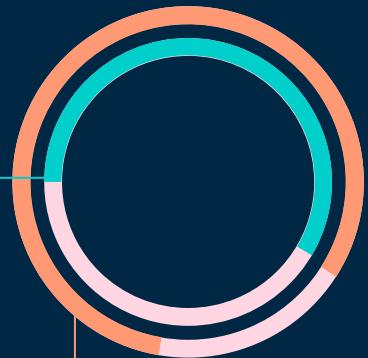
Saturn is composed of hydrogen and helium

# ANALYSIS

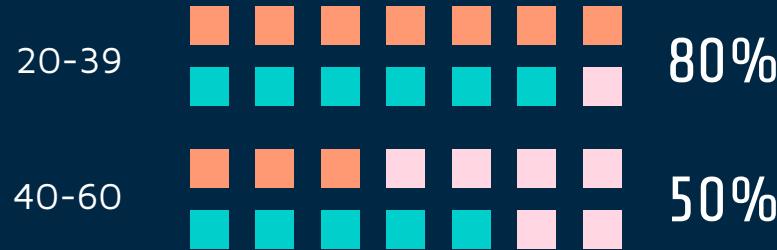


# TARGET

## GENDER



## AGE



A black and white photograph of two young women standing side-by-side, looking down at a tablet device held by the woman on the right. They are both smiling. The woman on the left has long blonde hair and is wearing a dark denim jacket over a white top. The woman on the right has curly dark hair and is wearing a light-colored cardigan over a t-shirt. The background is a bright, minimalist room with white shelves.

A Picture Is Worth a  
Thousand Words

# AWESOME WORDS

# OUR PROCESS

Despite being red,  
Mars is a cold place



Saturn is composed of  
hydrogen and helium

DAY 04

NEPTUNE  
It's the farthest  
planet from the Sun

# OUR CONSULTANTS



**HELENA PATTERSON**

You can replace the image on  
the screen with your own

**JANE DOE**

You can replace the image on  
the screen with your own



“This is a quote. Words full of wisdom that someone important said and can make the reader get inspired.”

—SOMEONE FAMOUS

# OUR PARTNERS

Venus has an extremely poisonous atmosphere

**VENUS**

**SATURN**

Saturn is composed mostly of hydrogen and helium



Despite being red, Mars is actually a cold place

**MARS**

**MERCURY**

Mercury is the closest planet to the Sun

# TESTIMONIALS



"Mercury is the closest planet to the Sun and the smallest of them all"

—RYAN DIXON



"Venus has a beautiful name and is the second planet from the Sun"

—ALIYA FARLEY



"Jupiter is a gas giant and the biggest planet in the Solar System"

—HENRY McKANE



"Saturn is composed mostly of hydrogen and helium"

—BILLY BROOKS



"The Sun is the star at the center of the Solar System"

—LUCY JADE



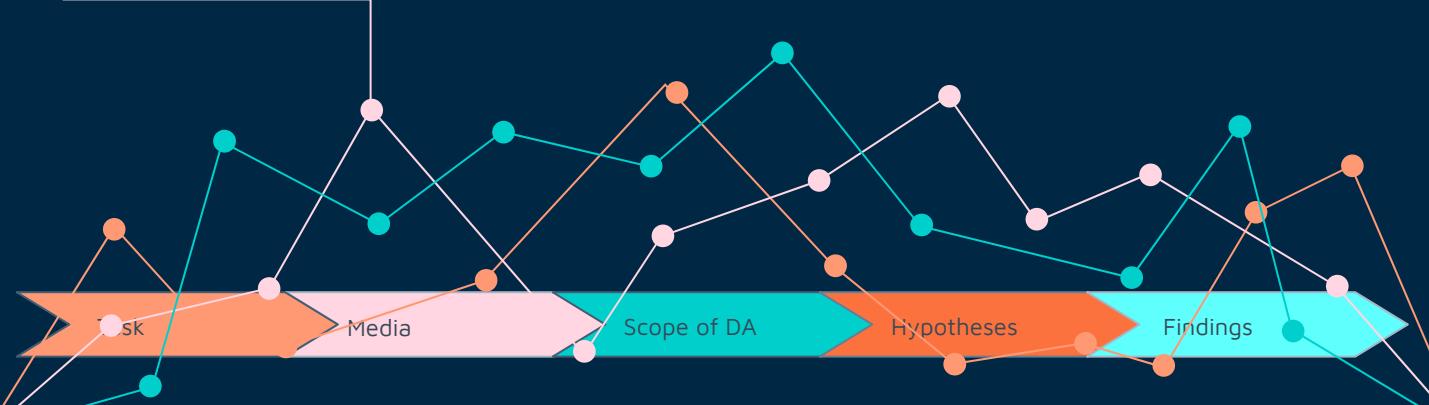
"Neptune is the fourth-largest planet in the Solar System"

—ROSE CLARK



# 4,498,300,000

Big numbers catch your  
audience's attention



# AWARDS

DATE	REASON	DESCRIPTION
------	--------	-------------

MERCURY	2010	Jupiter	It's the closest planet to the Sun and the smallest one
MARS	2012	Neptune	Despite being red, Mars is actually a cold place
VENUS	2016	Saturn	It has a nice name and is the second planet from the Sun

# UPCOMING GOALS

JUPITER

JUNE 2



It's the biggest planet in the Solar System

SATURN

OCTOBER 14



Saturn is composed mostly of hydrogen and helium

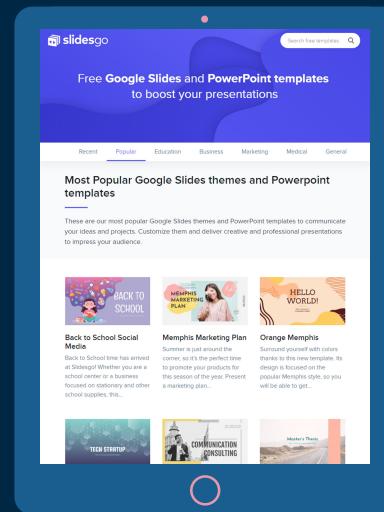
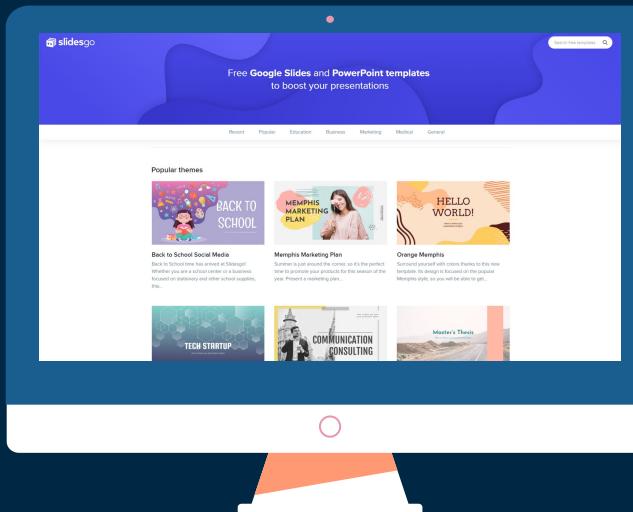
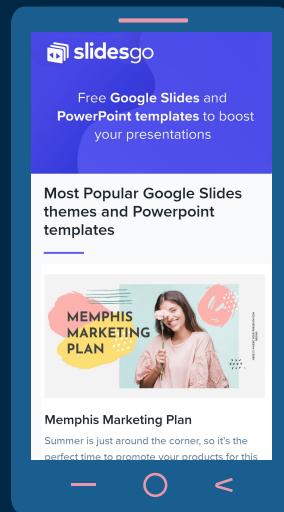
NEPTUNE

JANUARY 23



Neptune is the farthest planet from the Sun

# SNEAK PEEK



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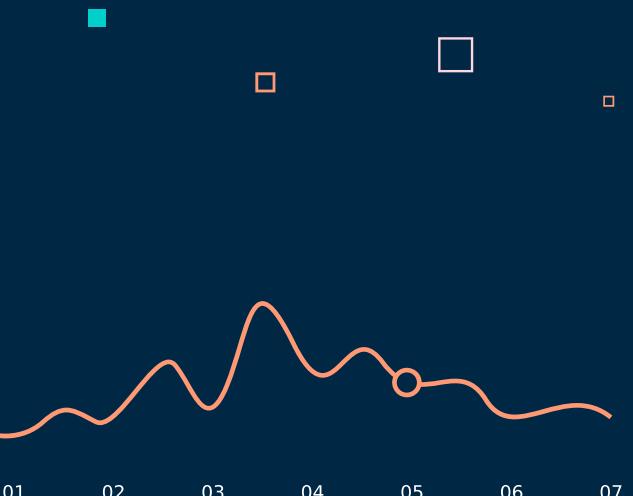
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# THANKS



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# ALTERNATIVE RESOURCES



# RESOURCES

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## VECTORS

- Abstract pixel rain blue background
- Dashboard element collection
- Red and blue neon fingerprint background
- Dashboard element collection template

## PHOTOS

- Female colleagues discussing work at office
- Close-up confident adult woman posing
- Portrait of beautiful adult woman smiling

# Instructions for use

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This presentation has been made using the following fonts:

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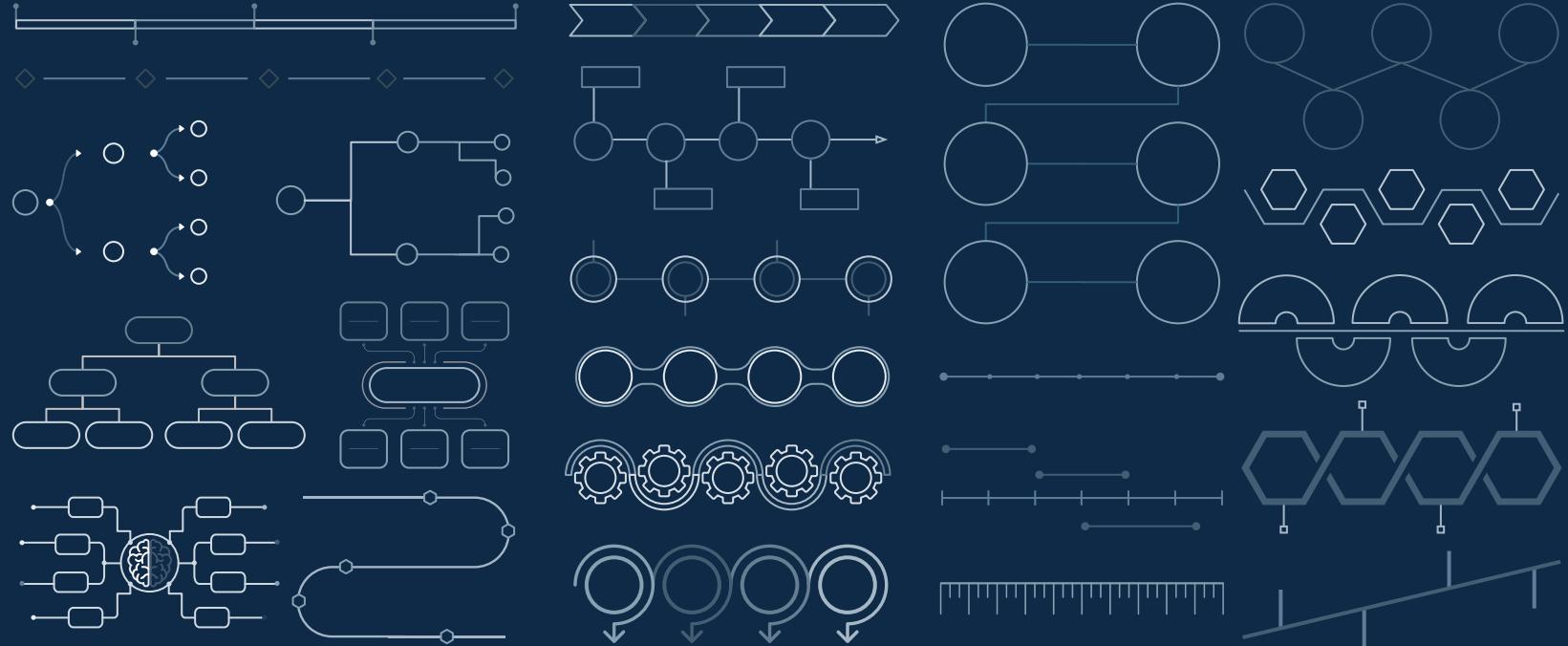
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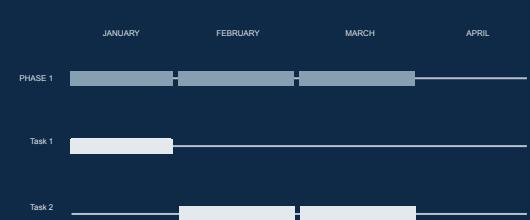
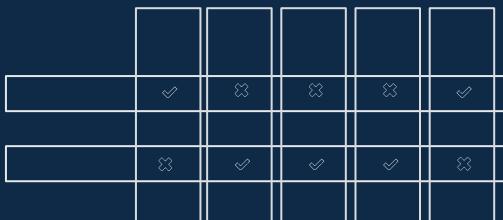
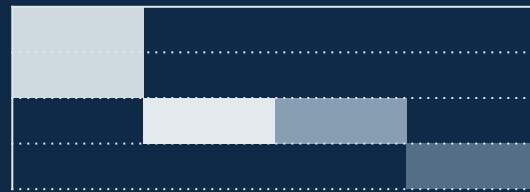
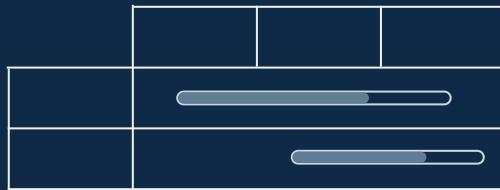
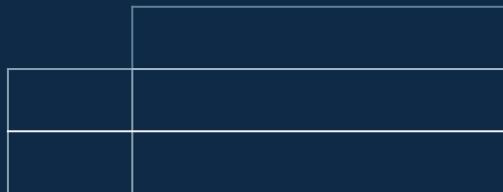
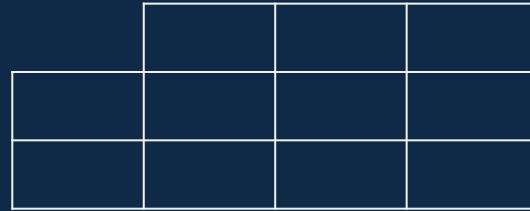
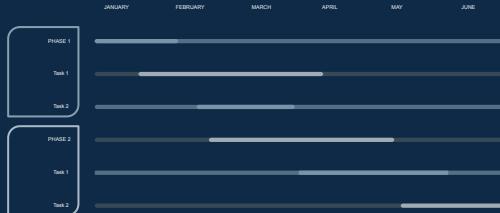
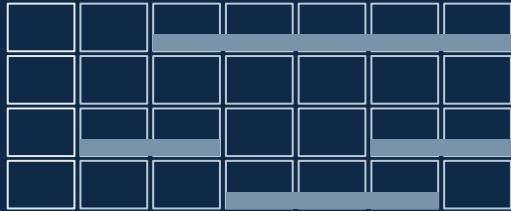
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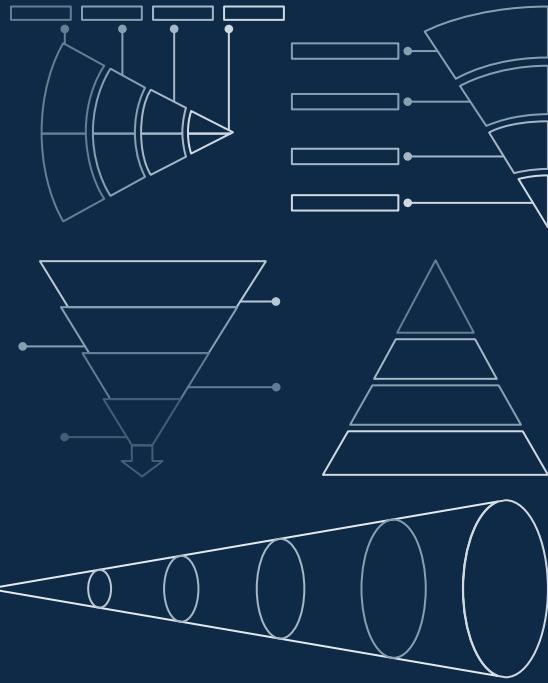
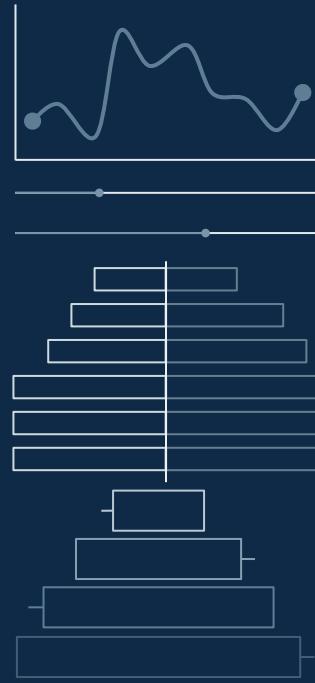
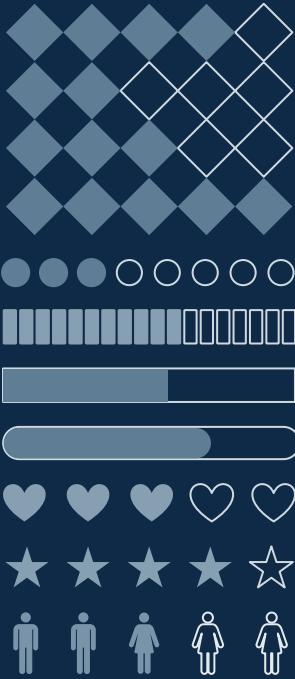
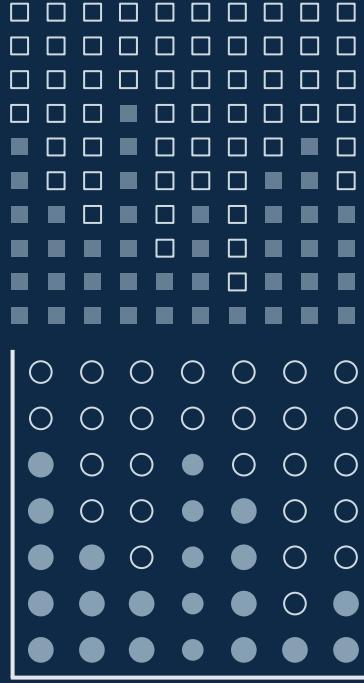












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