Close to home or communal goals?

Socioeconomic status is correlated to engineering problem-finding and relevance

Nathan Sanders and Laura Fogg-Rogers
Presented at the Public Communication of Science and Technology Conference 2023
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DIGITAL ENGINEERING TECHNOLOGY & INNOVATION

Primary Engineer® Programmes ...the first step

IF YOU WERE an ENGINEER WHAT WOULD YOU DO?

ENGINEERING A SUSTAINABLE FUTURE

Transport - 40% less car traffic

Energy – renewable energy and no fossil fuels

Waste - 65% reduction in what we throw away

Nature - stop biodiversity loss

To achieve a zero carbon global economy, everything we make, transport, and power will need to be completely re-imagined and re-engineered. There is a green jobs boom underway, and we need to be educating more engineers.

Engineering skills are in short supply

New industries and technologies are emerging, adding to already significant demand for engineering skills

124,000 engineers and technicians with core engineering skills required per year + **79,000** engineering-related roles to arise per year = **203,000** people with Level 3+ engineering skills needed every year to meet demand

Figure 10.21, page 270

Annual shortfall of up to 59,000 engineering graduates and technicians to fill core engineering roles

Figure 10.21, page 270

46% engineering employers surveyed report recruitment difficulties

Page 20

It is essential more young people - particularly girls - study STEM

129,059 engineering-related apprenticeship starts across England, Scotland and Wales

Page 9

37,335 first year engineering and technology undergraduates in the UK

Figure 6.10, page 145

10% decrease GCSE entries for biology, chemistry and physics between 2012 and 2017

Page 87

Proportion female:

GCSE Physics entrants 50%

Figure 4.4, page 92

A level Physics entrants 22%

Figure 3.20, page 82

Engineering and technology undergraduate entrants 16%

Figure 6.10, page 145

Engineering apprenticeship starts (England only) 8%

Figure 5.8, page 116

Demand and shortfall figures presented here are not directly comparable to previous editions due to the use of a revised engineering footprint.

We need to improve awareness of engineering and the different routes into the profession

27% 11 to 14 year olds in 2017 know what engineers do compared to just 15% in 2013

Fig 3.11, page 66

36% 11 to 14 year olds know what to do next to become an engineer

58% 11 to 14 year olds know almost nothing or just a little about what apprentices do and the different types of apprenticeships available

Page 86

Raising understanding among key influencers is critical

Who would you consider going to for careers advice?

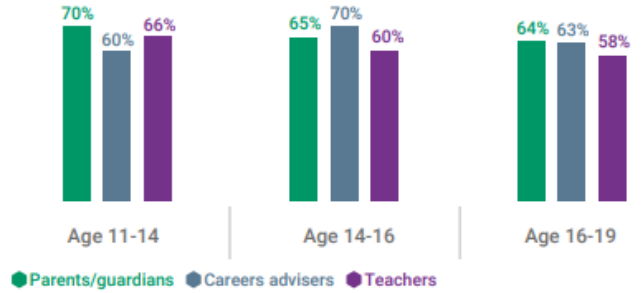

Fig 3.14, page 68

31% parents know what engineers do

Fig 3.11, page 66

36% of parents and **58% of teachers** feel confident giving careers advice about engineering

Page 86

Engineering UK, 2018

7505_infographic_leaflet_2018_web.pdf (engineeringuk.com)

ILR Review
Cornell University ILR School
Impact Factor: 3.57

Why do Women Leave Science and Engineering?

Jennifer Hunt ✉ View all authors and affiliations

Volume 69, Issue 1 | https://doi.org/10.1177/0019793915594597

Abstract

The author uses the 2003 and 2010 National Survey of College Graduates to examine th
women compared to men from science and engineering relative to other fields. The aut
higher relative exit rate is driven by engineering rather than science, and that half the ga
by the relatively greater exit rate from engineering of women dissatisfied with pay and p
opportunities. Family-related constraints and dissatisfaction with working conditions ar
secondary factors. The relative exit rate by gender from engineering does not differ fro

REVIEW article
Front. Psychol., 31 May 2017
Sec. Organizational Psychology
Volume 8 - 2017 |
https://doi.org/10.3389/fpsyg.2017.00901

This article is part of the Research Topic
Women's Under-representation in Engineering and Computing: Fresh Perspectives on a Complex Problem
View all 14 Articles >

Can I Work with and Help Others in This Field? How Communal Goals Influence Interest and Participation in STEM Fields

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Although science, technology, engineering, and mathematics (STEM) disciplines as a whole have made advances in gender parity and greater inclusion for women, these increases have been smaller or nonexistent in computing and engineering

UWE Bristol | University of the West of England

IF YOU WERE an ENGINEER WHAT WOULD YOU DO?®

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Engineering is a diverse and exciting field open to more young people than is often thought. 'If you were an engineer, what would you do?' is an annual, national, competition that celebrates every single entry!

Each year group has its own awards. Simply register to access the teaching resources, links to engineers and discover how to inspire creative problem solving in children and young people between the ages of 3 – 19 years of age.

Please note the submission deadline for the 2022/2023 academic year is March 22nd

LEARN MORE

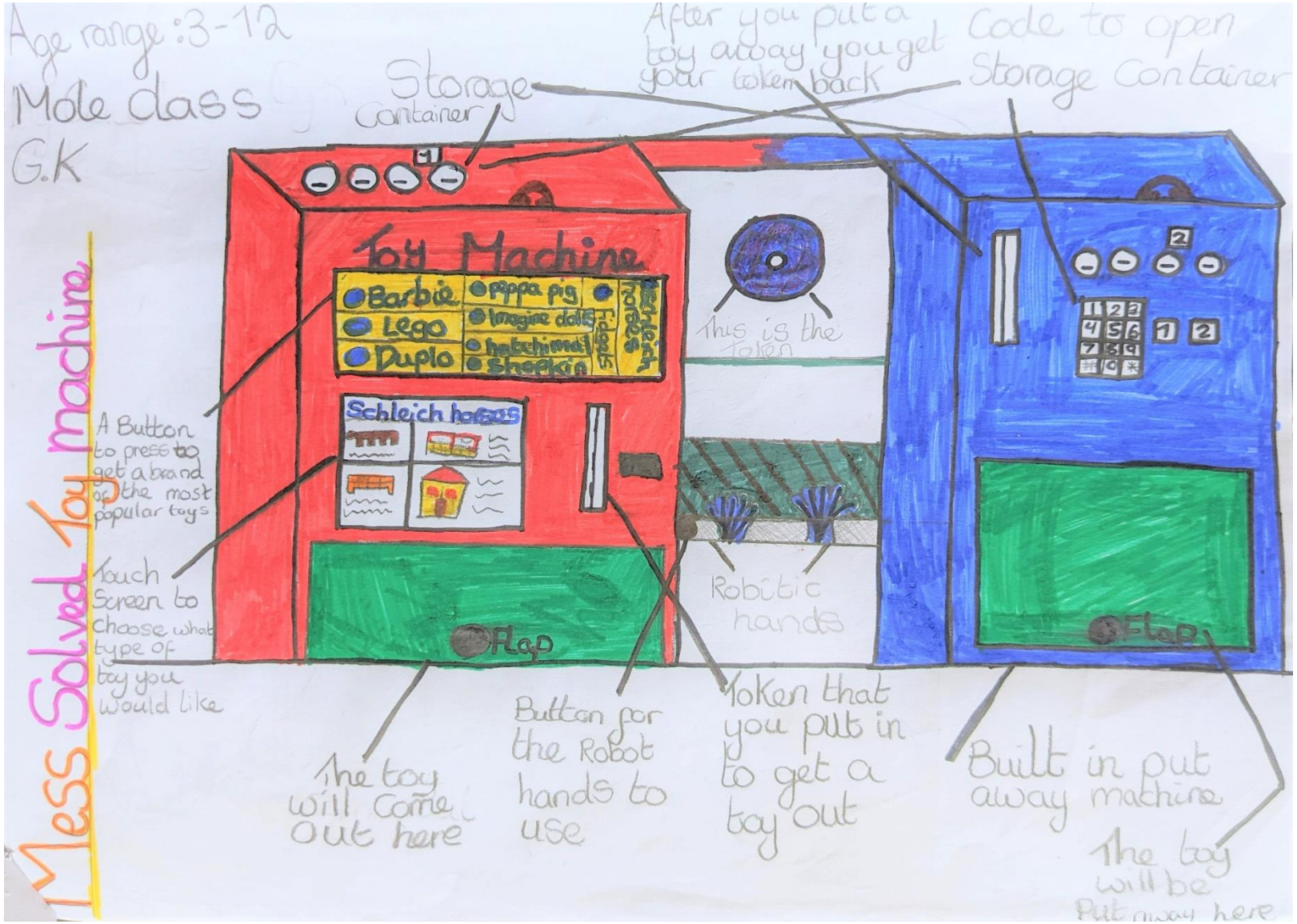
WHY, HOW, WHAT, WHEN

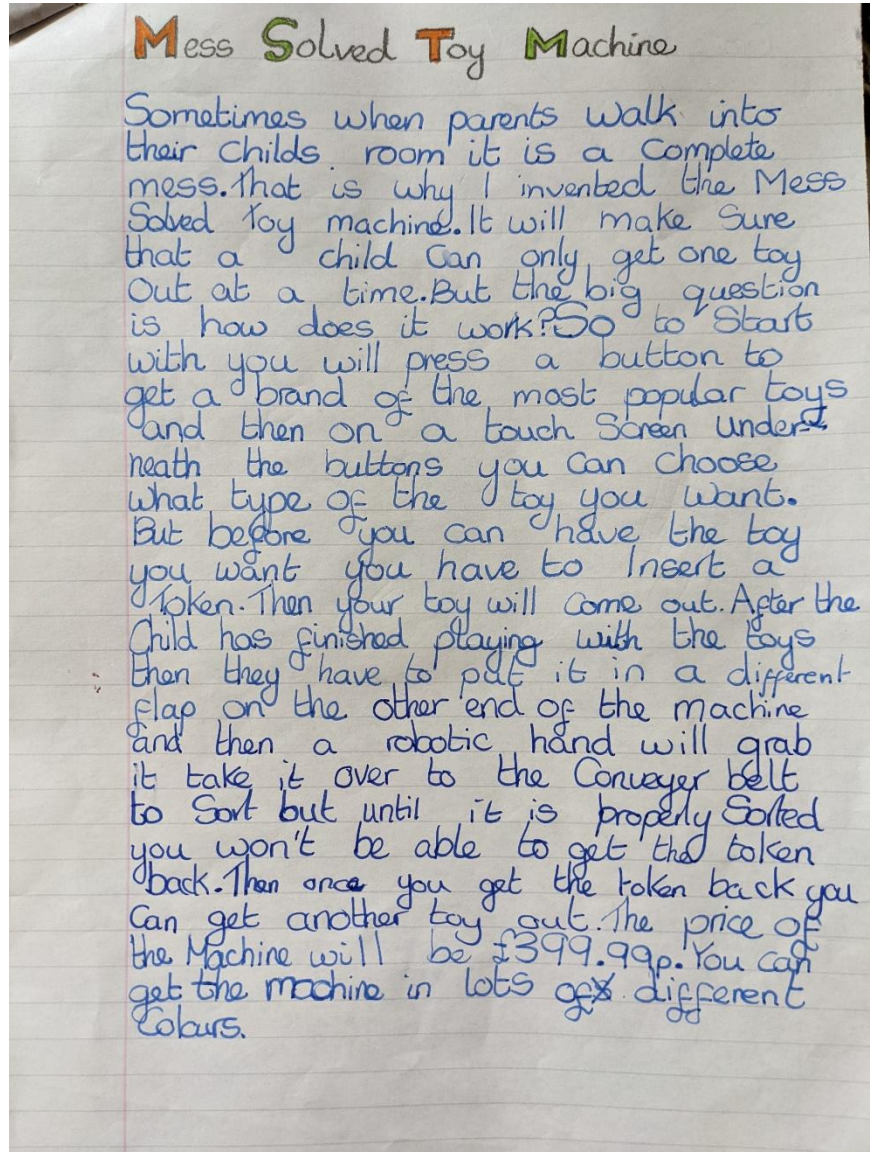
Find about the Leaders Award "If you were an engineer what would you do?" competition

MEET AN ENGINEER

If You Were An Engineer, What Would You Do? offers opportunities to interview engineers bring the STEM project to life for pupils at home and those still in school.

If you were an engineer, what would you do?





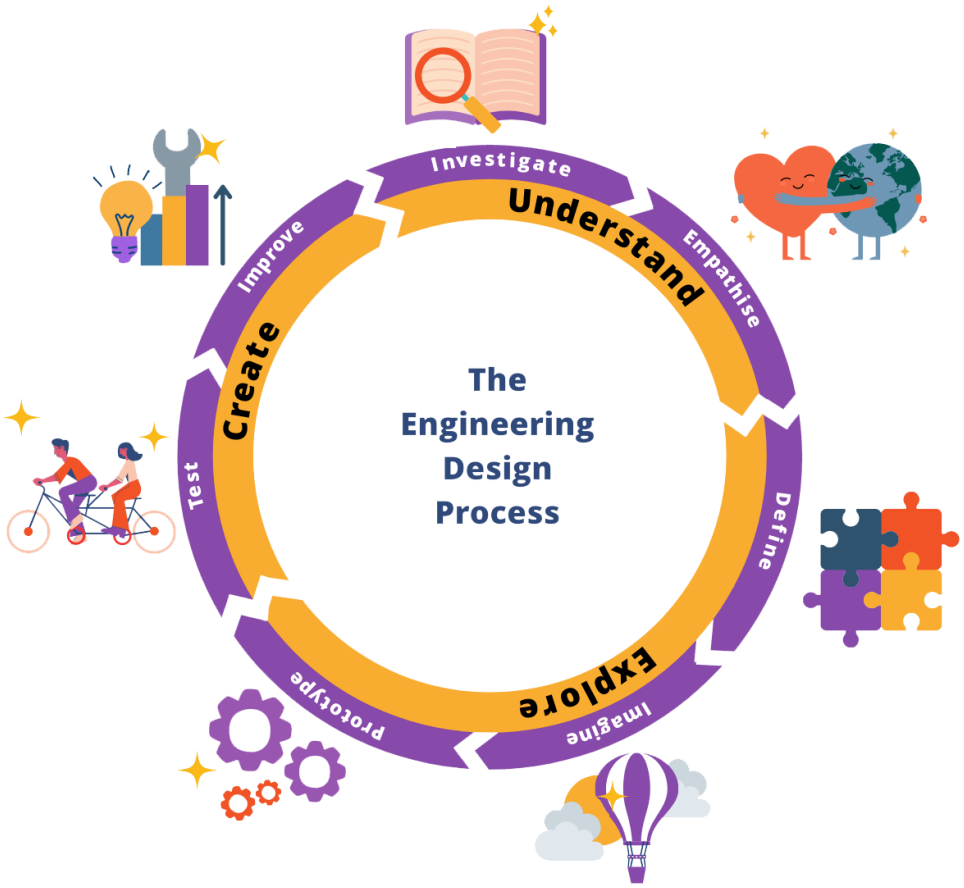
Mess Solved Toy Machine

Sometimes when parents walk into their childs room it is a complete mess. That is why I invented the Mess Solved Toy machine. It will make sure that a child can only get one toy out at a time. But the big question is how does it work? So to start with you will press a button to get a brand of the most popular toys and then on a touch screen underneath the buttons you can choose what type of the toy you want. But before you can have the toy you want you have to insert a token. Then your toy will come out. After the child has finished playing with the toys then they have to put it in a different flap on the other end of the machine and then a robotic hand will grab it take it over to the Conveyer belt to sort but until it is properly sorted you won't be able to get the token back. Then once you get the token back you can get another toy out. The price of the machine will be £399.99p. You can get the machine in lots of different colours.

Research question

1. **What types of problems do children self-identify to solve?**
   - **We postulate that this is a proxy for the topics or issues that they are concerned about.**

2. **Is there a difference between problems selected by gender, age, or social class?**



Methods

Leaders Award 2018/2019

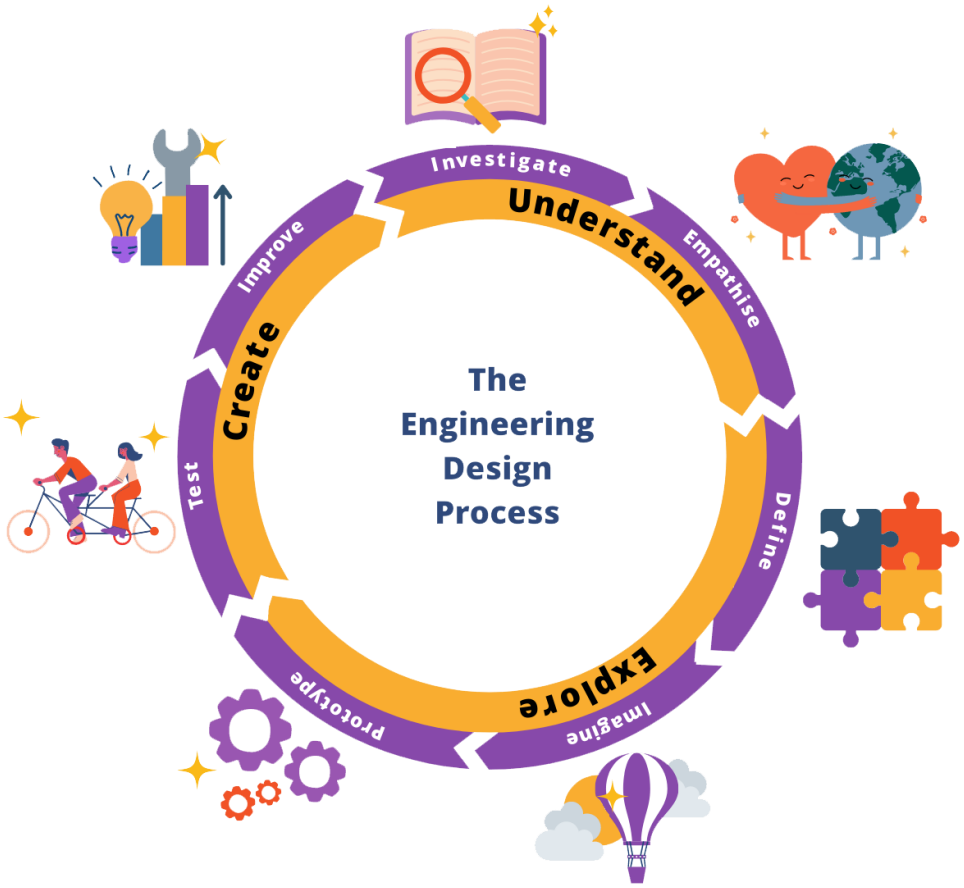
- 49,000 entries
- We sampled primary school entries from South West of England
- Final sample of **892 entries.**

The cover letter:

- Supported an understanding of the **demographic** characteristics of the sample.
  - Whether the entrant was female or male (or not stated)
  - The entrant's school year group (used to denote age)
  - The entrant's school postcode (used to assess social class, by the Index of Multiple Deprivation)

The Engineering Design Problem:

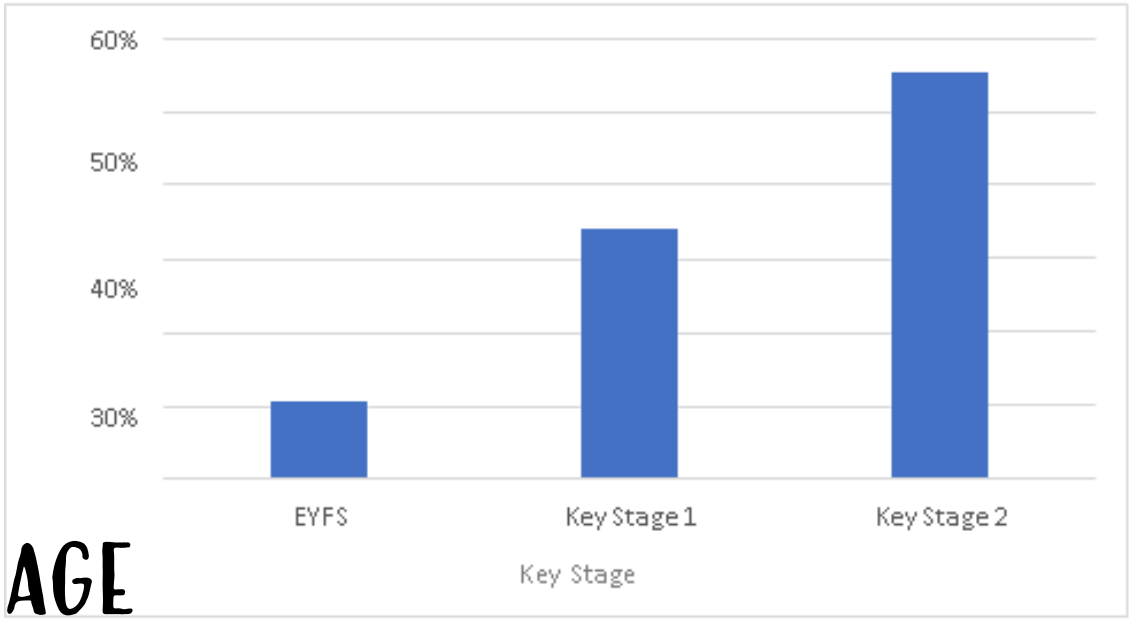
- A **qualitative content analysis** of the entries was conducted to categorise the primary themes of each entry.
- These themes were identified and analysed using a **thematic analysis.**



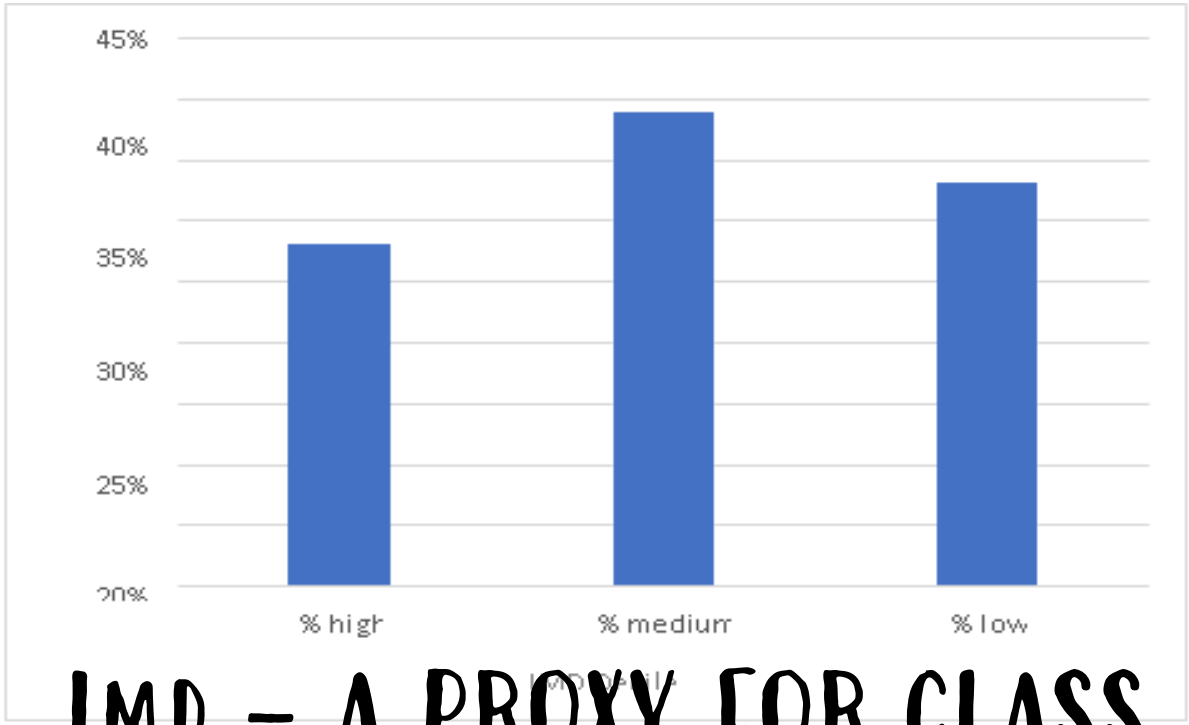
Participant characteristics

892 entries were analysed - 53% of entries were from boys and 47% were from girls.

Entries were spread across different socioeconomic areas and ages.



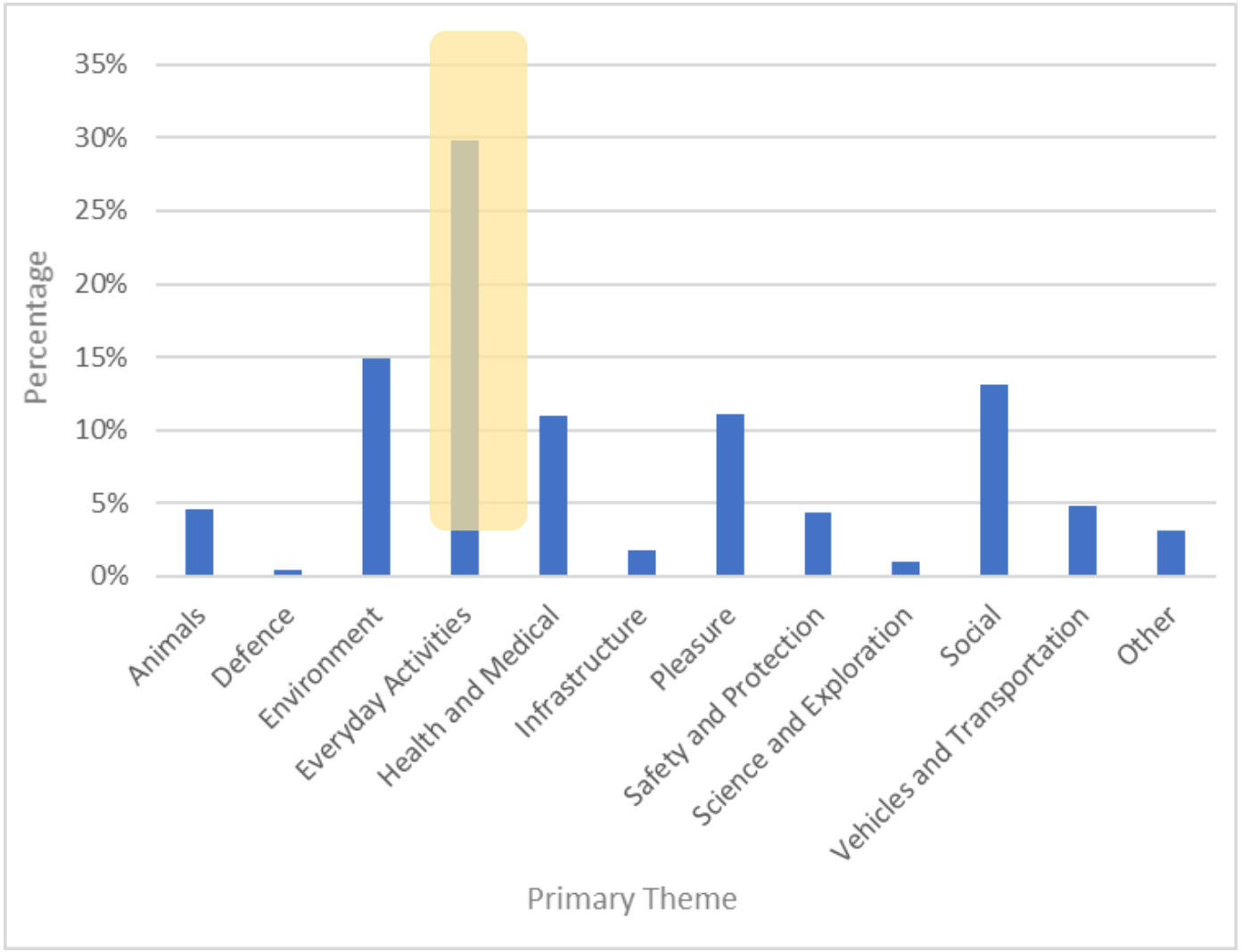
AGE



IMD – A PROXY FOR CLASS

PROBLEM-FINDING THEMES

The primary theme of **'everyday activities'** was the most represented category, accounting for **28%** of all categorised entries.

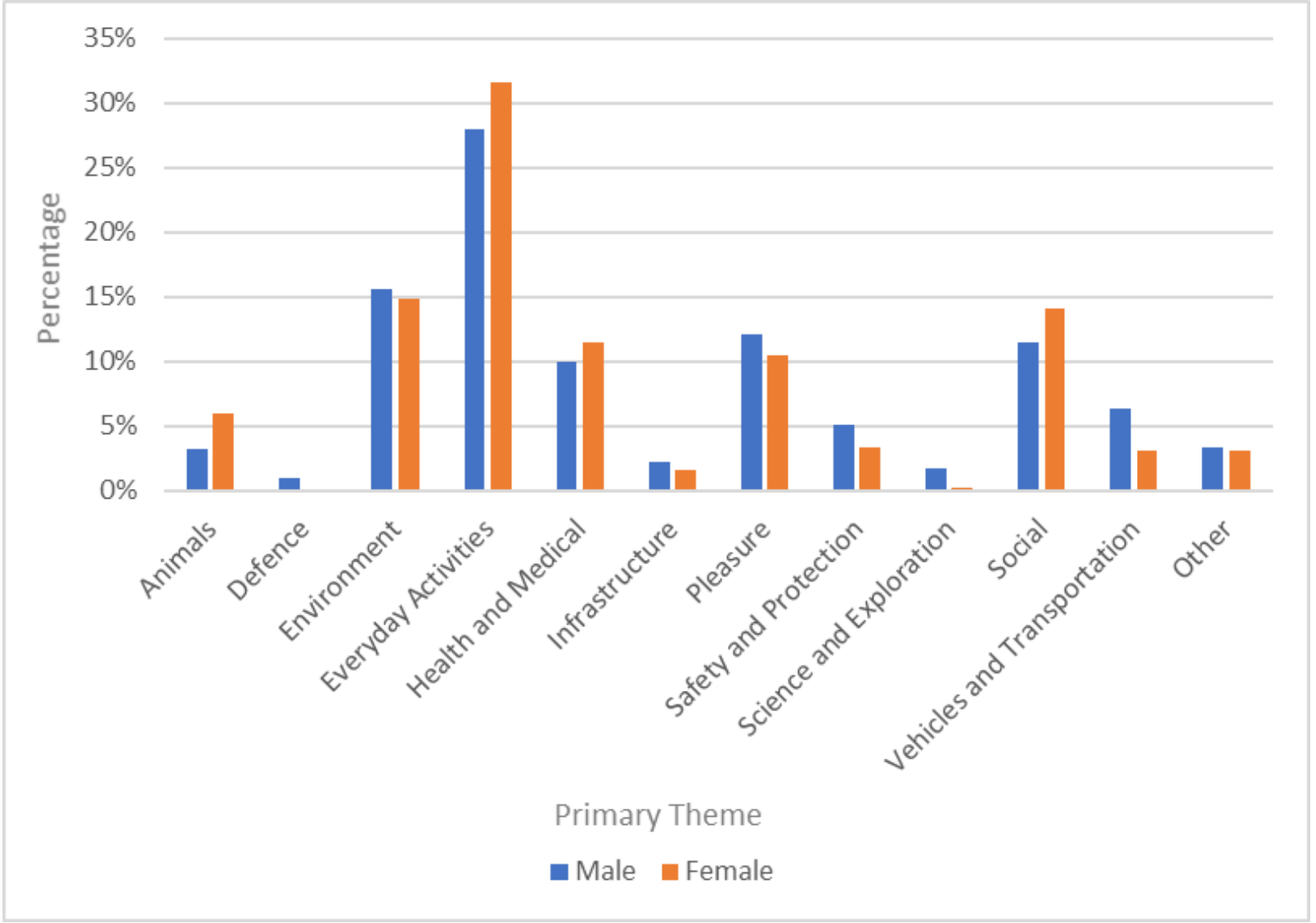


Gender differences?

Between **boys and girls**, there were **no variances of greater than 3.6%** for any primary theme, when the findings for primary themes were analysed by gender alone.

There was a trend for girls to choose more ‘everyday activities’, ‘environment’ and ‘social’ problems.

The differences were not statistically significant.

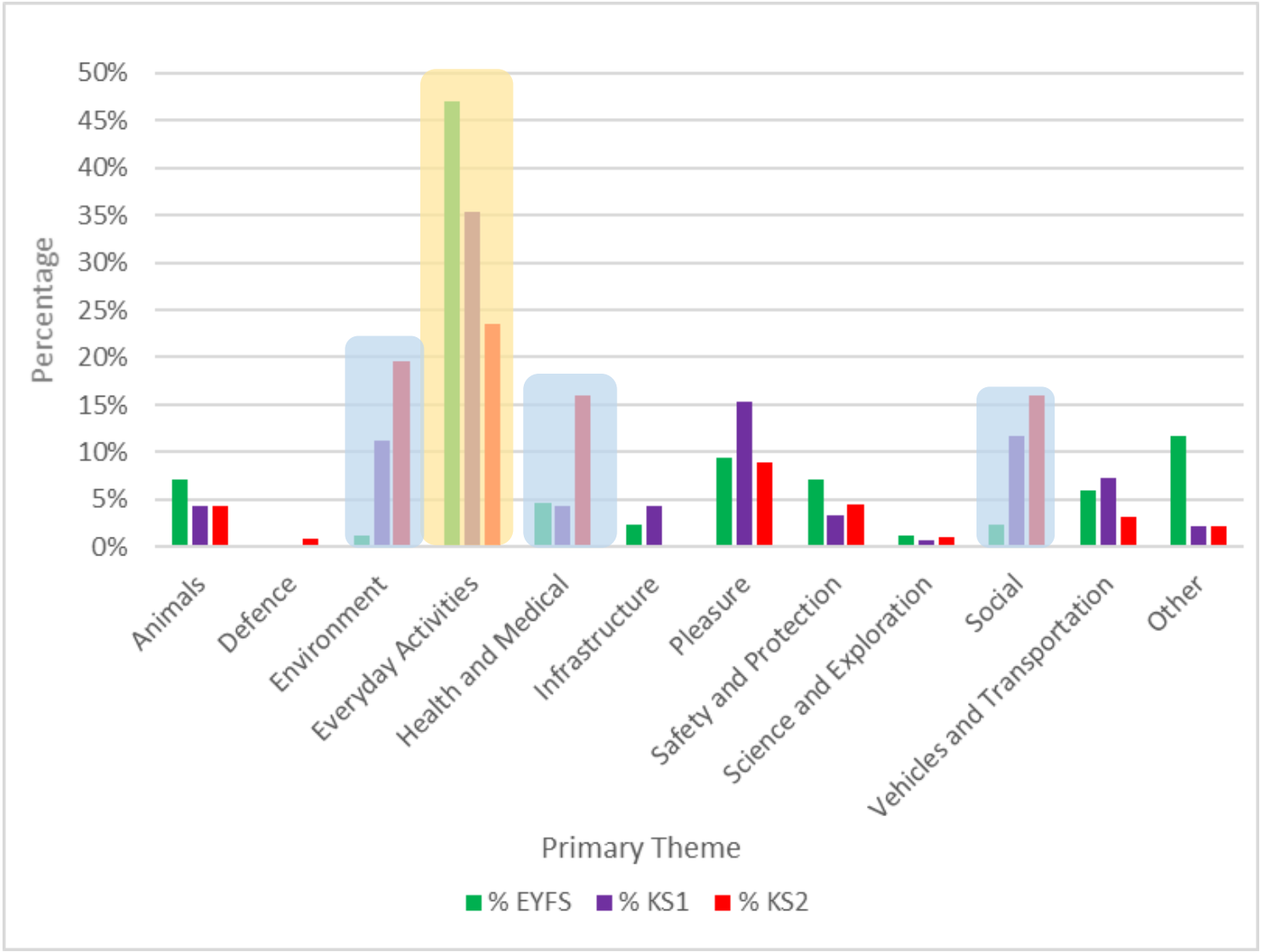


Differences with age

The proportional representation of the primary theme of **'everyday activities'** decreased from early years to upper primary (**EYFS to KS2).**

The proportional representation of the primary themes of **'social', 'environment' and 'health and medical'** increased from early years to upper primary (**EYFS to KS2).**

These differences **were statistically significant.**

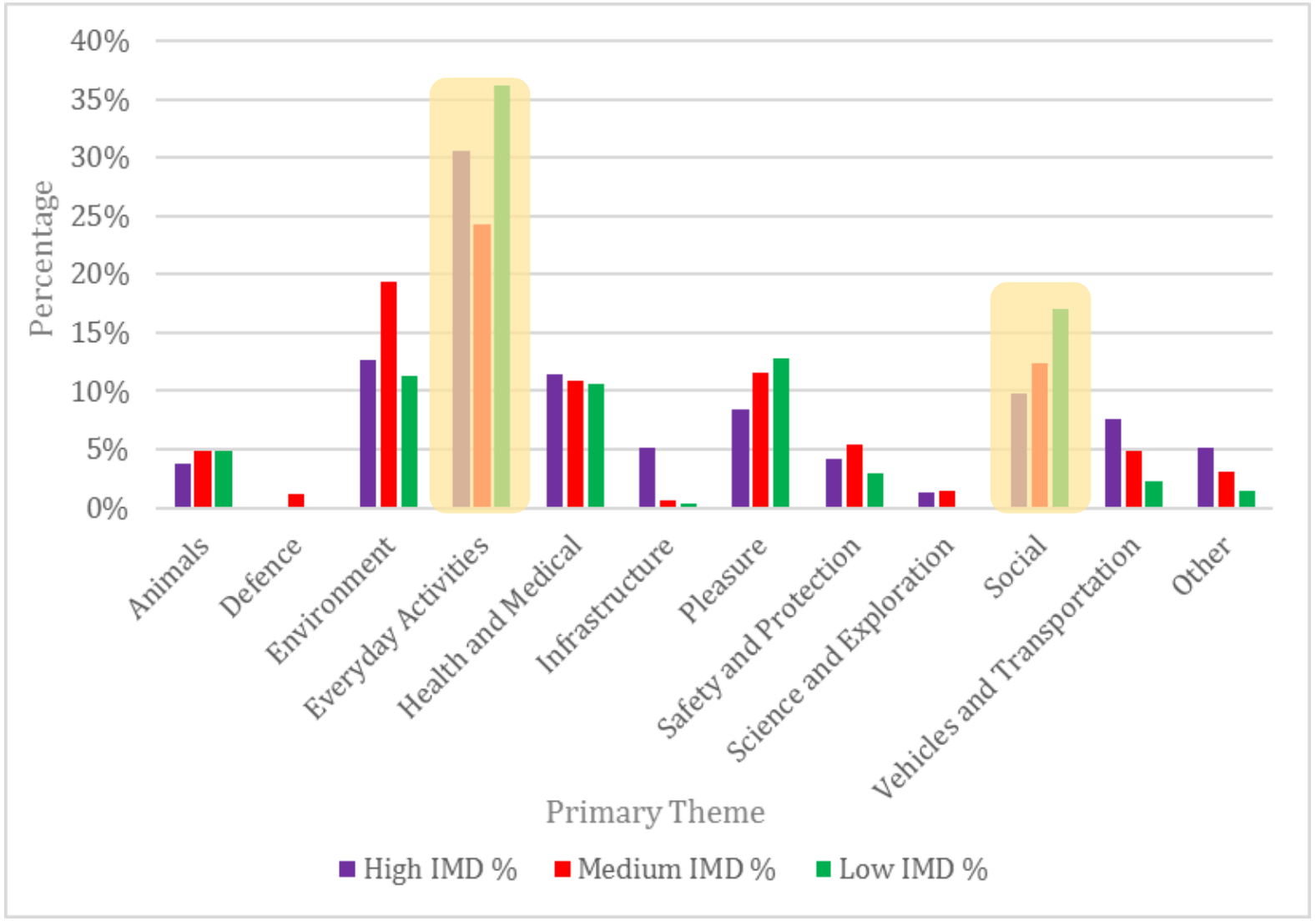


Differences in social class

The primary themes of **'everyday activities' and 'social'** were better represented within **low** compared with medium and high IMD decile entries.

'Pleasure' was better represented in **low** decile entries, **'environment'** was better represented within **medium** decile areas, and '**infrastructure'** and **'transportation'** were better represented within **high** decile entries.

These were all **statistically significant differences.**



Discussion

- Children self-identified problems they can relate to, which they see as part of their everyday life. As children get older, they may draw on issues and problems they see in the media or in their surrounding area. Children from different areas relate to different issues.
- The engineering industry tends to promote space, fast cars, robots, and weaponry – is this out of touch with the issues children are interested in?
- This study provides ideas for how to build connections between engineering and children from different social classes. Children may benefit from science communication which focusses on issues and problems they can relate to, particularly in times of socioeconomic and environmental difficulties.

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