

# Uncovering Meaningful Computing Contexts for Incarcerated College Students

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Table 2: Student Topics for Open-Ended Programming Assignments

Code	%	Description
business management	14.1%	Tool for business owners/managing a business
sports statistics	11.5%	Compute sports player or team statistics;
physical health	10.3%	Physical healthcare related; warning / diagnosing of potential health issues
writers	10.3%	Tool for writers; correcting grammar
students	9.0%	Tool for students; study habits / time management for students; assess academic progress / standing
teaching	9.0%	Tool for educators / tutors; teaches a user about a topic
no discernible theme	6.4%	No discernible purpose or theme; random calculations
incarceration	6.4%	Related to prison reform; helps incarcerated people; improves life in prison
playing sports	6.4%	Tool for athletes; keeps score of a game / tournament; assesses athletic performance
activities	5.1%	Activities / hobbies (i.e., going to the movies, travel recommendations)
food	5.1%	Collecting food preferences; related to food quality
cars	3.8%	References car parts/fixing cars; recommendations on a car to purchase
commissary	3.8%	Related to prison commissary purchases; calculating commissary totals
outside occupation	2.6%	Tool specific to an occupation outside of prison (e.g., electrician)
budgeting	2.6%	Tool for budgeting money / saving money
prison work	2.6%	Program related to a work assignment in the prison
games	2.6%	Game simulation; game shows/reality TV games
mental health and addiction	2.6%	Tool for emergency response for mental health crises; help people struggling with addiction
family	2.6%	Tools for families / relationships between family members
social justice	2.6%	Educates / informs / collects information about a social justice topic
house	1.3%	Calculates some feature of a house (e.g., area of a room)
disabilities	1.3%	Intended to serve individuals with disabilities
artist	1.3%	Tool for artists
politics	1.3%	Political opinions or preferences

## METHODS

### Study Population:

- 20 students in CS1 through a college-in-prison program
- Incarcerated at an adult male prison in the US
- Had completed an associate's degree with a high GPA
- Racial demographics shown in Table 1 differed greatly from computing students on traditional college campuses [7]
- Nuances related to the particular prison yard and facility: Typically serving long-term or life sentences
- 85% of students were age 40 or older
- Many had been incarcerated for multiple decades, meaning limited or no prior experience with computers

Table 1: Student Racial Demographics

Racial Identity	Percentage of Students
Chicanx or Latinx	30.0%
White or Caucasian	30.0%
African American or Black	30.0%
American Indian or Alaska Native	15.0%
Asian or Asian American	5.0%
Other: Mexican	10.0%
Other: African	5.0%
Other: Cuban American	5.0%

### Data: Open-Ended Programming Assignments

- Four programming assignments (PAs) were assigned approximately bi-weekly during the course.
- Each of these PAs contained two parts: the first part was a pre-defined problem with detailed instructions and expectations; the second part was an **open-ended prompt** for students to write a program incorporating certain elements or concepts (e.g., boolean value, "for" loop, etc.)

### Analysis: Qualitative Coding

- Included 78 total open-ended PA submissions from 20 students across four PAs throughout the course
- The two first authors completed three rounds of open coding to establish thematic codes, followed by one additional round to establish a consistency score (ICR=0.84)
- As some of the program submissions incorporated multiple themes, we coded the submissions with all that applied.

## RESULTS

We identified 24 unique topics or themes in students' open-ended PA submissions, listed in Table 2. Below are the three most common topics:

### 1. Business Management

```
#The purpose of this program is to provide information to the customer based on the age they entered.
#The individuals who will use the program are the people who shop at the liquor store.
#This will help the store determine which people to sale alcohol to and who not to.
...
if age < 21:
    print("User is unable to consume alcohol")
    print("User must leave store")
elif age >= 65:
    print("customer is a senior")
    print("Customer can purchase alcohol and receive a free bag of chips")
...
```

Other examples included a digital log of CD borrowers, and a "Community Center Tracking Program" that collected information about the customer experience.

### 2. Sports Statistics

(Note: a pod refers to a branch of a housing unit in this prison)

```
# Program to be used by Football enthusiasts.
# Program is a recreational tool used to make sports more enjoyable.
...
number_fans1 = (input('enter number fans team1:'))
number_fans2 = (input('enter number fans team2:'))
...
pod_population = int(66)
percent_team1 = float(number_fans1 / pod_population * 100)
percent_team2 = float(number_fans2 / pod_population * 100)
...
```

Other examples included calculating baseball batting averages and base percentages, free throw percentages for players on a fantasy basketball team, and determining NFL draft pick order.

### 3. Physical Health

```
# This program would make it more convenient to manage food allergies by scanning the ingredients.
...
if ingredients.index(allergy)==-1:
    return "There were no allergens found."
else:
    locate=content.index(allergy)
    ...
    return warning
...
```

These programs were physical healthcare related, including diet and heart rate. We distinguished these as separate from mental health and addiction, which included a program for triangulating emergency response for individuals in a mental health crisis, and recommending groups to attend based on substance-use history.

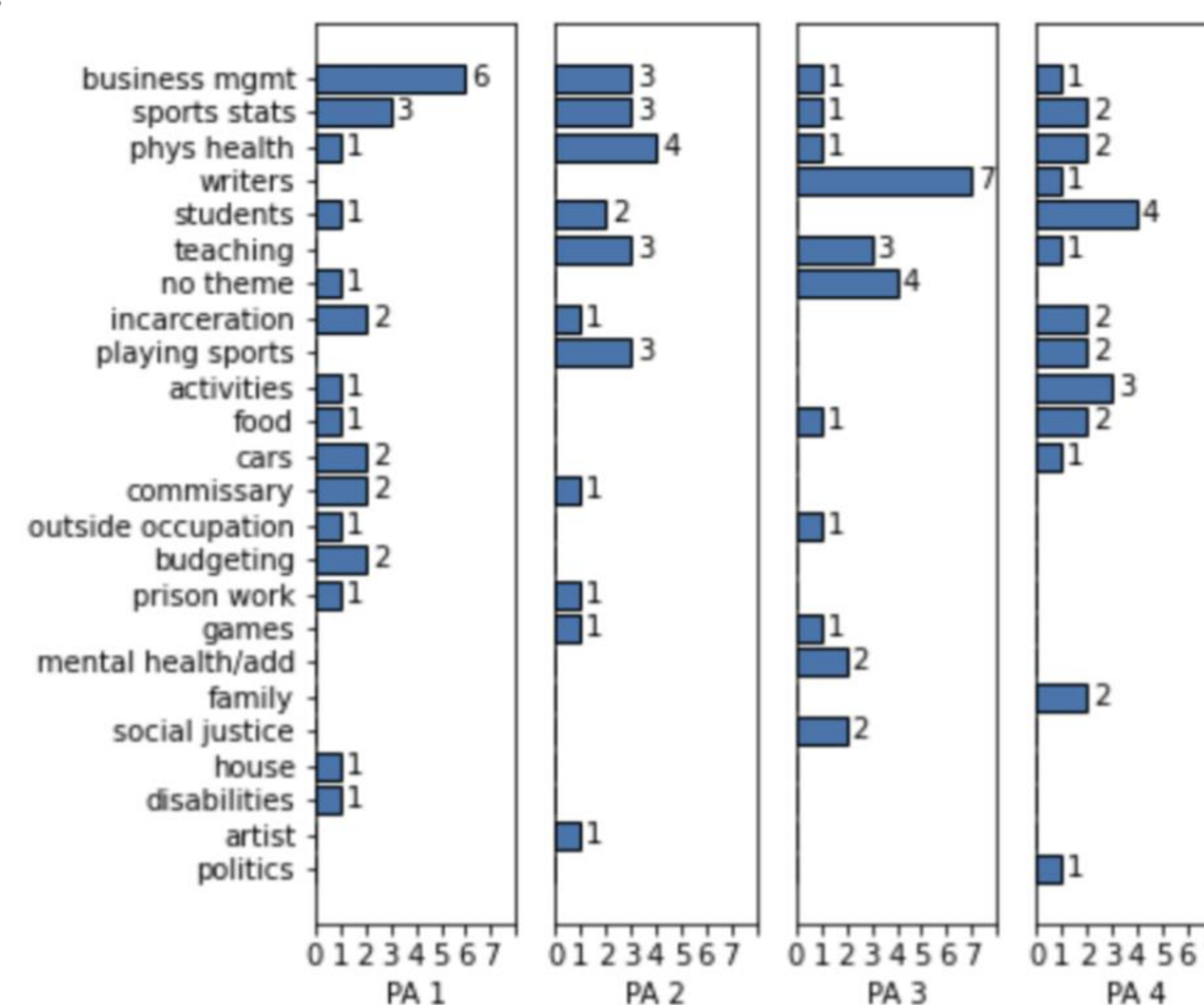


Figure 1: Counts of Topic by PA

## CONCLUSIONS

In this study, we present the following contributions:

- An approach to identifying relevant computing contexts for a specific population of students
- 24 PA topics chosen by incarcerated college students, and their popularity across four PAs
- An initial basis for applying computing in context and culturally relevant pedagogies in prison contexts

Results of our qualitative analysis of open-ended PA submissions from a CS1 course taught in prison found that the three most common topics chosen by students were business management, sports statistics, and physical health. The variety of topics chosen expanded throughout the course as students were exposed to more programming concepts and examples. Future courses and interventions can use these contributions to make computing more relevant to incarcerated students, promoting student engagement and success.

## REFERENCES

1. 2020 STEM For All Video Showcase. "STEM Opportunities in Prison Settings (STEM-OPS)." Accessed January 18, 2024.
2. Conway, Patrick Filipe. "Andragogy in Prison: Higher Education in Prison and the Tenets of Adult Education." 2022.
3. Gay, Geneva. *Culturally Responsive Teaching: Theory, Research, and Practice*. teachers college press, 2018.
4. Guzdial, Mark. "Does Contextualized Computing Education Help?" 2010.
5. Guzdial, Mark. "Exploring Hypotheses about Media Computation." 2013.
6. Ladson-Billings, Gloria. "But That's Just Good Teaching! The Case for Culturally Relevant Pedagogy." 1995.
7. Margolis, Jane, et al. *Stuck in the Shallow End: Education, Race, and Computing*. The MIT Press, 2017.
8. Porter, Leo, Mark Guzdial, Charlie McDowell, and Beth Simon. "Success in Introductory Programming: What Works?" 2013.
9. Sharmin, Sadia. "Creativity in CS1: A Literature Review." 2022.
10. Taylor, Satra, et al. "Why Race Matters for Higher Education in Prison." 2021.

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**Abstract:** Higher education is expanding in United States prisons, with a growing demand for STEM offerings [1]. Academics from other disciplines have stressed the importance of culturally relevant pedagogy (CRP) in prison higher education [10], and computing in context has shown major benefits in CS1— especially for women and nontraditional students [5,8]. In this paper, we analyze course data from a CS1 course taught in a college-in-prison program to answer the following research question: **What contexts do incarcerated students in CS1 find relevant?** We identify 24 topics pursued by students across 78 open-ended programming assignment submissions, the three most popular being business management, sports statistics, and physical health. These results offer insight into potential contexts that are meaningful to incarcerated college students to be incorporated into future computing curricula and interventions in prisons.

## BACKGROUND & MOTIVATION

Relevance is a core component of intrinsic motivation, and central to the educational frameworks below [9].

- **Computing in Context:** Making CS relevant means students can more easily see value in what they are learning, which increases retention [4]
- **Andragogy:** Adult students need to see value in what they are learning prior to investing effort, and it is important to incorporate and embrace adult students' breadth and diversity of past life experiences [2]
- **Culturally Relevant Education:** Beyond the standards of relevance in computing in context and andragogy, requiring the development of "broader sociopolitical consciousness" to critique societal norms and institutions that produce social inequality [6] and connecting knowledge to "appropriate responsive and responsible action" [3].

Together, these frameworks provide a strong case for seeking to identify what computing contexts incarcerated students find most relevant.



Above: The first author with the first cohort of students in the prison at the Fall 2023 wrap-up celebration.