Midterm Exam

Authoring Instructions

1. **Place your TCard on a corner of your desk** where it is easily visible.
2. **Label your Booklet** clearly, placing only one letter or number in each spot filling in your name, and student number.
3. Write your response in the space provided within the Booklet, in **pen**, and **do not use any corrective mechanisms that obscure content** (e.g. WhiteOut™ tape or liquid). If you want to make changes, simply cross out words.
4. **Follow any additional instructions** provided by the Proctors.
5. You will have **90 minutes** to complete this midterm.

Potential Academic Offences

1. You must not have any aids other than your pens and TCard.
2. You must not confer or collaborate with others during the midterm.

Note that your writing must be readable by your audience (e.g. members of Teaching Team).

Objectives

The primary objective of the midterm exam is to assess your understanding of the core concepts and models outlined in the first three weeks of Praxis I. Additionally, you are being assessed on your ability to make quality engineering arguments.

The midterm, like all written ESC101 assignments, is part of the English Proficiency Assessment mandated by the Faculty of Applied Science and Engineering. As such, one of its objectives is to assess your ability to write English coherently and clearly in a closely supervised situation.

Question 1 (worth 9 out of 30 total marks)

Below is a preliminary **set of requirements**. Do not assume an order to the bullets. There are many errors here - identify three (3) errors in the requirements. For **each** error:

A) Briefly explain what the error is and why it is an error [1 mark]

B) Explain how the error relates to the component of the requirements it is listed under. [1 mark]

C) Correct the error. [1 mark]

You may assume that evidence exists to support any specific values indicated below.

Opportunity

Recommend a way for a student to get to class each day

Stakeholders

1. Students (e.g. those who are travelling)
2. Environmentalists
3. University Instructors
4. Others travelling at the same time

Requirements for a Mode of Transportation

Objectives

- Allow for maximum outdoor mobility
- Keep the user comfortable
- Should not be too heavy
- Be environmentally responsible
- Must not be expensive
- Should be fast

Metrics

- Distance in metres
- Emissions in metres of carbon dioxide
- Stopping distance in metres (as per ISO4210-2:2015)
- Speed in km/h
- Should take no longer than three minutes to reach full speed

Constraints

- Stopping distance must be less than 15m
- Must have a max speed less than 32 km/h (as per Government of Ontario regulations)
- Must have a mass less than 120 kg (as per Government of Ontario regulations)
- Keep the user dry
- Can't be green (the colour)
- Shouldn't be bulky

Criteria

- Lighter is better
- Must be visible
- More mobility
- Less non-recyclable material is better
- Faster is better

Have you identified three (3) errors from the requirements and corrected them?

Question 2 (worth 9 out of 30 total marks)

A) Use the provided evidence package to add an additional objective to the requirements from Question 1 with its associated metric(s), constraint(s), and criteria (as appropriate). This additional objective must not be related to any existing metrics, constraints or criteria. [5 marks]

B) Justify the inclusion of the new requirement string for addressing the opportunity. [4 marks]

In your response to parts A and B make sure to cite (refer to) the evidence you use.

Have you written out the additional objective, metric(s), constraint(s) and criteria, and justified their inclusion?

Question 3 (worth 12 out of 30 total marks)

Your response to this question must be written in complete, coherent, and integrated sentences (in paragraphs).

The words listed in the table below represent a set of concepts introduced in Praxis.

- Choose exactly three (3) concepts from the table below.
- Connect each concept you choose to one (1) Praxis concept **not on the list** you chose from.
    - You **must not** connect your chosen concepts to any concept that appears in the table below.
    - You **must not** use any concept from Praxis more than once when answering Question 3.
    - This will yield three (3) connected pairs comprising a total of six (6) distinct concepts.
- For each of the three (3) connected pairs:
  A) Define each concept in the pair as we have used them in Praxis [1 mark for each definition]
  B) Explain the nature of the relationship between the two (2) concepts in the pair [2 marks for connection]

Table of Praxis Concepts

□ Model	□ Objective
□ Evidence	□ authority
□ Interpretive claim	□ Stakeholder

Have you connected three (3) concepts from the list above with three (3) other course concepts, using any concept only once? Have you explained the nature of those connections?

Source 1: from *Increasing Active Transportation Through E-Bike Use: Pilot Study Comparing the Health Benefits, Attitudes, and Beliefs Surrounding E-Bikes and Conventional Bikes*

Background: The emergence of electric pedal-assist bicycles (e-bikes) presents an opportunity to increase active transportation by minimizing personal barriers of engaging in physical activity.

Objectives: The aim of this study was to assess the beliefs of individuals using e-bikes for active transport and report preliminary biometric measurements while using e-bikes for physical activity compared with conventional bikes.

Methods: Participants used both conventional bicycles and e-bikes to compare energy expenditure while riding on the study route. Apple smart watches were used to track each participant's heart rate, distance, speed, and time while riding both bicycles. A total of 3 survey instruments were used to estimate beliefs: one administered before riding the bicycles, a second administered after riding a conventional bike, and the final survey completed after riding an e-bike. Survey instruments were constructed using constructs from the theory of planned behavior.

Results: The study sample (N=33) included adults aged between 19 and 28 years. Paired *t* test analysis revealed that participants believed a conventional bike was more likely than an e-bike to benefit their physical health (P=.002) and save them money (P=.005), while an e-bike was perceived to be more likely than a conventional bike to save them time (P<.001). Paired *t* test analysis revealed participants significantly agreed more with the statement that they could ride an e-bike most days (P=.006) compared with a conventional bike. After participants traveled approximately 10 miles on each type of bicycle, participants' mean average heart rate while riding the e-bike was 6.21 beats per minute lower than when riding the conventional bike (P=.04), but both were significantly higher than resting heart rate (P<.001).

Conclusions: This pilot study suggests that e-bikes are an active form of transportation capable of providing much of the cardiovascular health benefits obtained during conventional bike use. E-bikes may help reduce some of the obstacles to conventional bike use, such as increased transportation time, decreased convenience, and physical fatigue.

Hoj TH, Bramwell JJ, Lister C, Grant E, Crookston BT, Hall C, West JH. (2018). Increasing Active Transportation Through E-Bike Use: Pilot Study Comparing the Health Benefits, Attitudes, and Beliefs Surrounding E-Bikes and Conventional Bikes. *JMIR Public Health and Surveillance 4(4):e10461*. doi: 10.2196/10461

Source 2: from *The Prevalence of Physical Activity Maintenance in a Sample of University Students: A Longitudinal Study*

The evidence is incontrovertible: regular participation in physical activity has tremendous benefits for Canadians, including their physical and mental health,[1–8] as well as the country's financial welfare.[9] An estimated 2.1 billion health-care dollars were spent in Canada in 1999 as a result of physical inactivity.[9] The financial impact of physical inactivity in Canada is staggering, given that "[a] 10% reduction in the prevalence of physical inactivity has the potential to reduce direct health care expenditures by $150 million a year." [9(p. 1435)] To achieve these financial savings, Canadian citizens must first achieve the physical-activity-related health benefits. This requires adults to engage in moderate-intensity activity for at least 30 minutes on "most, preferably all days of the week,"[10(p. 402)] whether this activity is done all at once or in 10 to 15 bouts. As described by Pate et al,[10] this public health message was borne from a workshop that included 20 experts in the fields of physical activity and health who critiqued and summarized the applicable scientific evidence to create this physical activity guide- line for health (hereafter referred to as the PAGH). This guideline has since been adopted by a number of countries, including Canada, as reflected in Health Canada's Physical Activity Guide to Healthy Active Living.[11]

Participants

Participants were 392 undergraduate university students from 2 university campuses in southwestern Ontario. I chose the 2 universities for inclusion because of my affiliation with both institutions. I randomly chose academic classes from the disciplines of health sciences/studies, kinesiology, foods and nutrition, sociology, political science, anthropology, history, English, economics, psychology, computer science, mathematics, chemistry, actuarial science, statistical science, and engineering for inclusion in the study. The study population was representative of students registered in the academic classes from which they were drawn, with specific regard to academic major, gender, and age.

Results

To code and analyze the results, I added together the values reported in the *strenuous* and *moderate* physical activity categories to represent the number of times per week students engaged in moderate physical activity. I included *strenuous* activities within the *moderate* physical activity delimitation for the purpose of this study because they surpassed the minimum physical activity intensity necessary to gain health benefits.

Respondents met the PAGH on the basis of their self- reported sum of moderate and strenuous physical activity sessions per week and the number of days per week in which they engaged in these sessions. I categorized participants who reported engaging in moderate plus strenuous physical activity for a total of 30 minutes (all at once or in 10- to 15-minute blocks) on at least 5 days a week as *actives* and those who did not meet this standard as *insufficiently active*. At baseline, I categorized 199 respondents (51%) as active, and at the 1-month follow-up, I categorized 82 of the 232 active students who completed the one-month follow- up survey (35%)

and maintained their status as *maintainers*. Maintainers did not differ demographically from the other respondents at 1-month follow-up, by independent *t* test, with 2 exceptions: maintainers were more likely to be enrolled in a health-related academic discipline and be in their fourth year of study than were the insufficiently active subjects ($p < .05$).

Comment

The level of physical activity among university students in this study is disconcerting. Only 35% of students maintained physical activity for 1 month at the level necessary to gain health benefits (ie, in accordance with the PAGH). This prevalence of physical activity is lower than researchers found in most previous studies in which they assessed physical activity prevalence against the PAGH. For example, Leslie et al[27] found that nearly 60% of the university students studied in Australia were sufficiently active. Likewise, Pinto et al[25] found that 58% to 64% of university students (undergraduate and graduate) from a private school in Rhode Island, were active in accordance with the PAGH. Sarkin et al,[26] in their southern California study, had results that were close to the current study; they identified 37% of university students as sufficiently active for health gains. From my results, it is clear that with 65% of students not meeting the PAGH guideline for physical activity maintenance, the majority of this student population is at risk for the health consequences associated with an inactive lifestyle.

Jennifer D. Irwin PhD (2007) The Prevalence of Physical Activity Maintenance in a Sample of University Students: A Longitudinal Study, *Journal of American College Health*, 56(1), pp. 37-42, DOI: 10.3200/JACH.56.1.37-42