

**Project Title:** Initial Plan Ordering Pizza using Internet of Things

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**Module:** 1920-CM3203 - 40 credits

## **Project Description:**

My project is an investigation into developing an educational tool to increase understanding of nutrition in children. I will be extending and improving on a project by a previous student [1] which created an interactive food ordering system called PizzaBox.

This system allowed users to create their own DIY pizza using 3D-printed elements. The plastic "topping" elements included RFID tags which could then be placed on the "pizza base" which contained a microcontroller and RFID shield. The system would register and save what toppings had been added and upon hitting the "order" button the system would then send an order containing information about the pizza toppings chosen.

My adaptation of this project [1] will be with the aim of being a nutritional education tool. A recent study[2] has found that "improvement of diet could potentially prevent one in every five deaths globally." Other studies have found that adult eating habits are related to food habits as children [3], but that "children's eating behaviours are susceptible to many external influences within their families, schools and communities" [4]. So, by targeting children as my user demographic, the tool is likely to make the largest impact.

I hope to talk to a nutritionist about pediatric nutrition and learn which areas are the biggest problems for young people in the UK and which issues might be significantly helped by better education in those areas, especially to children of primary school age.

E-textiles, or electronic textiles, are an interesting tool for education. Many studies have investigated allowing children to create their own pieces of e-textiles to learn about circuitry and the related maths or physics concepts [5][6], but this study will create an e-textiles product that can then be used to educate. Instead of using the 3D-printed elements of the previous study I will be using felt food shapes to represent the base and toppings, hopefully this will make the product fun and tactile to use.

My project should allow users to attach felt toppings to a felt pizza base, probably using conductive hook and loop[7] and then use various feedback mechanisms to let the user know how healthy or unhealthy the pizza they have created is. These feedback mechanisms might

include sounds or voices, blinking lights, light colour changes or textual or graphical representations on an attached screen.

To ensure the tool is something children understand and is intuitive for them to use I will undertake a co-design methodology with them. Co-design has been proven to be beneficial in designing for children and it will allow me to better understand the children's needs as users [8].

A final key element in the design is allowing children to choose between various vegetables as toppings, as "providing children with choice during the process of vegetable eating" has been proven to be important in increasing vegetable consumption[9].

Overall, my aim is to create a tool which engages the target demographic as an entertaining novelty but also manages to educate effectively. Ideally that would lead to a change in behaviour by the children so that when they are given the choice to choose their own meals, they choose a healthier option.

## **Project Aims and Objectives**

- To investigate what areas are currently most misunderstood about pediatric nutrition and which key issues need the most attention brought to them.
  - I will achieve this by interviewing a dietician or nutritionist who works with young people.
- To explore the best methods of explaining these areas of nutrition to young people enabling me to co-design with them
  - I will work with discussion groups of primary-school aged children and after questioning them on their ideas and experience of nutrition, I aim to facilitate the design of a product.
  - By co-designing with those in the intended demographic, I ensure that the user's find the design to be intuitive to use and useful to them.
- To create low, medium and high fidelity prototypes of a final product, building on the work already completed within the previous PizzaBox project [1].
  - I want to incorporate the use of E-textiles instead of the 3D-printed elements previously used.
- To design a final product which allows the user to create a customised pizza and receive nutritional information and recommendations on the pizza they have created, i.e. remove a certain ingredient so the pizza does not exceed recommended daily intakes for salt etc..
- To complete a feedback session with the test users to evaluate how successful the final product is.
- If time permits, I would like to explore personalising nutritional recommendations by age, gender or weight instead of giving standard advice for all children.

- If time permits I might also explore personalising recommendations by including allergy information in the feedback, perhaps advising users to avoid certain ingredients in case of personal allergies.

## Work Plan

Date	Week	Key Goal / Milestones	Other Tasks
27/01	1	<ul style="list-style-type: none"> <li>&gt; Finish Initial Plan</li> <li>&gt; Speak to outreach about organising co-design group.</li> </ul>	<ul style="list-style-type: none"> <li>• Complete research integrity module on learning central.</li> <li>• Complete submission for ethics board approval.</li> <li>• Submit initial materials order list to supervisor.</li> <li>• Research fundamentals of e-textiles.</li> <li>• Get in contact with a dietician who is knowledgeable about child nutrition especially.</li> <li>• Enquire with university outreach department about organising a group of children for the co-design process.</li> <li>• Create a GitHub repository for my code.</li> <li>• Organise weekly meeting with my supervisor.</li> </ul>
03/02	2	<ul style="list-style-type: none"> <li>&gt;<b>Submit Initial Plan</b></li> <li>&gt;<b>Submit ethics approval</b></li> <li>&gt;Contact the dietician</li> </ul>	<ul style="list-style-type: none"> <li>• Submit initial plan before the deadline: 3rd February.</li> <li>• Attend weekly supervisor meeting.</li> <li>• Complete a DBS background check in order to address safeguarding issues with children user group.</li> <li>• Download Nvivo for analysing qualitative data for interviews.</li> <li>• Research nutrition and gather relevant literature for my report.</li> <li>• Prepare questions for dietician</li> <li>• Contact dietician and arrange a later date to conduct the interview</li> <li>• Submit final materials order list to supervisor.</li> </ul>
10/02	3	<ul style="list-style-type: none"> <li>&gt; Begin writing report</li> </ul>	<ul style="list-style-type: none"> <li>• Attend weekly supervisor meeting.</li> <li>• Research E-textiles and gather relevant literature for my report.</li> </ul>

			<ul style="list-style-type: none"> <li>• Write as much as I can of the report including the introduction, background and methodology parts.</li> <li>• Design and prepare prototyping workshop questions and structure.</li> </ul>
17/02	4	>Attend first supervisor review meeting. >Get Ethics Approval >Complete DBS check	<ul style="list-style-type: none"> <li>• Attend a review meeting with my supervisor in order to confirm the project is going to plan at roughly a quarter of the way through the project and that no adjustments need to be made to the work plan. Alternatively, change the plan as is necessary according to supervisors recommendations.</li> <li>• Hopefully my DBS and Ethics board submission will have been approved by this stage so I will be able to conduct the co-design.</li> <li>• Conduct interview with the dietician.</li> <li>• Organise the time, venue and participants for the co-design workshop.</li> <li>• Send out consent forms for the study to participants' parents.</li> <li>• Further prepare the workshop, questions and print any worksheets.</li> </ul>
24/02	5	>Complete first co-design workshop	<ul style="list-style-type: none"> <li>• Attend weekly supervisor meeting.</li> <li>• Collect completed consent forms for the study from parents.</li> <li>• Conduct the first co-design workshop.</li> <li>• Organise video meeting with the dietician in order to show them the designs and ask for feedback on how the designs explain nutritional aspects and if this is accurate.</li> <li>• Draw simple initial designs resulting from both the workshop and the meeting with the dietician.</li> </ul>
02/03	6	>Get design feedback from dietician >Implement first design	<ul style="list-style-type: none"> <li>• Attend weekly supervisor meeting.</li> <li>• Implement the first of two designs.</li> </ul>
09/03	7	<b>Halfway Mark</b> >Attend second review meeting with supervisor. >Implement second design	<ul style="list-style-type: none"> <li>• Attend a second review meeting with supervisor to confirm project is on track and no adjustments need to be made, or to make a new plan if any adjustments are needed.</li> <li>• Implement the second of the two designs.</li> </ul>

16/03	8	>Write up report up to this point  >Organise second co-design workshop.	<ul style="list-style-type: none"> <li>• Attend weekly supervisor meeting.</li> <li>• Write up the section of the report relating to the first co-design study and the designs implemented so far.</li> <li>• Contingency time for any issues experienced with organisation of meetings so far.</li> <li>• Organise the time and venue for the second design workshop.</li> </ul>
23/03	9	>Complete second co-design workshop.	<ul style="list-style-type: none"> <li>• Attend weekly supervisor meeting.</li> <li>• Prepare materials and questions for the second co-design workshop.</li> <li>• Complete the second co-design workshop and gain feedback on the previously implemented designs.</li> <li>• <i>Consider that coursework hand-in for my Emerging Technologies module is this week: 27th March.</i></li> </ul>
30/03	10	>Design final prototype	<ul style="list-style-type: none"> <li>• Attend weekly supervisor meeting.</li> <li>• Design final prototype</li> <li>• Create full textile base</li> <li>• Design circuitry.</li> <li>• Program controller to recognise RFID chips and output desired feedback to users.</li> <li>• Push all code to the dedicated GitHub Repository</li> </ul>
06/04	11	> Implement final design >Organise final feedback workshop	<ul style="list-style-type: none"> <li>• Attend weekly supervisor meeting.</li> <li>• Sew elements together.</li> <li>• Test design functions.</li> <li>• Finish implementing final design.</li> <li>• Organise final feedback workshop with previous group.</li> </ul>
13/04	/	<i>Easter Break</i>	<ul style="list-style-type: none"> <li>• Slack time / Contingency / Rest</li> </ul>
20/04	12	>Conduct final feedback workshop >Write rest of report	<ul style="list-style-type: none"> <li>• Attend weekly supervisor meeting.</li> <li>• Conduct final feedback workshop with group.</li> <li>• Write about final design and feedback findings</li> <li>• Write evaluation section</li> <li>• Write discussion section</li> <li>• Write conclusions</li> <li>• Ensure referencing is done throughout.</li> </ul>

27/04	13	>Finalise report >Finalise accompanying videos	<ul style="list-style-type: none"> <li>• Attend weekly supervisor meeting.</li> <li>• Finalise Deliverables <ul style="list-style-type: none"> <li>◦ Demo video- a video explaining my projects capabilities in an accessible way for an outside audience</li> <li>◦ Screencast - a video explaining my code to future students or any relevant person in a way that will help them understand it more easily.</li> <li>◦ Link to the GitHub repository of all my code</li> <li>◦ Final Report including images of the Final Prototype</li> </ul> </li> </ul>
04/05	14	> <b>Final Report Due</b>	<ul style="list-style-type: none"> <li>• Submit final report before deadline: 7th May.</li> <li>• Prepare for project viva.</li> <li>• Potentially create a poster of my project for application to a conference.</li> </ul>

## References

- [1] Jones, L. & C. Perera, *PizzaBox: Studying Internet Connected Physical Object Manipulation based Food Ordering*@arxiv, 2019/06/08. Available online: <https://arxiv.org/pdf/1906.03524> [Accessed 02/02/2020]
- [2] Afshin, A. et al. Health effects of dietary risks in 195 countries, 1990–2017: a systematic analysis for the Global Burden of Disease Study 2017. *Lancet* **393**, 1958–1972 (2019).
- [3] Branen, L. and Fletcher, J. (1999). Comparison of College Students' Current Eating Habits and Recollections of Their Childhood Food Practices. *Journal of Nutrition Education*, 31(6), pp.304-310.
- [4] Birch, L., J. S. Savage & A. Ventura, 'Influences on the Development of Children's Eating Behaviours: From Infancy to Adolescence', *Can J Diet Pract Res*, 68, 1 (2007), s1-s56.
- [5] Peppler, K. and Glosson, D. (2012). Stitching Circuits: Learning About Circuitry Through E-textile Materials. *Journal of Science Education and Technology*, 22(5), pp.751-763.

- [6] Ball, D. and Tofel-Grehl, C. (2020). Potentially Electric: An E-Textiles Project as a Model for Teaching Electric Potential. *The Physics Teacher*, 58(1), pp.48-51.
- [7] Industries, A. (2020). *Conductive Hook & Loop Tape - 3" long*. [online] Adafruit.com. Available at: <https://www.adafruit.com/product/1324> [Accessed 3 Feb. 2020].
- [8] Campos, P., Graham, N., Jorge, J., Nunes, N., Palanque, P. and Winckler, M. (2011). *Human Computer Interaction - INTERACT 2011*. Berlin, Heidelberg: Springer Berlin Heidelberg, pp.632-635.
- [9] Zeinstra, G. (2010). *Encouraging vegetable intake in children*. Wageningen: Wageningen University, p.175.

## Coursework Submission Cover Sheet

***Please use Adobe Reader to complete this form. Other applications may cause incompatibility issues.***

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Student Number	<input type="text" value="C1642646"/>
Module Code	<input type="text" value="CM3203"/>
Submission date	<input type="text" value="03/02/2020"/>
Hours spent on this exercise	<input type="text" value="8"/>
Special Provision	<input type="checkbox"/>

(Please place an x in the box above if you have provided appropriate evidence of need to the Disability & Dyslexia Service and have requested this adjustment).

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### Group Submission

For group submissions, *each member of the group must submit a copy of the coversheet*. Please include the student number of the group member tasked with submitting the assignment.

Student number of submitting group member	<input type="text"/>
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***By submitting this cover sheet you are confirming that the submission has been checked, and that the submitted files are final and complete.***

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### Declaration

***By submitting this cover sheet you are accepting the terms of the following declaration.***

I hereby declare that the attached submission (or my contribution to it in the case of group submissions) is all my own work, that it has not previously been submitted for assessment and that I have not knowingly allowed it to be copied by another student. I understand that deceiving or attempting to deceive examiners by passing off the work of another writer, as one's own is plagiarism. I also understand that plagiarising another's work or knowingly allowing another student to plagiarise from my work is against the University regulations and that doing so will result in loss of marks and possible disciplinary proceedings.