Board of Education Curriculum Committee Meeting

Thursday, March 27, 2025 6:00 PM
Board of Education Conference Room E, Live Stream:
http://devos2.bethel.k12.ct.us/show?video=763ff4de0370 Materials can be
viewed at: https://meetings.boardbook.org/Public/Organization/2425 The
opportunity for members of the public wishing to make comments can attend and
comment in-person or may send public comments to the Board via email or
letter and it will be included as part of the record of the meeting., 1
School Street, PO Box 253, Bethel, CT 06801

1.	**Science**	
1.A.	Physics 43 and Science Research Curriculum	**Speaker(s):** Dr. Brooks
2.	**CTE**	
2.A.	Python 1 and Python 2 Curriculums	**Speaker(s):** Dr. Brooks
2.B.	Business, Marketing, Accounting 1, Technological Design, and CAD	**Speaker(s):** Dr. Brooks
3.	**Public Comment** **(Please note: The Board welcomes Public Comment and asks that speakers please limit their comments to 2 minutes. Speakers may offer objective comments of school operations and programs that concern them. The Board will not permit any expression of personal complaints or defamatory comments about Board of Education personnel and students, nor against any person connected with the Bethel Public School System.)**	
4.	**Adjourn**	

March 27, 2025
Board of Education

BHS Science Chair
Ray Turek

Agenda

- Review of Curricula:
 - Science Research
  - Physics 43

Physics 43

Duration: 2 semesters (1.0 credits)
Level: Level 3
Grades: 11 & 12

This physics course is designed for students that have not yet acquired the mathematics skills required for a traditional college prep physics course. Emphasis is on conceptual understanding of physics topics along with an attempt to grow student aptitude in algebra.

[Physics 43 Curriculum Folder](#)
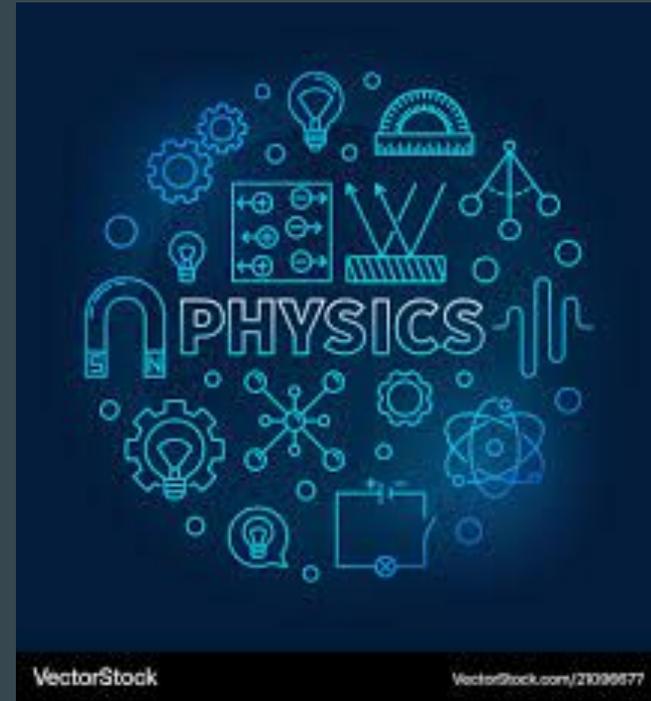
Units of Study:

Semester 1
- Scientific Inquiry
- Linear Motion
- Newton's Laws and Forces
- Circular Motion and Gravity

Semester 2
- Momentum
- Energy
- Harmonic Motion and Waves
- Electricity and Magnetism

A Deeper Look Into Unit 5: Momentum and Impulse

ESSENTIAL QUESTIONS
1. How can physics principles help you or other objects survive a collision?

Unit 5 Link

Egg Drop Project

Assessment

Science Research

Duration: 2 semester (1.0 credits)
Level: Honors
Grades: 10, 11 & 12

This science class provides students an opportunity to engage in research on any topic of their choice. The course is the embodiment of the NGSS science and engineering practices and authentic learning. .

[Science Research Curriculum Folder](#)

Units of Study:

- Ideation Phase
- Development of a Research Plan
- Experimentation/ Design Build
- Analysis and Conclusions
- Communicating Information
- Refinement

Using Computational Simulations of Antibodies to Target the *Streptococcus anginosus'* Surface Protein TMPC to Mitigate Gastric Cancer

Introduction

Gastric cancer, which is often associated with poor diet and lifestyle, is a leading cause of death worldwide. Recent studies have indicated that the bacteria Streptococcus anginosus has a prominent role, via its TMPC protein receptor, and promotes cancer metastasis by binding to gastric cells. Antibodies, through immunoglobulins (Ig) counteract binding between receptors and proteins as they are able to detect foreign objects in the bloodstream. To this end, certain antibodies can potentially bind with Streptococcus anginosus and prevent the interaction from occurring, which would prevent it from spreading and affecting other epithelial cells in the stomach lining. Indeed, identifying the correct antibodies could contribute to preventing the metastasis of Gastric Cancer among patients. This can be measured by finding the binding affinities to asses how strong the bonds are between antibodies and Streptococcus anginosus to test which one will have the strongest binding energy, the more negative the binding energy value the more likelihood of that antibody being more potent to bind with TMPC.
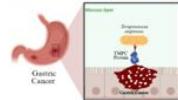

Figure 1: Schematic of TMPC mediated gastric cancer detection using antibody. Obtained from Biorender.

Research Question: How do individual antibodies interact with the TMPC bacterial protein, and which of the antibodies demonstrate the strongest binding energy to prevent TMPC (bacterial) interactions with human gastric cells?

Hypothesis

It is hypothesized that the Antibody 1A5F of the isotope group 1gG will be able to effectively bind to the TMPC Streptococcus anginosus surface protein binding sites through having the highest binding energy. This is due to the fact that research has shown its effectiveness against the proliferation of gastric cancer, which could potentially work in this case. This, in theory, will be able to impair the interaction between the TMPC bacterial protein and 1A5F will likely demonstrate the strongest bonding energy and prevent the interaction between the TMPC bacterial proteins and human gastric cancer cells.

Procedure

Full Procedure in Research Paper

1. Obtain TMPC amino acid sequence from Uniprot Webserver and 20 antibodies at random and made sure of compatibility with web servers from Protein Data Bank (PDB)
2. Divide antibodies into four groups, IgA, IgE, IgG, IgM
3. Perform molecular docking simulations in HDOCK2.0 online web server between the proteins and TMPC to record the bonding affinities between them
4. Use Prodigy web server to determine which amino acids and amino acid groups have high binding energy to TMPC, measured in binding energy (kcal/mol)
5. Determine, with statistical analysis including comparisons of medians the analysis of the data and ANOVA for statistical significance.

Abstract

Gastric cancer is the fourth leading cause of cancer-related mortality worldwide. Recent studies exposing gastric cancer to mice identify Streptococcus anginosus (Sa) as the pathogen that binds with surface protein TMPC. Studies show that the binding between TMPC and Sa proliferates the metastasis of gastric cancer. Historically, studies done in mice can be extrapolated to humans. As a result, this project aimed to identify the most potent antibodies targeting the Sa protein and TMPC-Gastric epithelium interaction as hindering the binding will prevent them from linking and prevent cancer metastasis. It was hypothesized that the Antibody 1A5F of the immunoglobulins group 1gG will be able to effectively bind to the TMPC Sa. Online docking servers were used to obtain the 3D structure of TMPC protein, while the antibodies were downloaded from the protein data bank. Additionally, TMPC was docked online and binding sites were predicted using machine learning softwares, with the twenty antibodies from four immunoglobulins types IgA, IgE, IgG and IgM to test for the lowest Binding Energy (k/mol) and most potent antibody to bind with TMPC. However, results from ANOVA demonstrated that while there was no statistically significant difference between the immunoglobulins, 4A6Y of IgM had the strongest binding energy of -21.3 kcal/mol, and not IA5F, thus serving as the most promising candidate to impede the binding between TMPC and epithelial cells. Indeed, antibody 4A6Y can be used as a promising candidate that could theoretically mitigate the proliferation of gastric cancer and be potentially tested for efficacy in laboratory trials.

Data Results

Figure 2: Predicted binding site on the TMPC protein surface computed through using Scannet and Webserver

Figure 3: Molecular docked structure of TMPC protein and antibody complex obtained from docking in HDock Web Server.

Green= TMPC
Antibody: Purple and Orange

Figure 4: The results of the ANOVA show the lack of statistical significance between groups since Tukey test was not run (p>0.05)
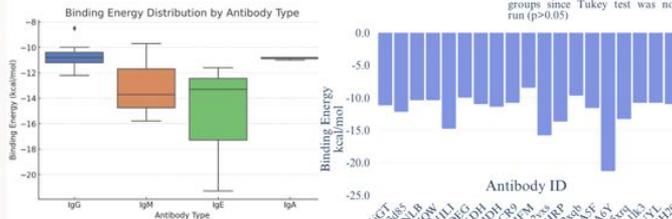

Figure 5: Statistical Analysis of Antibody Types vs Binding Energy shown through box plot. It is demonstrated that antibody group IgE has a larger and has more variance quartile range in comparison to IgG, IgM and IgA.

Figure 6: Binding energy between the TMPC and individual antibody calculated using PRODIGY Server. Antibody 4A6Y demonstrated the highest binding energy (the more negative the stronger).

Conclusion

After experimenting, it was found that while no statistically significant difference was present between the four immunoglobulin types (Ig) as shown by the ANOVA results since all the p-values are greater than 0.05. When comparing the medians between the groups, group IgE has the strongest binding energy, but group IgM has a larger median. However, the mean for IgE is larger at -15.40 than IgG, at -10.66 kcal/mol, IgA at -10.87 kcal/mol , and IgM at -13.07 kcal/mol. Antibody 1A5F is not the most potent antibody, but 4A6Y is, and this is because since outliers impact means, antibody 4A6Y increases it for group IgE. However, the binding energy difference is less varied between groups. Based on the simulated results, this demonstrates that the Antibody 4A6Y of group IgE will have the strongest binding energy with TMPC. Reconciling the difference between the lack of statistical significance between the antibody groups but the -21.4 kcal/mol value of 4A6Y can be seen through the fact that not all antibodies in group IgE will produce such negative binding energy results, but that 4A6Y is an exception. The most important takeaway is that looking at the group of the antibody is not a good predictor of the bonding and that each antibody must be looked at individually in a case-by-case basis.

Figure 7: Schematic of TMPC mediated gastric cancer with Antibody interception- Obtained from Biorender.

Limitations

Since a computational project was conducted, there is no experimental redundancy or validation of results for the future. The TMPC and Sa were in isolation from each other and could potentially produce different results entirely. Another limitation is the lack of software to simulate an environment, such as water in the cell and other cell components, which could interfere with the binding and the effect that will have on the outcome of the results, as well as the fact that only 20 antibodies were tested out of many billions.

Application & Future Research

A way to potentially overcome the limitations would be to test the computer model in situ, which would create a true simulation of the cell environment and its many factors. An application would be to then take the antibody 4A6Y , inject it into mice through monoclonal antibodies, and test whether it would prevent the proliferation of gastric cancer. Indeed, 4A6Y is a promising candidate to prevent the metastasis of gastric cancer. Future studies could look at the myriad of other antibodies as well as use the conjugated fluorescent dye methods for 4A6Y and use it to potentially aid in gastric cancer detection and further prevent its proliferation.

Figure 8: Antibody conjugated fluorescent die method dye used in the gastric cancer detection

References

Full Reference in Research Paper

- Fu, K., Cheung, et al. (2024). Streptococcus anginosus promotes gastric inflammation, atrophy, and tumorigenesis in mice. Cell, 187(4), 882-896.
- Abramson, J., et al. (2024). Accurate structure prediction of biomolecular interactions with AlphaFold. Nature, 1-3.

Microplastic Influence on Microbial Strength Against Disinfection

Introduction:

According to current research, microplastics (MPs) are an ever-increasing issue on Earth. Over time, plastic doesn't undergo chemical decomposition like naturally occurring substances, but instead, slowly breaks apart into smaller particles that easily accumulate and spread everywhere, including water, air, and food systems, causing them to be found even inside human bodies. Studies have shown that MPs can act as a shield for microbes within the human body, which allows them to bypass the immune system, however, their resistance against disinfection outside the human body has not been tested. Their ability to resist disinfection can have a significant impact on the effectiveness of sanitation in places like homes, hospitals, and many environmental sanitation
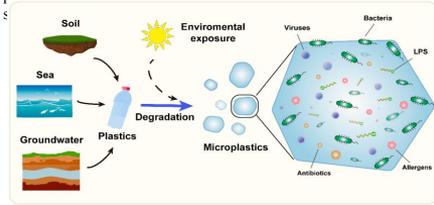
Purpose:

The objective of this investigation is to determine if the addition of microplastics to a bacterial environment increases their resistance to disinfection, with bleach or hydrogen peroxide. If a sample of bacterial solution is disinfected with bleach or hydrogen peroxide, will the bacterial resistance increase with the presence of microplastics?

Procedure:

For full, detailed procedure, see research paper

1. Fill three test tubes with 13 mL of nutrient broth.
2. Label the test tubes (samples) A, B, and Control.
3. Add 2 drops of E. coli to each test tube using a pipette.
4. Incubate the test tubes at 37°C for 24 hours.
5. Add 0.01 grams of 10-90um polyethylene microspheres (microplastics) to test tubes A, B, and Control.
6. Place the test tubes in the centrifuge, then incubate for 24 hours again.
7. Add 0.5% bleach solution to sample A.
8. Add 0.5% hydrogen peroxide solution to sample B.
9. Measure the samples A, B, and Control with spectrophotometer.
10. Convert OD600 value to CFU/mL.
11. Repeat steps 1-10, with 0.00g MPs, 0.03g MPs, and 0.05g MPs.
12. Compare the concentrations of bacteria for the different amounts of microplastics and for each disinfectant, and analyze whether the presence of microplastics resulted in higher bacterial survival after disinfection.

Abstract

The purpose of this experiment is to investigate whether the presence of microplastics (MPs) increases the resistance of Escherichia Coli (E.coli) to disinfection with bleach and hydrogen peroxide. MPs are an environmental contaminant, and their potential to act as a protective barrier for microorganisms against disinfectants is an untested, but critical issue. In this project, E.coli was grown in nutrient broth in an incubator at 37°C for 24 hours, before being combined with varying concentrations of polyethylene microspheres (0.00g, 0.01g, 0.03g, 0.05g) and being incubated again for 24 hours. The cultures were then exposed to either bleach or hydrogen peroxide for 2 minutes. Bacterial survival was measured using a spectrophotometer at 600 nm, the wavelength for detecting bacteria. The results from 3 trials indicated a trend towards increased bacterial survival with higher concentrations of MPs. For instance, in the samples containing 0.05g MPs, bacterial survival increased by 368% for bleach and 248% for hydrogen peroxide, compared to the samples with no added MPs. This suggests that MPs provide a protective shield for E.coli, increasing their resistance to common disinfectants. These findings imply dangers for public health, highlighting the potential for MPs to affect the efficiency of disinfection in places like homes, hospitals, and many environmental sanitation systems such as wastewater treatment facilities.

Data Analysis

Graph 1

Avg E.coli Concentration vs. Microplastics Quantity in Sample

- Hydrogen Peroxide
- -6.4E+09*x + 2.76E+08 R² = 0.927
- Bleach
- -7.69E+09*x + 1.26E+08 R² = 0.992
- No disinfectant
- -5.3E+08*x + 5.09E+08 R² = 0.161

Graph 2

E.coli Survival (With Respect to 0g MPs Sample) vs. Microplastics in Sample

- Hydrogen Peroxide
- -27.6*x + 0.188 R² = 0.927
- Bleach
- -54.4*x + -0.111 R² = 0.992
- No Disinfectant
- -0.993*x + -0.0448 R² = 0.161

Graph 3

E.coli Concentration vs Microplastics Quantity for Various Disinfectants

Conclusion:

A one-way ANOVA that compared trials with different amount of MPs for a given disinfectant indicated that there was a statistically significant difference in E. coli concentration from 0.00g MPs to 0.05g MPs (Bleach: $p < 0.0001$; Hydrogen peroxide: $p < 0.0006$). When no disinfectant was used, there was no statistically significant difference in E. coli concentration across the different MP concentrations. This trend is visualized in Graphs 1 and 2, which illustrate the reduced efficiency of both bleach and hydrogen peroxide as MP levels rise. In Graphs 1 and 2, we can also see that the R^2 values for the trend lines of Hydrogen Peroxide and Bleach are 0.927 and 0.992, respectively, indicating that there is a strong correlation between the two variables. The presented data analysis suggests that microplastics can interfere with the ability of common disinfectants to kill bacteria.

Limitations:

This study focuses solely on E. coli. This limits the generalizability of the results to other bacterial species, which may have different responses to microplastics and disinfectants. Additionally, the study only used two types of disinfectants and did not test them at different concentrations. A specific microplastic type with a specified size range and shape was used for this experiment. This could also limit the way the bacteria can interact with the microplastics, which affects results. The limited volume of bacteria used further constraints the broader applicability of the findings.

Future Work:

In the future, this project should include a wider range of bacterial species to assess the generalizability of the results. It should also investigate the effects of various different microplastic types, sizes and shapes. Additionally, a microscopy study should be conducted in order to visualize the interaction between microplastics and bacteria. The study should test the effects of different concentrations of disinfectants and expand the types of disinfectants tested. Understanding how bacteria interacts with MPs can be the next step in this research study.
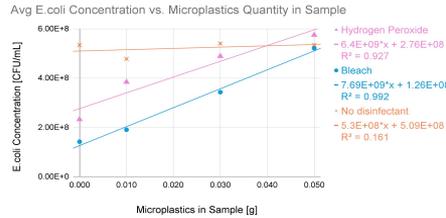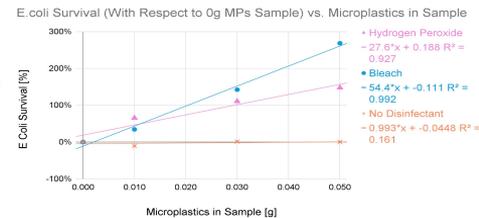
References:

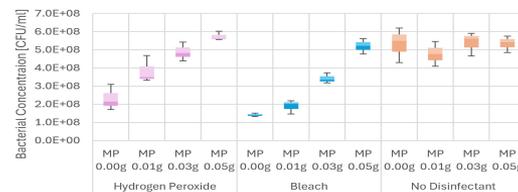Zuckerman, W. (Host). (2024, October 3). Microplastics: How Worried Should You Be? [Audio podcast episode]. In Science Vs. Rose Riemler. https://www.happyscribe.com/public/science-vs/microplastics-how-worried-should-you-be

Ohnishi, T., Goto, K., Kanda, T., Kanazawa, Y., Ozawa, K., Sugiyama, K., Watanabe, M., Konuma, H., & Hara-Kudo, Y. (2013). Microbial contamination associated with consumption and the growth in plastic bottled beverage. Journal of environmental science and health. Part A, Toxic/hazardous substances & environmental engineering, 48(7), 781–790. https://doi.org/10.1080/10934529.2013.744647

Yang W., Li Y., Boraschi D. (2023, 17 Feb), Association between Microorganisms and Microplastics: How Does It Change the Host–Pathogen Interaction and Subsequent Immune Response? Journal of Molecular Sciences https://pmc.ncbi.nlm.nih.gov/articles/PMC9963316/

Caceres, G. (2024, April 17). Measuring Microplastics: To Solve the Problem, We Have to Understand and Measure It. Taking Measure Blog, National Institute of Standards and Technology. https://www.nist.gov/blogs/taking-measure/measuring-microplastics-solve-problem-we-have-understand-and-measure-it

Dang, H., Wang, X., Niu, X., Zeng, J., Zhou, Y., Suona, Z., Yuan, Y., & Chen, X. (2023, Oct). Overview of analytical methods for the determination of microplastics: Current status and trends. TrAC Trends in Analytical Chemistry, vol 167, Article 117261 https://www.sciencedirect.com/science/article/abs/pii/S0165993623003485

Zhai, X., Zhang, X., Yu, M., Microbial colonization and degradation of marine microplastics in the plastisphere: A review. (n.d.). Frontiers in Microbiology, 2023, Feb17, 14:1127308, https://pmc.ncbi.nlm.nih.gov/articles/PMC9981674/

Regis, A. (2024, June 6). Discovering the Plastisphere: USU Examines Antibiotic-Resistant Genes on Microplastics in Wastewater. Utah State University. https://www.usu.edu/today/story/discovering-the-plastisphere-usu-examines-antibiotic-resistant-genes-on-microplastics-in-wastewater

Wojnowska-Baryla, I., Bernat, K., Zaborowska, M. (2022, October 14). Plastic Waste

Come out and see the Science Research Students present their findings at the STEAM Expo on April 23rd on stage in the auditorium.

Bethel Public Schools
Course Proposal

1. **Title of Course**: Python 1

2. **Department(s):** Career Technical Education

3. **Submitted by**: M.Doolan

4. **Length of Course (full year, semester):** Semester

5. **Grade Level(s), if applicable**: 9-12

6. **Prerequisites, if any**: None

7. **Short Course Description, suitable for Program of Studies:**
   Python 1 course is designed to provide students with a foundational understanding of programming using the Python language. This course is ideal for individuals with little to no prior programming experience and aims to introduce the essential concepts and techniques used in Python programming. Students will learn how to write, debug, and run Python programs while becoming familiar with the structure and syntax of the language.

8. **Statement of Need for this Course**: *Give the rationale for the proposal, including its relationship to past, current, and future development in the school system.*

Python is one of the most widely used programming languages. This course will focus on strengthening student's problem-solving skills, creativity, and industry-agnostic computational abilities, as well as providing a solid foundation in the Python programming language.

9. **Course Objectives**: *The purpose of the new or modified course should be stated here. What is it that the course seeks to help students achieve? What are the student outcomes expected at the end of a given time? What additional outcomes are being sought which cannot be defined in behavioral terms? What are relevant long-term course targets such as student participation rates and evaluation criteria?*

Proficiency in the Python programming language

10. **Scope and Substance of the Course:**

1

Unit	Concept
1	Creating drawings, shapes, colors, opacity
2	Functions, onMousePress and onMouseRelease, and shape properties
3	onMouseMove and onMouseDrag, conditionals, helper functions
4	elif statements, onKeyPress and onKeyRelease, shape methods
5	Compound and nested conditionals, onKeyHold
6	Groups, onStep, motion

11. Class Size: *State minimum and maximum class size and pupil/teacher ratio.*

25 students/1 teacher

12. What specific improvements will this proposal make to the school's academic program and the commitment to the implementation of the *Common Core Standards*?

Programming classes offer students the opportunity to develop essential 21st-century skills. Couse also provides students with technical literacy as well as practical numeracy applications.

13. What impact – positive or negative – will this proposal have upon other courses or programs offered within the subject area in your building? *For example, will the addition of this course reduce the number of pupils in other courses in the department?*

Positive impact - Currently there is a lack of programming classes offered at BHS

14. What impact – positive or negative – will this proposal have on other courses/programs offered in the other buildings? *For example, would this proposal cause adjustments to be necessary in feeder programs or follow-up programs? Would this proposal reduce the number of pupils in other departments (in teacher assignments, etc.) be necessary?*

Positive - The course provides an introductory class for the computer science class.

15. Would adoption of this proposal require staff adjustments, e.g., employing new staff, retraining veteran staff? *If yes, show the number of positions involved the first year, compared to the past, and project the figure for each of the three successive years?*
No

Resources & Development Needs:

1. Will a writing team be necessary to prepare a curriculum guide? *If so, submit a proposal for curriculum work along with this course proposal.*

Currently being written

2. **What research has been conducted in the area addressed by this course?** *Summarize that research and indicate the relationships of the research to this proposed course. Indicate any trends or practices in other schools.*

The PLC researched multiple sources that offer basic Python programming courses that teach students the fundamentals of designing, writing, testing, debugging, and maintaining Python code. After researching various methods for teaching Python programming, we found that the Carnegie Mellon University Computer Science Academy's approach provides an engaging and rigorous learning experience suitable for learners of all levels. This graphic-based approach allows students to explore creativity in programming while visually identifying their mistakes, greatly enhancing the debugging process. Additionally, practical algebra-based numeracy skills are applied both directly and indirectly through this graphics-based programming method.

3. **Textbook (if applicable):**

No

4. **Other Resources Recommended:**

Carnegie Mellon University Computer Science Academy's Integrated Development Environment

5. **Names of Staff Who May Teach the Course:**

Ragan, Doolan, and Boman

6. **Training of Staff Required:**

No

7. **Department Approval:** *Please have at least 50% of the department members or grade level teachers indicate their approval with their signature and date.*

Date 12/3/24

Date 10/3/24

Date 12/3/24

Signature of School Administration:

Date

Signature of District Administration:

Date

Please submit this form electronically to Dr. Brooks and also submit a hard copy with signatures via inter-office mail.   Thank you!

3

Bethel Public Schools
Course Proposal

1. **Title of Course**: Python 2

2. **Department(s):** Career Technical Education

3. **Submitted by**: M.Doolan

4. **Length of Course (full year, semester):** Semester

5. **Grade Level(s), if applicable**: 9-12

6. **Prerequisites, if any**: None

7. **Short Course Description, suitable for Program of Studies:**
   Python 2 course is designed to provide students with essential concepts and techniques used in Python programming. Students will learn how to write, debug, and learn the structure and syntax of the Python programming language.

8. **Statement of Need for this Course**: *Give the rationale for the proposal, including its relationship to past, current, and future development in the school system.*
Python is one of the most widely used programming languages. This course will focus on strengthening student's problem-solving skills, creativity, and industry-agnostic computational abilities, as well as providing a solid foundation in the Python programming language.

9. **Course Objectives:** *The purpose of the new or modified course should be stated here. What is it that the course seeks to help students achieve? What are the student outcomes expected at the end of a given time? What additional outcomes are being sought which cannot be defined in behavioral terms? What are relevant long-term course targets such as student participation rates and evaluation criteria?*
Proficiency in the Python programming language

10. **Scope and Substance of the Course:**

Unit	Concept
1	New Shapes, Local Variables, and For Loops
2	Math Functions, Random Values, and Nested Loops

1

3	Types, Strings, and While Loops
4	Lists, group.hitTest(), writing functions that return values
5	2D Lists, Games
6	Final Project *No CTs for this unit* (Images, sounds)

11. <u>Class Size</u>: *State minimum and maximum class size and pupil/teacher ratio.*

25 students/1 teacher

12. What specific improvements will this proposal make to the school's academic program and the commitment to the implementation of the *Common Core Standards*?

Programming classes offer students the opportunity to develop essential 21st-century skills.
Couse also provides students with technical literacy as well as practical numeracy applications.

13. What impact – positive or negative – will this proposal have upon other courses or programs offered within the subject area in <u>your building</u>? *For example, will the addition of this course reduce the number of pupils in other courses in the department?*

Positive impact - Currently there is a lack of programming classes offered at BHS

14. What impact – positive or negative – will this proposal have on other courses/programs offered in the <u>other buildings</u>? *For example, would this proposal cause adjustments to be necessary in feeder programs or follow-up programs? Would this proposal reduce the number of pupils in other departments (in teacher assignments, etc.) be necessary?*

Positive - The course provides an introductory class for the computer science class.

15. Would adoption of this proposal require staff adjustments, e.g., employing new staff, retraining veteran staff? *If yes, show the number of positions involved the first year, compared to the past, and project the figure for each of the three successive years?*
No

Resources & Development Needs:

1. Will a writing team be necessary to prepare a curriculum guide? *If so, submit a proposal for curriculum work along with this course proposal.*

Currently being written

2. What research has been conducted in the area addressed by this course? *Summarize that research and indicate the relationships of the research to this proposed course. Indicate any trends or practices in other schools.*

2

The PLC researched multiple sources that offer basic Python programming courses that teach students the fundamentals of designing, writing, testing, debugging, and maintaining Python code. After researching various methods for teaching Python programming, we found that the Carnegie Mellon University Computer Science Academy's approach provides an engaging and rigorous learning experience suitable for learners of all levels. This graphic-based approach allows students to explore creativity in programming while visually identifying their mistakes, greatly enhancing the debugging process. Additionally, practical algebra-based numeracy skills are applied both directly and indirectly through this graphics-based programming method.

3. **Textbook (if applicable):**

No

4. **Other Resources Recommended:**

Carnegie Mellon University Computer Science Academy's Integrated Development Environment

5. **Names of Staff Who May Teach the Course:**

Ragan, Doolan, and Boman

6. **Training of Staff Required:**

No

7. **Department Approval:** *Please have at least 50% of the department members or grade level teachers indicate their approval with their signature and date.*
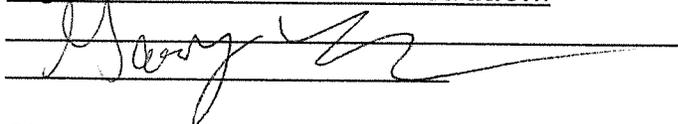
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Date 12/3/24

Signature of School Administration:

Date

Signature of District Administration:

Date

Please submit this form electronically to Dr. Brooks and also submit a hard copy with signatures via inter-office mail. Thank you!

3

Career Technical Education

Career Technical Education - Computer Application & Technology

Computer Application & Technology for Business - Microsoft Suite

Desktop Web Design and Development - HTML and CSS Programming

Python 1 - Programming

Python 2 - Programming

Robotics - C++ Programming

Computer Science - Theoretical, scientific, and mathematical approach to information and its computations.
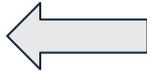
Career Technical Education - Python 1

Python 1 provides students with a foundational understanding of programming using the Python language. This course is ideal for individuals with little to no prior programming experience and aims to introduce the essential concepts and techniques used in Python programming. Students will learn how to write, debug, and run Python programs while becoming familiar with the structure and syntax of the language.

Curriculum

Grades 9-10

Python 1

1. Creating Drawings
2. Functions, Mouse Events, and Properties
3. Mouse Motion Events, Conditionals, and Helper Functions
4. More Conditionals, Key Events, and Methods
5. **Complex Conditionals and More Key Events**
6. Groups, Step Events, and Motion

Python 1

Lesson 5 - Complex Conditionals and More Key Events

Using the interface, students will:
1. Description: Practice exercise:
   a. Complex Conditionals - Notes and Exercises
   b. More Key Events - Notes and Exercises
   c. Unit 5 - Exercises
2. Deliverables: Creative Task
3. Resources: Review/Quizzes

Current events - Computer Science Industry
   a. Resources: News Sources
   b. *Deliverables:* Students will create a presentation using a platform of their choice, followed by reflection and feedback from peers

Career Technical Education - Python 2

Python 2 is designed to provide students with essential concepts and techniques used in Python programming. Students will learn how to write, debug, and learn the structure and syntax of the Python programming language.

Curriculum

Grades 10 - 11

Python 2

1. New Shapes, Local Variables, and For Loops
2. Math Functions, Random Values, and Nested Loops
3. Types, Strings, and While Loops
4. **Lists, group.hitTest(), writing functions that return values**
5. 2D Lists, Games
6. Final Project - (Images, sounds)
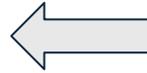
Python 2

Lesson 4 - Lists, group.hitTest(), writing functions that return values

Using the interface, students will:

1. Lists - Notes and Exercises

2. List methods - Notes and Exercises

3. Return values - Notes and Exercises

4. Unit 10 Exercises

5. Creative Tasks

6. Review/Quizzes

Current events - Computer Science Industry

    a.   Resources: News Sources

    b.   *Deliverables:* Students will create a presentation using a platform of their choice, followed by reflection and feedback from peers

Career Technical Education - Introduction to Business

Introduction to Business
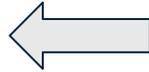
Marketing 1

Accounting 1

Marketing 2

Accounting 2

Introduction to Business

Business Fundamentals is a survey course that introduces students to economics, business law and ownership structures, accounting, marketing, and entrepreneurship. Students examine the role of business in the context of the global economy and local communities. Instructors guide students in group activities, current events discussions, and field experiences to prepare students for successful participation in the workplace.

Curriculum

Grades 9-10

Introduction to Business

Unit 1 → Characteristics and Functions of a Business

Types of Business Ownership ⇐

Unit 2 → Economics and Private Enterprise

Unit 3 → Business and Government

Introduction to Business

Unit 1 - Types of Business Ownership

- Introductory Lesson (video, text and slide deck)
- Discussion Questions and Glossary Matching
- At the Bell: "Public vs. Private: Business Ownership"
- Activity 1-10 Business Ownership Case Study
- Activity 1-10 Business Structure Research Project
- Film Screening: "The Founder"
- Lesson Quiz - individual

Simulation - Restaurant

Career Technical Education - Marketing 1

Introduction to Business
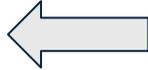
Marketing 1 ⬅

Accounting 1

Marketing 2

Accounting 2

Marketing 1

Fundamentals of Marketing is the introductory course in the marketing program which presents students with a basic knowledge of marketing. Students will explore marketing's role in business, and they will learn about the concepts of promotion, selling, and product and service management.

Curriculum

Grades 9-10

Marketing 1

Unit 1 → What is Marketing?

Unit 2 →   Promotion

Unit 3 → Product and Pricing

   Product Mix

Unit 4 → Branding

Marketing 1

Unit 3 - Product Mix
- Introductory Lesson (video, text, and slide deck)
- Discussion Questions and Glossary Matching
- Activity: Concept Tracker - Product Lines
- Activity: Product Mix Collage
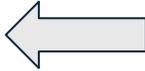- Lesson Quiz - Individual

Simulation - Sports

Career Technical Education - Accounting 1

Introduction to Business

Marketing 1

Accounting 1 ⬅

Marketing 2

Accounting 2

Accounting 1

This course presents students with a basic knowledge of business organization, accounting concepts, and procedures. The course covers the fundamental principles of the accounting cycle, including analyzing business transactions, payroll, and preparing basic financial statements. The course will delve into spreadsheets, systems, and a "real world" simulation for a startup company.
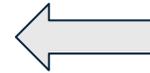
Curriculum

Grades 9-10

Accounting 1

Unit 1 → What is Account

Unit 2 → Accounting Equation

   How Transactions Affect the Accounting Equation ⬅

Unit 3 → Debits, Credits, and T accounts

Unit 4 → Journals

Accounting 1

Unit 2 - How Transactions Affect the Accounting Equation
- Introductory Lesson (video, text and slide deck)
- Discussion Questions and Glossary Matching
- 2-2 Exercises (Group, Try it Yourself, Challenge Problem)
- 2-2 Accounting in Action (Netflix, Disney 10Q)
- Lesson Test Application
- Lesson Test Multiple Choice

Simulation - Retailing

Career Technical Education - Technology Education

Tech Design
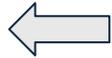
CAD I

CAD 2

Principles of Engineering

Technological Design

The Technological Design course introduces students to Computer-Aided Design (CAD) and its applications in engineering, architecture, and manufacturing. Through hands-on projects, students develop foundational skills in 2D and 3D modeling, precision measurement, and iterative design, using industry-standard software to create technical drawings and prototypes. The curriculum emphasizes creativity, problem-solving, and real-world applications, preparing students for careers in design, technology, and manufacturing.

Curriculum

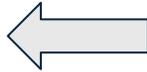Grades 9 - 10

Technological Design

Unit 1 → Introduction to CAD Related Careers

Unit 2 → Measurement and Physical Design

Unit 3 → 2D Design

Unit 4 → CAD 3D Design

Unit 5 → Physical Design

Technological Design

Unit 5 - Physical Design

Practical Assessment: Jigsaw Puzzle

Students will cycle through the engineering design process in order to collaboratively fabricate a set of puzzle pieces.

Engineering Design Process Journal (Template)

Project Description Document

Project Rubric

Career Technical Education - CAD 1

Tech Design

CAD I

CAD 2

Principles of Engineering

CAD I

The CAD course introduces students to computer-aided design in engineering, architecture, and manufacturing, emphasizing hands-on learning and career exploration. Students develop skills in 2D and 3D modeling, mechanical design, and architectural drafting using industry-standard software. The curriculum fosters creativity, problem-solving, and technical proficiency, preparing students for careers in technology-driven fields.
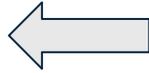
Curriculum

Grades 10-12

CAD I

Unit 1 → Exploration of CAD Related Careers

Unit 2 → Advanced 3D Design

Unit 3 → Mechanical Design

Unit 4 → Architectural Design

CAD I

Unit 3 - Mechanical Design

Practical Assessment: Gear Set

Students will cycle through the engineering design process in order to collaboratively fabricate a gear set.

[Engineering Design Process Journal (Template)](#)

[Project Description Document](#)

[Project Rubric](#)