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Innovating a Computational Thinking App Using Thunkable and MIT App Inventor

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Abstract: Thunkable and MIT App Inventor are tools for making a Computational Thinking Skills App to promote computational thinking developmental skills. With the ICT Enhancement course offered at the school, Students are tasked to innovate a mobile app. They are required to submit a running app created using Thunkable and MIT App Inventor. With this, students may practice their critical and creative skills and innovate with computational thinking skills. Students with basic computational thinking knowledge can produce apps in their chosen field with they are taking STEM, ABM, HUMSS and TVL track in the senior high school level.

Keywords: *Thunkable, MIT app Inventor Computational Thinking App, ICT Enhancement*

Introduction

Computational Thinking is a fundamental skill for everyone, not just for computer scientists. It plays a role in every educational program design-based learning activity that supports students' computational thinking development. Instructors can educate and encourage students to "think computationally" by moving projects beyond "using tools and information toward creating tools and information. Mobile app design can encourage students to think about ideas and solve problems. App design can allow the gradual and interactive exploration of computational thinking patterns. There is no doubt that app design is helpful to engage students in computational thinking. Students will immerse themselves in the design process with the MIT app inventor development environment. Students will make connections between computer science and other fields. This will develop their computational thinking skills. (*Https://Stelar.Edc.Org/Sites/Default/Files/Yadav%20et%20al%20%282014%29.Pdf*, n.d.)

Computational thinking (CT) skills are problem-solving techniques derived from computer science but applicable across many disciplines. These skills help break down complex problems into manageable parts, identify patterns, and create step-by-step solutions. Here are some core components of computational thinking: **Decomposition**: Breaking down a complex problem or system into smaller, more manageable parts. This allows a person to focus on each part individually to understand and solve the larger problem. **Pattern Recognition**: Observing similarities, trends, or repeated patterns in data or processes. Recognizing patterns can make it easier to predict outcomes and find solutions. **Abstraction**: Simplifying a problem by focusing on important details and ignoring irrelevant information. This helps in creating a model that captures the essence of the problem without being bogged down by unnecessary complexities. **Algorithm Design**: Developing a step-by-step solution or a set of rules to solve a problem. Involves creating clear instructions that can be followed to achieve a desired outcome. **Debugging**: Testing and revising solutions to identify errors or inefficiencies. Debugging ensures the solution works correctly and efficiently. **Generalization**: Extending a solution to solve similar problems by identifying how the process can apply to other situations or data sets.

Thunkable is an online platform for creating an app. It is a graphically rich visual programming tool, it is a drag-and-drop feature. It does not require writing code and enables users, regardless of skill set, to create applications for Android or IOS operating system devices. (*Https://Thunkable.Com/*, n.d.)

MIT App Inventor (also known as App Inventor or MIT AI2) is a user-friendly visual programming language that utilizes high-level blocks. Originally developed by Google, it is currently overseen by the Massachusetts Institute of Technology. This tool empowers novice programmers to develop applications for Android and iOS. As of September 25, 2023, the iOS functionality is undergoing beta testing. MIT App Inventor is cost-free and open-source, distributed under dual licensing: a Creative Commons Attribution ShareAlike 3.0 Unported license and an Apache License 2.0 for the source code. It is intended for children and students learning computer programming, like Scratch. *(https://en.wikipedia.org/wiki/MIT_App_Inventor)*

Review of Related Literature

To solve problems, computational thinking (CT) is defined as the application of automation, analysis, and abstraction [3]. In several NSF-funded studies, we look at how these styles of thinking manifest themselves in middle and high school students. We talk about possibilities and obstacles for both in-school and out-of-school settings. Based on these findings, we develop a "use-modify-create" framework that depicts three stages of students' computational thinking activity in their daily lives. We urge sustained funding for the creation of learning environments rich in computational thinking, for teachers who can help students use them, and for studies on the wider benefits of computational thinking. (*Https://Dl.Acm.Org/Doi/10.1145/1929887.1929902*, n.d.)

Computational thinking (CT), an essential 21st-century skill, is improved through game-based learning (GBL). However, students often overlook self-assessment and critical thinking during gameplay, impeding higher-order skill development. The integration of CT core competencies by teachers remains underexplored. To address this, we employed student-generated questions (SGQ) in a GBL platform, enhancing CT skills, motivation, and confidence in 53 primary school students across four experimental CT sessions. Results indicate the SGQ strategy significantly boosted CT skills, learning motivation, and confidence compared to a control group. This highlights the efficacy of combining SGQ and CT competencies to promote advanced cognitive problem-solving through gamified learning, fostering greater motivation and confidence in students. (*Https://Www.Sciencedirect.Com/Science/Article/Abs/Pii/S0360131523000714*, n.d.)

Computational thinking (CT) is becoming increasingly popular, even at the comprehensive school level, as it plays a significant role in many other topics and is becoming more widely acknowledged as a valuable ability for everyone. Therefore, research is required to create a model that can be used to define the dimensions of CT and to create a shared understanding of CT skills. This study provides a general overview of the dimensions of CT defined in scientific papers by a comprehensive literature assessment using the EBSCO Discovery Service and the ACM Digital Library search. It is suggested that CT abilities should be developed in three steps, starting with problem definition, followed by problem resolution and solution analysis. The following ten CT talents are divided into these three stages: issue formulation, abstraction, reformulation, decomposition, data gathering and analysis, algorithmic design, parallelization and iteration, automation, generalization, and evaluation. (*Https://Dl.Acm.Org/Doi/10.1145/1929887.1929902*, n.d.)

The burgeoning topic of computational thinking (CT) in education is examined in this study. There are many different definitions, interventions, assessments, and models, according to a study of the pertinent literature. We have developed the following working definition of CT after synthesizing various approaches used to develop the construct in K–16 settings: the conceptual foundation required to solve problems effectively and efficiently (i.e., algorithmically, with or without the aid of computers), with solutions that are reusable in various contexts. This definition emphasizes that CT is first and foremost a style of thinking and acting, which can be demonstrated by the application of specific abilities, which can then serve as the foundation for performance-based evaluations of CT talents. Our classification of CT into six key categories was based on the literature and included decomposition, abstraction, algorithm design, debugging, iteration, and generalization. This article calls for more in-depth study in this area while providing examples of CT definitions, interventions, assessments, and models from many disciplines.

(*Https://Www.Sciencedirect.Com/Science/Article/Abs/Pii/S1747938X17300350*, n.d.)

These are part of the 21st-century skills. The use of digital technologies is related to the computational thinking set in which the learner is engaged in an active design. Higher Education creative programming skill is seen in this paper. (*Https://Educationaltechnologyjournal.Springeropen.Com/Articles/10.1186/S41239-017-0080-z*, n.d.)

II. Methodology

This study is an Output -based type of Research. Students taking ICT Enhancement are required and assigned to create an app associated with the respective strand whether they are taking STEM, HUMMS, ABM, or TVL. Students are taught to engage and perform activities in developing a mobile application. They are guided to explore properties and events, and design and use blocks of codes to make each palette function. They are introduced to Mobile application tools like MIT App Inventor for Android devices and Thunkable for IOS devices so that they may develop their critical thinking skills, designer skills, and computational thinking skills by applying blocks of code. They may create an apk file and install and run the app on a mobile phone either Android or IOS phone or run it on the Web for live testing. In navigating the running app they may have a screen recording app for them to record upon exploring and navigating the running app they made or give them a chance to present the running app they made in the class as a requirement in the ICT Enhancement course.

Computational Thinking Skills App Examples

The following App was created by students as their Techno App Projects in the ICT Enhancement course. The following App was made and assigned by the students as their task in completing their ICT Enhancement course.

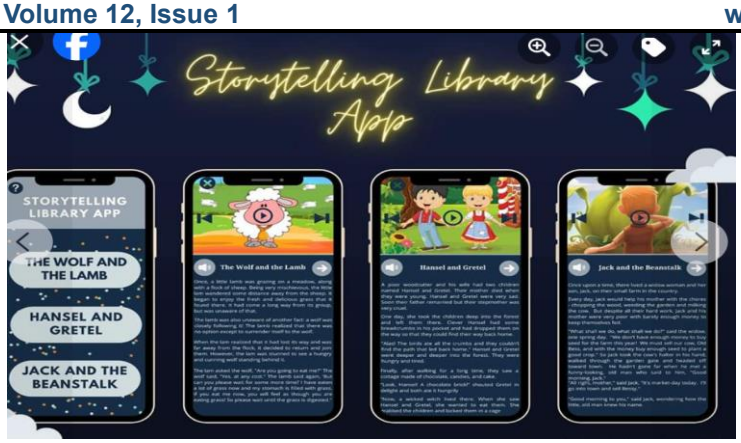


Figure Storytelling Library App – It is an app that tells fairytale stories like The Wolf and the Lamb, Hansel and Gretel, and Jack and the Beanstalk.

Figure Animal Sound App- It is an app that tells about the sound of an animal.

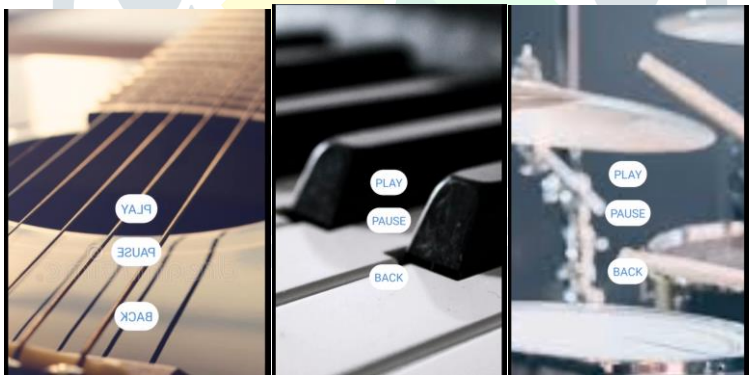


Figure Instrumental App- It is an app that tells about the sound of a particular instrument like piano, guitar, etc

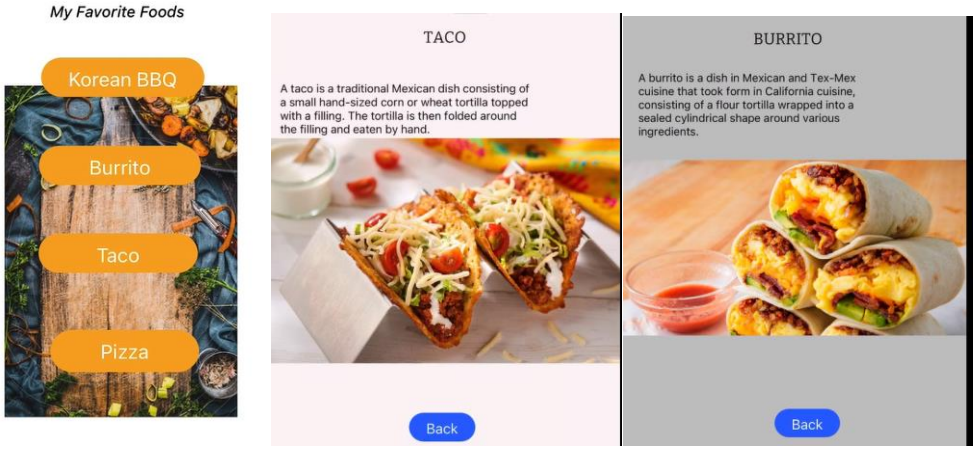


Figure Food Apps- it showcases the different food presentations in an app.

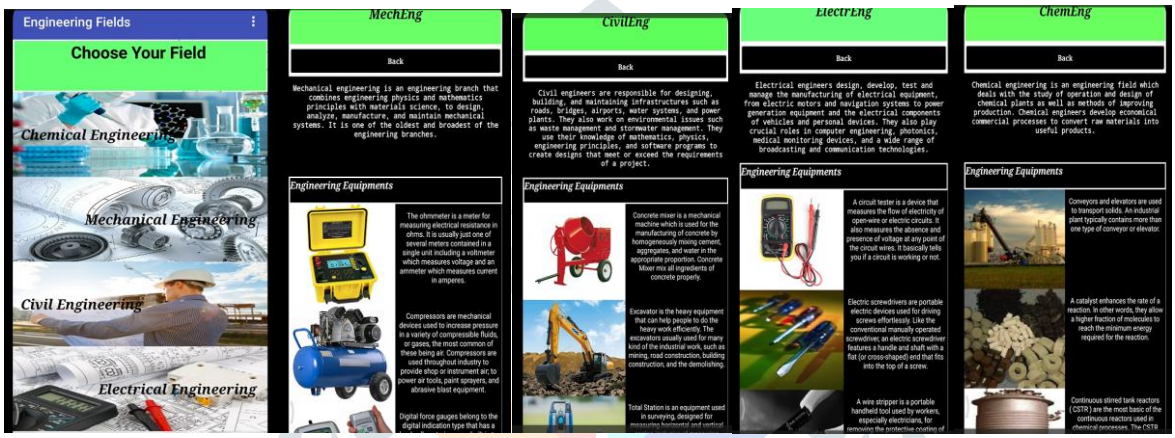


Figure Engineering App- it showcases the different Engineering Professionals

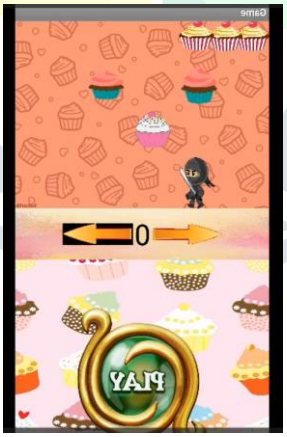


Figure Cupcake Game App showcases the game of cupcakes with sound and score points every time it hits the cupcake.

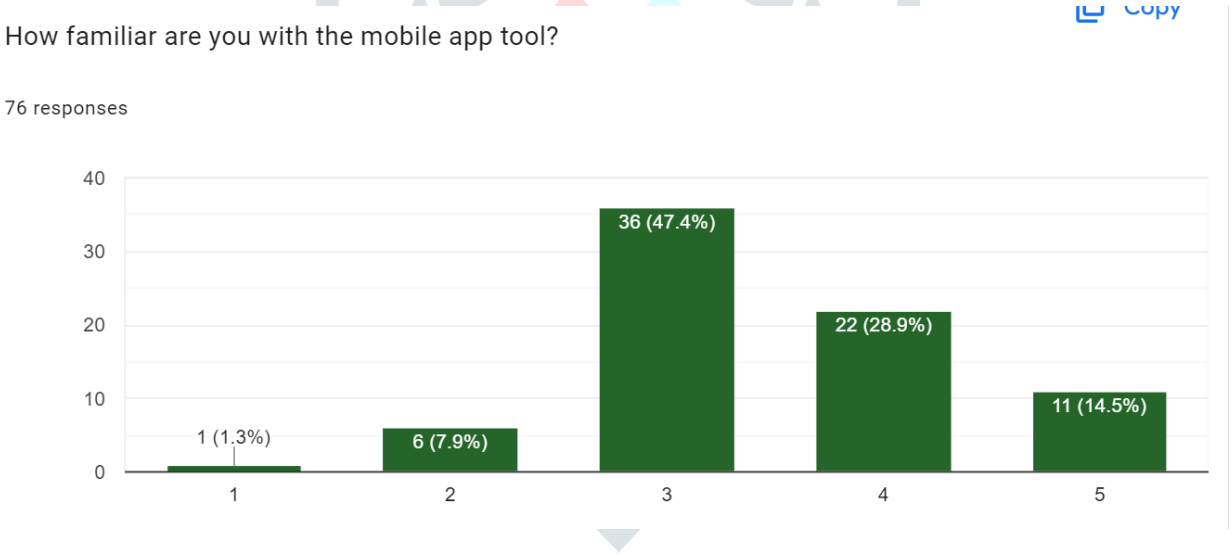
Figure Medical App shows topics related to medical or health.

III. Data Collections

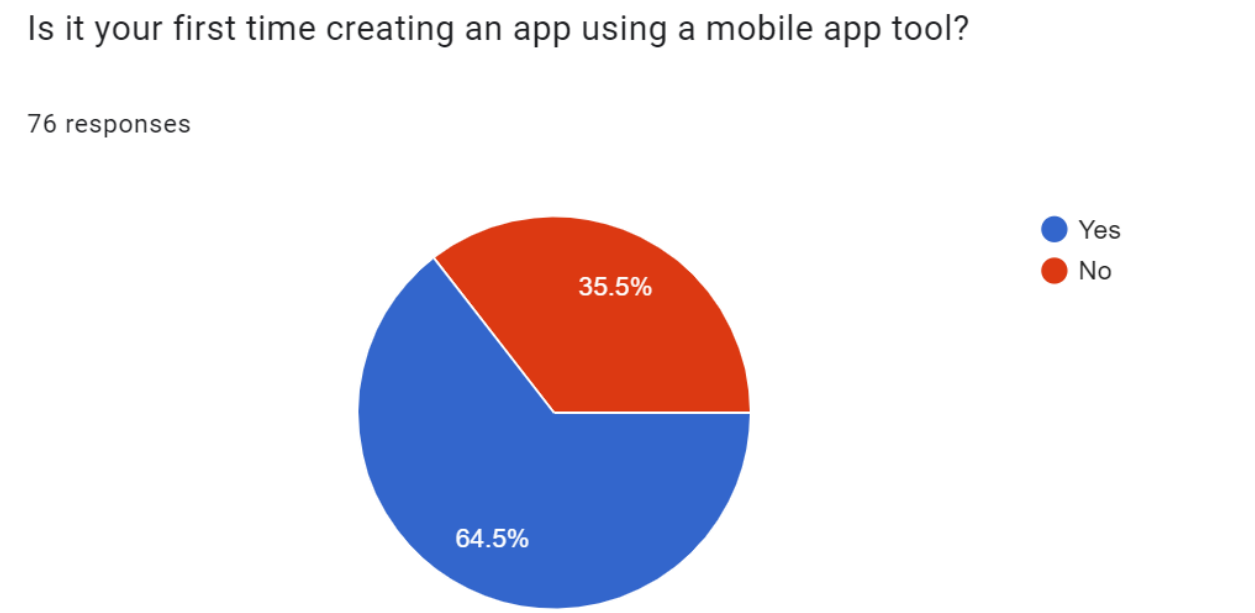
This study aims to involve students in participating in the online survey with a self-made question focusses on the familiarity of the application created the usefulness of the computational thinking skills in learning and the experience in doing the application that enhances their creativity by designing an application that would run on their devices like smartphone whether it is Android or iOS phones.

IV. Results and Discussions

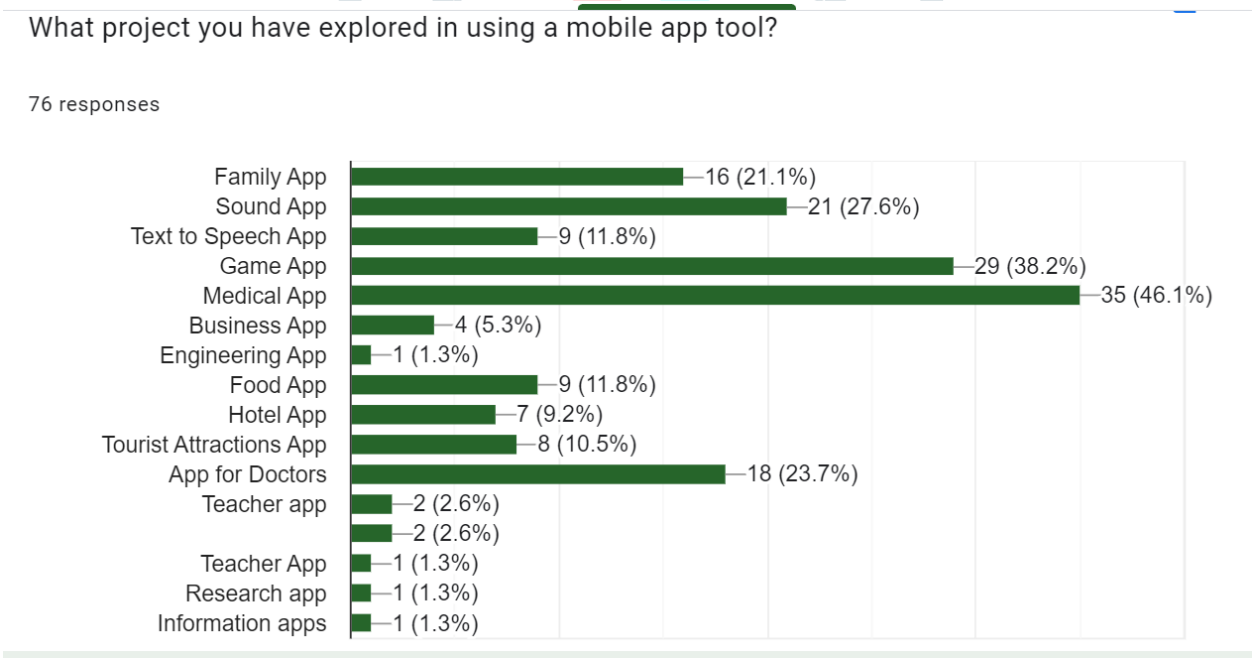
1. How are familiar with the mobile app tool?



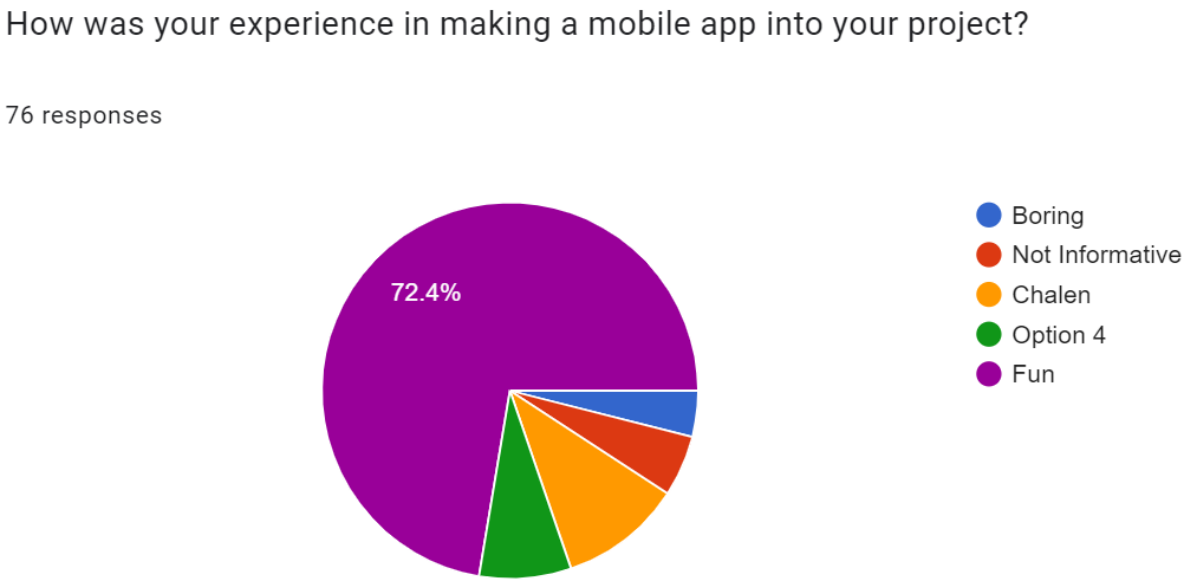
2. Is it your first time creating an app using a mobile app tool?



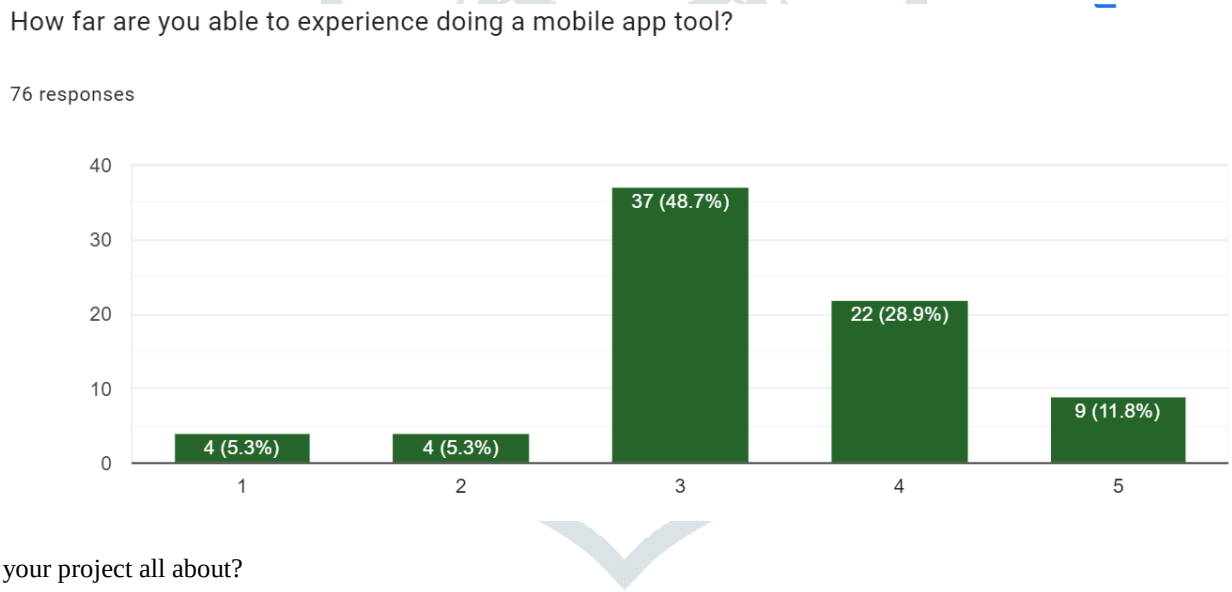
3. What project you have explored in using a mobile app tool?



4. How was your experience in making a mobile app into your project?



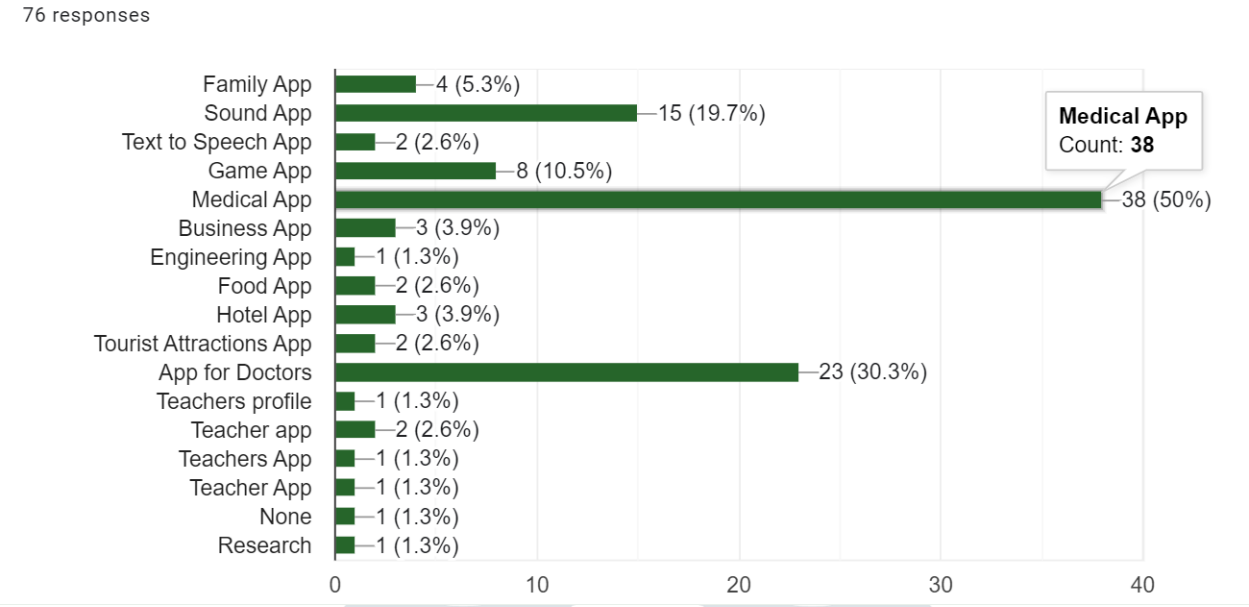
5. How far are you able to experience doing a mobile app tool?



6. What was your project all about?

- Family App[ ]
- Sound App[ ]
- Text to Speech App[ ]
- Game App [ ]
- Medical App[ ]
- Business App[ ]
- Engineering App[ ]
- Food App[ ]
- Hotel App[ ]
- Tourist Attractions App[ ]

- App for Doctors[ ]



V. Conclusions

Learning and exploring new things like creating an app will eventually practice their computational thinking skills which are needed in the future of computing. Computational Thingking Skills is a foundation skills for fields like coding/programming and data science but is also increasingly valuable in everyday problem-solving and decision-making across diverse fields like HUMMS ABM, STEM and TVL.

VI. References

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- (*Https://Dl.Acm.Org/Doi/10.1145/1929887.1929902*, n.d.)

Biography

Joan S. Rajah is a graduate of Bachelor of Science in Computer Science (BSCS) @ Southwestern University last October 1997 with 18 units in Education and a Licensed teacher currently connected at the University of San Jose Recoletos (USJR) Senior High School Department (SHS). She earned master's units by taking Masters in Information Technology (MSIT) at the USJR, Cebu City Philippines. She handles Robotics, ICT Enhancement, Empowerment Technology and Programming. She was previously a computer science instructor at Cebu St. Paul College, Southwestern University, the University of Southern Philippines Foundation (USPF), and Ama Computer Learning Center (ACLC) in Mandaue City. She researched the topics on Student Feedback Survey (SFS) for Faculty Performance Evaluation Bases for Online Computerization of the Decision Support System- Local Research-USPF Research Digest -2008, Virtual Learning Environment- Local Research - USPF Research Digest-2011-2012. She recently published a paper on the Experience of Students in the University of San Jose Recoletos (USJR) Senior High School (SHS) ICT Enhancement Curriculum Innovating an Augmented Reality App in 21st Century Classroom presented in Singapore and is an IFERP member in 2024. And the new research paper on Innovating a Computational Thinking App Using Thunkable and MIT App Inventor, 2025

Research Field

Joan S. Rajah, Student Feedback Survey (SFS) for Faculty Performance Evaluation Bases for Online Computerization of the Decision Support System- Local Research-USPF Research Digest -2008

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