Raspberry Pi Curriculum
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Overview of this Initiative

The United States is increasingly dependent on technology (National Academy of Engineering, 2019) to foster and to main our growth, but as a society as a whole, we do not necessarily understand the fundamentals behind the technology we cherish and use (International Technology and Engineering Educators Association, 2007). Technology continues to make drastic improvements in our daily lives, the way we learn, communicate, interact, work, and to simplify our daily tasks and chores. For the next generation to continue with the enhancement of existing innovations, we need to prep and to equip the next generation of workforce with knowledge and skills, so they continue to raise the bar by creating and thinking of new ideas and ways to improve our living standards.

Our life will continue to be intensely dependent on the new development of technology and how it is going to affect the way we interact with the environment. Over the years, technology creates efficient in the process we consider repetitive tasks and to give us more time to focus on creating new approaches to solving old issues. Technology advancement simplified the way we perform a task, gives a better output rate, but at the same time, it creates an imbalance of adverse effects. Breakthroughs continue to occur daily, but how to use the discovery to develop the best of use remains a challenge and to evaluate the new approach will create unique benefits or will create more problems down the road for us.

Individuals need to understanding of what technology is capable and how they can harness the power to enhance or to better society. It is better to have students develop an understanding of technology in the early part of their education. The introduction of computer science education should occur in middle school to get students familiar with programming skills, but the challenge faced by the school administrator to implement the curriculum includes

securing funding for training to teach the course, trying to find qualified teachers, and locating space to host the session (Mayer, 2019).

For New Jersey students, one of the student learning standards focus on technology; students need to become familiar with the different technology available to help them optimize their learning experience, prepare students for the necessary skills for college and career readiness (State of New Jersey Department of Education, 2017). Technology advancement is changing the way we interact with society, for individuals not to be familiar with the new technological development will be an unjust cause and missing the opportunity for full participation in the growth of the society. Students who enrolled in computer science courses will have a better understanding of the underlying behind the technology innovation, curious of the inner workings, and create an environment to support their passion for finding out why things work that way. Individuals who are technological literacy give them the capability to assess a particular purchase better; to be more informed of their buying decisions (International Technology and Engineering Educators Association, 2007).

Schools who do not have the budget or have qualified staff to implement a computer science course fully, now, have alternative options including Girls Who Code, an organization that provides an online platform for any school that wants to start an afterschool programming club to get girls interested in coding. "Girls Who Code provides free materials including the curriculum, the online education platform, recruitment materials, program support, and training the club facilitator" (Girls Who Code, 2018). The objective of the non-profit organization is to close the gender gap in technology (Girls Who Code, 2018).

However, another option is available to assist and to provide teachers with resources in helping to create the curriculum for all students interested in learning computing and digital making known as the Raspberry Pi Foundation (Raspberry Pi Foundation, 2018). There tons of materials available for teachers who are tech-savvy or not to get started. The instructions written from a non-technical perspective that includes illustration for steps by steps instructions to implement projects.

Implementation Proposal Guideline (Iowa Department of Education, n.d.)

Stage 1: Exploration, Awareness, & Capacity Review

The teacher works an individual or works with other teachers to form a team to explore resources and support available to develop the curriculum. The teacher needs to bring the awareness of the need for this implementation, why it is critical for students' success, and to include the administrator, principal, vice principal, and subject matter expert as part of the working group for moral support and guidance. Does the school have enough resources to support this implementation whether it will be a standalone or an integration into an existing STEM-related course?

• Determine the different capacity options for application and create a preliminary implementation timeline (Iowa Department of Education, n.d.).

• Examine existing materials and what additional materials are needed.

• Determine the metrics used to measure the implementation.

• Evaluate funding options and ways to secure it.

Stage 2: Transition

• Identify existing expertise in the school or district to build a working group to support the implementation.

• Get familiar with the processes of how to integrate into the current lesson plan or to do it as a standalone unit.

• Review the materials and resources necessary for a smooth implementation.

• Create an introductory guide to ensure what learning objectives are covered.

Stage 3: Training

• Attend a professional development training to get familiar with the software and hardware that will use for the curriculum.

• The school administrators should ensure staff has enough training to support implementation.

Stage 4: System to track the progress of the program

Stage 5: Implementing the curriculum

Stage 6: Evaluating the effectiveness of the implementation with the students.

Evaluation Plan

Evaluation objectives include reporting on the quality and extent of curriculum implementation. The evaluation identifies areas of strengths and challenges in the implementation process, both for the educators and the administrators to use as an ultimate guide to support another implementation.

The Raspberry Pi curriculum should meet the criterion highlight by 2014 New Jersey Core Curriculum Content Standards – Technology (State of New Jersey Department of Education, 2017).

Students who are in the Grades from 6 to 8 should be able to perform the following:

• Understand and use the software and hardware of the Raspberry Pi including the ability to set up a unit and be able to connect to other peripheral devices.

• Demonstrate an understanding on how to install an operating system on the Raspberry Pi, choosing one of the following operating systems: Raspbian, Open Source Media Center, Open Embedded Linux Entertainment Center, and Windows IoT Core (Raspberry Pi Foundation, 2018).

• Navigate the application installed on the Raspberry Pi unit including the different programming tools like MATLAB, Python, & Scratch.

• Identify the structure and components of the system folders; students can navigate from one folder to another with the use of command lines.

• Develop a simple coding structure to solve a real-world problem.

• Compile and execute the written code through the selected programming language to provide an output.

• Students should be capable of attaching third-party components for project-based design challenges include kits from Arduino, sensor module, output module, and communication relay module.

Reflection on related class readings

The Raspberry Pi initiative covers many of the concepts discussed in the Implementation and Evaluation of Curriculum course. Some of the key objectives including learning through experience, working and learning together, and sharing the knowledge with others.

Students are able to learn through the Raspberry community and the different organizations that are established to cater to the interest of Raspberry users as highlight by Lave & Wenger (2016) which involves participation through the community and learning from a mentor who is familiar with the concepts. Also, the moving away from rote memorization to learning through experience as described in Dewey's learning philosophy. In addition, the What Works Clearinghouse (2018) provides reviews on polices, guidelines, and research on products and programs that works in education.

References

Girls Who Code. (2018). Girls who code clubs overview. Retrieved from

https://girlswhocode.com/wp-content/uploads/2018/10/GWC_2018_International-

Canadas.pdf

International Technology Education Association. (2007). Standards for technological literacy:

Content for the study of technology Third Edition. Retrieved from

https://www.iteea.org/File.aspx?id=67767&v=b26b7852

Iowa Department of Education. (n.d.) Iowa Science Standards Implementation Plan.

Retrieved from

https://www.educateiowa.gov/sites/files/ed/documents/IowaScienceStandardsImplementa

tionPlan_0.pdf

Lave, J., & Wenger, E. (2016). Situated learning: Legitimate peripheral participation.

Cambridge, United Kingdom: Cambridge University Press.

Mayer, V. (2019). Computer science for middle school (CS4MS): How middle school

administrators and teachers implement computer science (ProQuest No. 13811316).

Retrieved from ProQuest Dissertations & Theses Global database.

National Academy of Engineering. (2019). Making the Case for Technology Literacy. Retrieved

from https://www.nae.edu/10932/Symposium

Raspberry Pi Foundation. (2018). About us Raspberry Pi foundation. Retrieved from

https://www.raspberrypi.org/about/

Raspberry Pi Foundation. (2018). Operating system. Retrieved from

https://www.raspberrypi.org/downloads/

State of New Jersey Department of Education. (2017). New Jersey student learning standards

 technology. Retrieved from https://www.state.nj.us/education/aps/cccs/tech/

What Works Clearinghouse. (2018). Find What Works Retrieved from

 https://ies.ed.gov/ncee/wwc/