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CodeVA Elementary Coaches Academy : Impact of Computer Science Implementation in K-5

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Chapter 1: Introduction

A Growing Need

Globalization and the flow of information has had a huge impact on the world's economies, markets, trade, finance, healthcare and education (Labonte, Mohindra, & Shrecker, 2011). The world has become a much smaller and far more connected place, and communication and access to knowledge has exploded. The ability to exchange information has become instant and the flow of information substantially greater. This increase in the availability of knowledge and information has sped up the natural technological, cultural, and social upheaval that occurs as a consequence of the human condition. These upheavals result in an increased demand for physical infrastructure, nourishment, energy, healthcare services, and education, in order to meet the new challenges of human growth and survival (Khan, 2005).

Today, we are faced with the need of a workforce conversant in the fields of information technology, biotechnology, material science, and nanotechnology in order to respond to the present problems or challenges that need to be conquered for human advancement (Khan, 2005). We are currently failing to meet this challenge as not enough of the students coming out of high school have the computer science skills necessary to fill the jobs that are available (Kessler, 2017). Computer science education impacts society in many ways. First, computer science is the content area that puts students on the path towards many successful careers. Second, computer science is the stepping stone to innovation and the success of individual companies. Third, computer science supports and links to other sciences that have enormous implications in the scientific and humanistic real world. Fourth and lastly, computer science has the potential to guide research and design as well as produce answers to a great deal of societal problems (Zendler & Klaut, 2012). By infusing computer science into the K-12 curriculum, we can lessen the educational disconnect between content and career.

National Landscape

Code.org is a national organization seeking to incorporate computer science into public classrooms across the United States; the mission of Code.org is to expose as many students in K12 as possible to the field of computer science, in the belief that the more students that are exposed to computer science--especially in the under represented groups of females and minorities--will result in more students pursuing careers in the associated computer science fields (Young, 2018). Since 2013, Code.org's programs have expanded throughout K12 and can be found embedded into 43 states' curriculum. Students have their first experience of coding at the elementary school level, and there are different age appropriate programs that follow students through their K-12 career, culminating with the 'Hour of Code'. To get their message out, Code.org conducts summer training academies that instruct teachers of all levels to go back into their schools to create coding programs for their students. In Virginia, the momentum from the push for computer science on the national stage has been grasped by CodeVA in establishing and growing the computer science curriculum in K12 schools in the commonwealth.

The Role of CodeVA

CodeVA, and their Elementary Coaches Academy, provides school professionals with the tools necessary to teach today's students the skills necessary to complete the tasks of tomorrow. In its mission, CodeVA works on two fronts; the first is through advocacy, and in this area CodeVA has had great success. The Virginia lawmakers have made significant revisions to the required academic standards. Virginia, which is far ahead of other states in the progression of computer science implementation, has incorporated computational thinking and coding to the standards in K-12 as well as mandated the offering of stand alone classes such as AP computer science. CodeVA can take a great deal of credit for the petitioning, lobbying, and hard work that has resulted in the implementation of this legislation (Shawchuk, 2017).

On the second front, CodeVA is looking to make computer science education relevant, meaningful and equitable through real world, collaboratively-engaging programs. The premise is that computer science is for all and can be interwoven through all content areas. CodeVA attempts to meet the various needs of computer science implementation through a variety of programs, one being the Elementary Coaches Academy. The primary objective of the Elementary Coaches Academy is to train coaches to train teachers in their local districts how to incorporate computer science into everyday teaching by developing a common, consistent computer science language. Teachers and others from local school districts are trained on a volunteer basis at summer academies and follow-up weekly or monthly training throughout the year is ongoing. The Elementary Coaches Academy seeks to increase the number of qualified computer science teachers across the state in order to address demographic disproportionality and prepare all students for the 21st century workforce (Margolis et.al., 2015). The majority of the Elementary Coaches Academy lessons require no devices, or what is referred to as unplugged learning.

Statement of the Problem

Despite CodeVA working to incorporate computer science principles into the general curriculum, the organization is challenged in how to disseminate knowledge from coaches to school personnel and ensure the infusion of computer science within and across elementary classrooms. CodeVA currently runs an Elementary Coaches Academy to train school employees to go back and train site-based teachers on best practices for the incorporation of computer science principles. As the development of computer science standards moves rapidly-- and because the academy relies upon volunteer coaches to disseminate training at the system,school, and/or classroom level -- CodeVA's Elementary Coaches Academy struggles to determine the impact of the program which seeks to provide innovative training tools for program participants. Impacts on effectiveness include, but are not limited to, developing and maintaining a volunteer workforce that is prepared to lead relevant and evidence based professional development in their localities, building upon existing social media

outreach to improve communication, resources, and collegiality of ECA attendees, and creating a marketing plan to school districts and their central leadership to ensure that the necessary people with the autonomy to influence change are able to attend.

Assumptions and Limitations

The first assumption of the study is that school divisions are inconsistently selecting and sending participants to learn at the ECA who are then tasked to return to their respective school divisions to provide meaningful, innovative, and effective professional development strategies in implementing computer science classroom lessons. The fluidity of computer science curriculum and its adoption by the Virginia Department of Education (VDOE) is a possible limitation as there seems to be a lack of an accountability mechanism through required assessment. The assumption is that the current computer science curriculum standards will be the final standards adopted by the VDOE. Also limiting the study is the reduced access to teachers receiving training from ECA-trained coaches, especially those teachers trained by coaches at previous ECAs. Lastly, the study is limited by the inability to track or assess student performance or content knowledge of these curriculum standards.

Scope and Delimitations

The scope of the study is confined to the past three years of CodeVA's Elementary Coaches Academy. The majority of the secondary data provided by CodeVA came from coaches who attended training during the summer of school year 2019-2020. A delimitation of the study includes the fact that the study primarily focuses on process-based analysis of the program rather than performance-based assessments.

Purpose of the Study

The purpose of this study is to examine the impact of CodeVA's Elementary Coaches Academy on adult learning and professional development opportunities for teachers regarding the implementation of computer science standards across the Commonwealth of Virginia. The information obtained also will determine what variables have an impact on the Elementary Coaches Academy, such as the ability to create relationships with decision makers across the commonwealth's school districts, the development and motivation of a volunteer workforce that will diffuse innovation across the state, and the improved training through research-based adult learning principles of that volunteer workforce.

Research Questions

Research questions were grouped into two major categories. Question One focuses on impacts of the program and Question Two focuses on variables that impact the program.

Question 1: What is the impact of the elementary coaches academy?

a) What are evidence-based coaching and coaching academy models/best practices?
b) What are evidence-based or best practices in effective PD? What do we consider success from PD? What can adult learning principles tell us about how to make an impact?
c) How do training programs assess/evaluate/spread impact? How do new concepts & learning (like CS) spread? How can diffusion of innovation theory help increase effectiveness of coaches (i.e. identifying early adopters, etc)?
d) How do training programs sustain? How do training programs ensure that the output of coaches sustain? How can PD be crafted so it leads to lasting change? How do the attendees conduct the PD back at the school?

CODEVA ECA

Question 2: What impacts the effectiveness of CodeVA's elementary coaches academy?

a) How do you motivate volunteers or unpaid employees designated by their respective school division to participate, lead change, create buy-in among others? What is their motivation to accurately report outcomes & follow up?

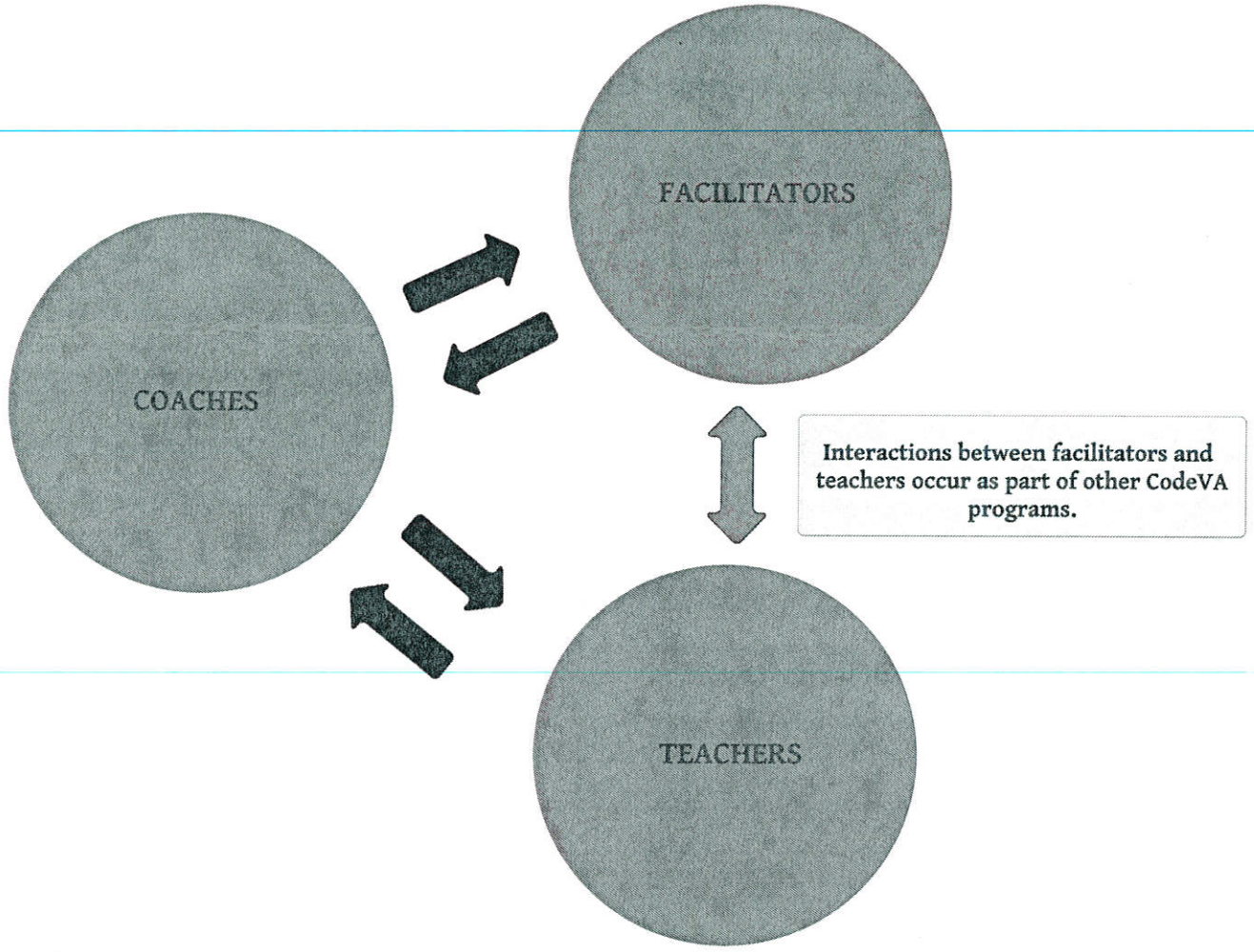
b) How does analyzing/assessing processes help programs improve?

Definition of Terms

- Computer Science (CS) - Is the study of processes that interact with data that can be represented in the form of programs that are used to solve real world human problems.
- CodeVA - non-profit organization that partners with schools, parents, and communities to bring equitable computer science education to all of Virginia's students.
- Elementary Coaches Academy (ECA) - train-the-trainer type program that incorporates professional development for school employees to learn effective computer science best practices in order to return to their local school division for site-based professional development and classroom implementation.
- Facilitators - CodeVA-paid facilitators of the ECA are school division employees from across the Commonwealth who have been selected by CodeVA to train coaches and serve as mentors to coaches in their respective geographic areas.
- Coaches - school employees from local school divisions, self-selected or sent by administration, who attend the ECA, Saturday supplemental sessions, and online discussions with facilitators throughout the academic year.
- Teachers - school-level recipients of professional development and coaching from ECA-trained coaches

Figure 1.1

Depiction of the Communication Among Facilitators, Coaches, and Teachers.



Chapter 2: Literature Review

Impact of the Elementary Coaches Academy

Principles of Adult Learning

Consideration of how adults learn plays a critical role when determining the impact of the Elementary Coaches Academy program. The research of both andragogy and transformational learning have shaped the foundation for best practices and principles for teaching adult learners. The term andragogy was coined by Malcolm Knowles (1970) as "the art and science of helping adults learn." The literature on adult learning suggests that adult learners are unique and teachers of adult learners should "use a style of teaching different from that used with children" (Collins, 2004). The realization that teaching adult learners varies from teaching children is a pedagogical shift and includes both the theory of andragogy and transformational learning.

Transformational learning has been defined by Mezirow (1997) as "the process of using a prior interpretation to construct a new or revised interpretation of the meaning of one's experience in order to guide future action." Transformational learning, according to Mezirow (2000), incorporates adults feeling disoriented with learning, self-examining situations through a lens of fear, acquiring knowledge and skills for implementing one's plans, and reintegration into one's life on the basis of conditions dictated by one's new perspective. Using this definition of transformational learning helps to put adult learning in the perspective of being a learning experience that goes beyond the transactional aspect of learning and helps adults to be aware of new perspectives and experiences. In order to deepen this awareness of new perspectives, adult learners must engage in self-reflection and dialogue that challenges established perceptions and focuses deeper than the acquisition of knowledge. Brookfield (1986) highlights the importance of critical reflection and how "adult education fosters a spirit of critical reflection; through education learners come to appreciate values, beliefs and

behaviors." Hodge (2011) emphasizes the point that transformative learning "looks at the nature of the learner's way of viewing, interrelating, valuing and anticipating experience and the dynamics of the process by which these meaning perspectives can come under challenge, destabilise and transform."

The transformational learning theory places the learner's attention on the experiences that shape and reshape their learning experiences, thus making learning more meaningful and beneficial for adult learners. Knowles has been seen as the authority on adult learning and in his (1980) study he evolved his theory to include six basic assumptions for adult learners. The central theme to his assumptions revolve around the notion that adult learning should be "self-directed" and oriented to the learner. Wichadee (2011) supports this notion of "self-directed" adult learning by stating "self-directed learning allows learners to gain a strong sense of self as they engage in learning activities that are meaningful to their own life experiences." Emphasizing the importance of meaningful life experiences has been researched as a critical aspect to adult learning. In particular, Knowles (1980) states that for adult learners to benefit from the learning experience the experience itself must play on the experience the adult learner brings into the learning experience. Collins (2004) also identifies that as a principle for adult learning, "learning is enhanced when it is immediately applicable to real-life contexts." This focus on real-life contexts and prior life experience makes for a rich learning experience that is meaningful and beneficial to the adult learner. Furthermore, both Knowles (1980) and Collins (2004) highlight that it is important for teachers of adult learners to understand the extensive knowledge adult learners bring into learning experiences and use this when designing the learning environment for adult learners.

In order to deepen awareness of new perspectives and pedagogy, adult learners must engage in self-reflection and dialogue that challenges established perceptions and focuses their learning deeper than the acquisition of knowledge. According to Knowles (1980), "as adults grow and develop, they "accumulate an increasing reservoir of experience that becomes an increasingly rich resource for learning-for themselves and others." Brookfield (1986) identifies the aim of adult education is to have adult learners "see themselves as

proactive, initiating individuals engaged in a continuous re-creation of their personal relationships, work worlds and social circumstances." As adult learners are working in this re-creation mode, they work through the experiences they enter the learning experience with and use that as a bridge for new learning that is impactful to their growth as learners. Mezirow (1997) furthers this point by saying "learning requires that new information be incorporated by the learner into an already well-developed symbolic frame of reference." All these points emphasize the importance of bridging new learning with relevant learning experiences as critical to the success of adult learners.

Coaching Programs Use Adult Learning Principles

Research across many disciplines suggest that coaching strategies are successful ways to promote integration of new ideas in adult learners. Armstrong et al. (2015) demonstrated that work-integrated learning combined with coaching enhanced the success of future pharmacists contextualizing classroom learning within practice. Similarly, a mixed-method analysis of adult coaching of safety practices in the mining industry in South Africa showed that managers changed their attitudes and practices because of coaching; this was most significant for females between ages 51-60 in management (Esterhuizen & Martins, 2016). How quickly adults internalize and apply new learning is especially of interest. Achuthan et al. (2018) found that adult learners are motivated by perceptions of gaining relative advantages over peers, ease of use, peer influence, perceived enjoyment, and perceived usefulness. These factors should be considered in the design of coaching preparation programs.

Coaching is a conversational and relational educational strategy to provide feedback, advice, and support to people as they learn and develop new skills. Cycling coaching observation and feedback aligns with the adult learning theory that adults: a) are problem-focused/goal-oriented, b) take a practical approach to their learning, and c) learn best when being an active participant in the learning (Kurz & Glover, 2017).-A cycle of observation and providing feedback assists the coaching model by promoting fidelity of implementation of the

new teaching knowledge. Reddy, Dudek, and Lekwa (2017) observed this in a study of the *Classroom Strategies Coaching Model (CSC)* with teachers from New Jersey and New York. The CSC model is a collaborative feedback process between coach and teacher involving frequent formative observations using a validated instrument to provide the teacher evaluative information. Feedback is a collaborative process structured over four-sessions with both problem-solving consultation and a review of data collected. Data includes observations, self-reflection by pupil, and goal setting for future instructional practices. The teachers who received immediate coaching through four sessions showed higher levels of self-reported competency than the teachers who did not participate in the coaching models (Reddy, Dudek, and Lekwa, 2017).

In a similar study involving English/Language Arts teachers, participants reported that analysis discussed following classroom observations were the most beneficial aspect of coaching (Wang, 2017). In this *Teacher Centered Coaching Model (TCC)*, teachers reported that open-ended comments and questions provided the greatest opportunities to participate in self-reflection. Additionally, participants reported an increased satisfaction with the process over time; participants became more comfortable with their coach, more comfortable in the process, more receptive to feedback, more willing to engage in self-reflection, and more willing to incorporate strategies in subsequent lessons (Wang, 2017). Brookfield (1986) highlights the importance of critical reflection and how "adult education fosters a spirit of critical reflection; through education learners come to appreciate values, beliefs and behaviors."

Practice implementing new skills, according to Berson et al (2019), is not as critical as follow-up discussions with a coach. Similarly, Israel et al (2018) emphasizes that while resource availability is important, the collegiality between teacher-teacher and teacher-coach were most important to the success of a given coaching model. Efforts to build capacity among teachers through co-planning, co-teaching, resource sharing, and reflection all showed positive impacts according to Israel et al. (2018).

A final element of note to a successful coaching approach include organizing adult learners into learning communities (Smith, 1979). These communities help foster the ongoing nature of professional development as

well as cultivate teamwork; Smith (1979) states school-based coaches can be critical elements in successful implementation of initiatives that require teachers to evaluate teaching practices and the implementation of new strategies. Smith's (1979) is also of interest in highlighting limitations of the coaching model. One example is when school divisions do not have capable coaches available. "Neither district can find as many coaches as they need" (Smith, 1979). In turn, the coaching shortage led to the inability to support teacher teams.

Impacts on the Elementary Coaches Academy

The literature also informs this project's second primary research question: What Impacts the Effectiveness of CodeVA's Elementary Coaches Academy? Identifying the variables that impact an organization increases the understanding of how the organization operates at optimal levels. Through an analysis of the client problem, we determined several areas for research on the elements that impact Elementary Coaches Academy success: motivating volunteers, marketing to volunteers and other stakeholders, and strategic planning. The current Elementary Coaches Academy model relies on paid facilitators to train volunteer coaches who are expected to go back to their local districts in order to train and assist volunteer teachers. In many cases, these external impacts intersect and often produce a multiplier effect. Non-profit volunteerism, for example, influences an organization's marketing strategy and strategic plan.

Engaging Nonprofit Volunteers

The literature on nonprofit volunteerism explores what motivates volunteers to join and remain with an organization. Organizations must tap into their human resources in order to maximize productivity and efficiency; this task is increasingly more complicated for non-profit organizations as they rely on volunteers as their workforce. Non-profit organizations do not have the power of compensation or job security to solicit loyalty from employees. Instead, non-profit organizations rely on engagement and attempt to connect to an employee's passion in order to solicit loyalty and increase or improve production output (Zollo,et al., 2017).

The primary asset that non-profit organizations have in leveraging and maintaining employee buy-in is that most often volunteers have a sense of passion or purpose in doing the work of the organization. Non-profit volunteers often believe they have a value or skill-set that will benefit the organization and fulfill its mission; Zollo, et al., (2017) describe this as the Gift Giving Theory. In their study of 379 volunteers, they found that individuals who felt as though they were using their gifts (time, resources, money, skills) were more likely to continue to volunteer than those who felt as though their gifts were not contributing to the organization. Volunteers also expressed a greater connection to the organization when they received positive feedback and an expression of gratitude. This exchange is described as positive reciprocity; it leads to greater volunteer buy-in, an alignment between volunteer and organizational goals, and an increased likelihood of volunteers remaining connected to the organization.

Nonprofit organizations must be purposeful in showing appreciation for their volunteers; this means they must focus on high quality interactions between the organization and its volunteers. Northouse (2007) describes these complex exchanges as "high-quality," meaning they cultivate a culture of trust and lead to volunteers adopting and carrying forward the goals and values of the organization. Camplin (2009) echoes the importance of the value of positive reciprocity between volunteer and organization. The Leader-Member Exchange Theory (LMX) outlines the importance of these mutually beneficial exchanges that include mutual respect, trust, and sense of obligation between leader and member (Camplin, 2009). This is a difficult task considering volunteers are doing the work of organizations without financial compensation. While in-depth, complex exchanges are necessary; the process of creating meaningful exchanges can be burdensome.

Knox and Gruar (2007) introduce stakeholder theory, which emphasizes the need to place greater importance on collaboration between nonprofit volunteers and the organization (Knox & Gruar, 2007). The authors argue that there is unrealized potential in the connection between volunteer and organization, especially in the mutually beneficial exchanges across the groups. This amplified focus on stakeholder interaction occurs in non-profit organizations as volunteers "often have complex inter-organizational relationships with

non-profits and many are intimately involved in the achievement of organizational goals and marketing strategy development" (Knox & Gruar, 2007, p. 116). The volunteers' worldview impacts how they view their work within the organization and how they align their values with the values and goals of the organization.

Finkelstein (2011) determined predictors for volunteerism among 154 undergraduate participants at a metropolitan university in the southeastern portion of the United States; she hypothesized that a volunteer's sense of individualism or collectivism would have a significant impact on the level and type of volunteerism. The study found that volunteers with a sense of collectivism perceived themselves as having a greater sense of personal and social responsibility to the organization than volunteers with a sense of individualism. The data also suggested that while collectivists had a greater sense of attachment to groups, individualists emphasize volunteering within groups that foster positive outcomes at the individual level for all.

The Role of Marketing

Understanding the need for meaningful conversations and the motivations of an individual do more than promote volunteer investment in the organization. It also helps organizations create and implement marketing strategies that attract additional volunteers, who can become one of their greatest marketing tools (Knox & Gruar, 2007). In the 1990's marketing was defined by the 4P framework of product, price, place and promotion; this was then expanded to incorporate processes, people and physical evidence to create the "7Ps" of traditional marketing (Rafiq & Ahmed, 1995). Marketing has taken on an even more important position in any company with the evolution of social media. Social media has opened up new and often cheaper forms of marketing and now plays a major role in grassroots marketing. Grassroots marketing is not as expensive as traditional marketing and therefore is a more attractive proposition for small businesses and non-profit organizations (Nicolau, 2011). Small businesses and non-profit organizations could advance their market stature without spending exorbitant amounts of money (Nicolau, 2011).

Bluemenstyk (2008) recognized buy-in and careful research as the two key areas for effective marketing. She suggested that fancy logos and shiny, eye-catching text were not enough to produce effective marketing; there needed to be substance to the marketing campaign that produced stakeholder involvement . Marketing of a non-profit organization to various stakeholders is largely dependent on the stakeholder's worldview of the non-profit organization (Knox & Gruar, 2007). The authors suggest that stakeholders place importance on the aspects of the organization that they most closely identify with or find to have the greatest value.

From the literature, the purpose of successful marketing includes to 1) increase buy-in 2) plan intentionally 3) provide a clear design and layout 4) incorporate collegiality 5) offer ongoing support 6) offer incentives 7) reflect and readjust. Marketing is one leg of a non-profit organization and there are many low budget ways to incorporate or expand this area to increase visibility and or useage. However, this does not occur by accident; there needs to be a robust intentional strategic plan (Wright, 2013; Ballew, Castro, Claus, Kittur, Brennan & Brownson, 2013; Miller and Merrilees, 2013).

Strategic Planning

While a marketing plan is temporary and needs to adjust to the changing needs of the marketplace, strategic planning is a long-range process that forecasts where an organization is headed by establishing long-range goals through organizational values and mission. "Strategic planning involves a set of planning activities such as setting objectives and goals, developing targets and performance indicators, and allocating resources" (Spee & Jarzabkowski, 2011, p. 1218).

Strategic planning involves more than individuals from an organization getting together and discussing ideas; the process requires complex interactions among stakeholders in which they agree on how the organization can best move forward. Spee and Jarzabkowski (2011) move away from communication as a simple method for the exchange of messages to the viewing of communication as a complex system that

organizes the social life of the company as depicted in Figure 2.1 Text and talk were used to identify the cyclical stages of the strategic planning process; the strategy texts shaped the strategy talk and then the strategy talk shaped the strategy text.

Figure 2.1

The Talk and Text Cycle of Strategic Planning

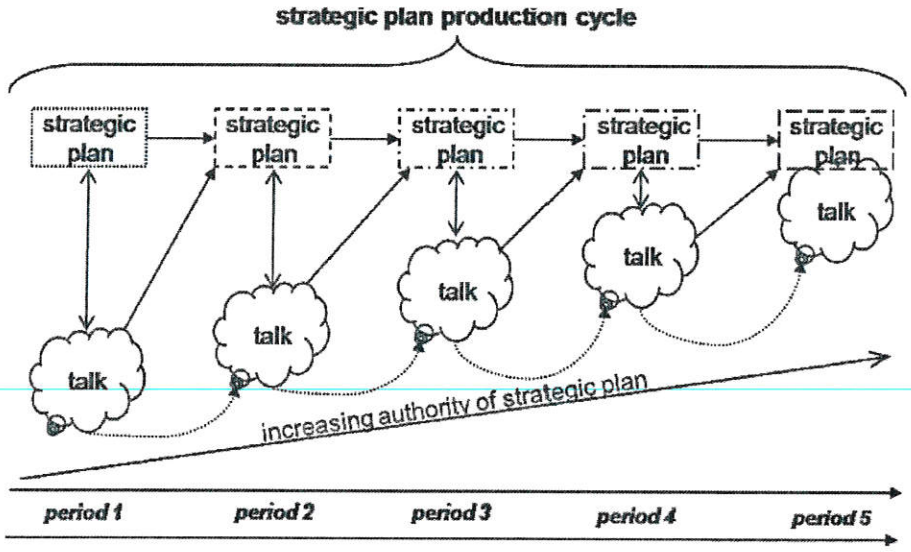


Figure 2.1 Taken from Spee and Jarzabkowski (2011).

The authors describe this process as recontextualization, increasing understanding by continuously writing and discussing ideas for clarification. Opposite of recontextualization, decontextualization occurs as the ideas written and spoken move further away from those initially engaged in the strategic planning process. By talking to coaches about the organization's strategic plan CodeVA decreases decontextualization, as presumably all the coaches were not involved in the creation of the strategic plan. Failure to discuss these ideas results in individuals who are not involved in the initial stages of the strategic plan not having the full context of the discussion of ideas that occurred and therefore not having a full understanding of the overall plan.

Klag and Langley (2014) discuss the four critical time points that inhibit successful strategic planning which is highlighted in Table 2.1. First, strategic plans fail when they are launched without adequate planning resulting in misunderstandings by organizational members and lack of focus. Second, strategic plans fail when the planning process stalls after engaging in initial launch activities often due to an organization struggling to keep up with the other day-to-day challenges facing their organization. Third, strategic plans fail when an organization successfully creates a plan but fails to implement the plan; this failure is often the result of lack of buy-in. Lastly, strategic plans fail when they are successfully executed but fail to generate effective, useful, or appropriate outcomes and minimal reflection.

Table 2.1

Critical Breakdown Points in Strategic Planning

Critical breakdown point	Launch but no planning	Planning but no plan	Plan but no execution	Execution but no impact
Symptom of failure	Aborted launch	Midstream stall	Shelved plan	Ineffective or no strategic outcomes
Conditions that breed breakdown	Lack of faith by participants and/or senior leadership in the relevance or likely impact of the activity. Lack of credibility of the facilitator as perceived by participants Lack of clear understanding by participants of how the activity will be connected to the planning process and subsequent actions	Organizational flux that diverts attention away from planning Lack of committed, credible, and/or capable leadership of the process Ambiguity around who is responsible for the process The organization is unfamiliar with strategic planning and sees it as "alien"	Lack of mechanisms for follow-up, and commitment to, implementation Plan is a purpose unto itself; fulfils an externally imposed ritual function Plan that is "unimplementable" due to attempts to please all stakeholders, creating ambiguity and inflation	Cyclical planning that does not reflect novel or sound thinking A plan that is obsolete is executed anyway Financial incentives are too closely tied to planning targets
Consequences	Wasted effort, frustration, cynicism Undermining of senior leadership Diminishes leadership capacity to motivate staff to participate in such activities in the future	Wasted efforts, frustration, cynicism No strategic impact, often for organizations that are in the most need of strategy	Legitimates ritualistic responses that may be repeated and transferred to other matters Missed opportunity to re-direct the organization	Focus on banal/ measurable: dynamics of measurement become dynamics of conservatism Perpetuation of the status quo Execution of a sub-optimal plan that should have been fluid rather than rigid

Table 2.1 Taken from Klag & Langley (2014).

The inability to successfully plan for an organization's long-term future creates an uncertain future in which the organization is susceptible to failure. The authors report that failure to successfully create or implement a strategic plan is linked to inadequate or failed leadership, participation, and motivation. "An effective strategic planning process is one that is suited to the organization and to the situation in which the organization finds itself" (Klag & Langley, 2014, p. 281).

Paris (2004) looked at strategic planning through a case study from the University of Wisconsin-Madison. Infusion strategies were identified as ways to have the strategic plan become part of the routine academic life. The university used the following infusion strategies: 1) identified point people to champion the priorities; 2) created key positions around some of the priorities; 3) created report pathways according to the plan; 4) spotlighted the plan at high-visibility campus events; 5) provided academic leadership training and development to support the plan. The process used by the university aligns with the characteristics, as outlined from the literature, of effective strategic planning. The highlighted infusion strategies that were embedded in the everyday actions of the students on campus increased participation and motivation, making the strategic plan successful. These infusion factors are critical to the strategic planning process because they help to sustain initiatives and provide desired outcomes. Additionally, a parallel exists between the Paris study and the Spee & Jarzabkowski study in regards to the emphasis on communication. The communication to the workforce through training or professional development is an area of concern when considering strategic planning. This disconnect is highlighted in Spee & Jarzabkowski, (2011) model between the strategic plan and the talk and text, or between the training teachers receive at institutions of higher education and what is being taught at the K-12 level. This disconnect in training needs to be addressed in the area of professional development for both pre-service and in-service training of teachers.

Effective strategic planning allows an organization to sustain its impact. Bansal and DesJardine (2014) define organizational sustainability as a development that meets the organizational needs of the present without compromising the ability to meet the future organizational needs. Like long-term volunteerism, organizational

sustainability involves the satisfaction and alignment of stakeholder and organizational values and goals. Haugh & Talwar (2010) describe the importance of a relationship between worker and organization by arguing that sustainability is achieved when the work of the organization demonstrates to employees how increasing sustainability relates to the employees day to day purpose within the organization. This link can be the key to the long term success of the organization because stakeholders have a sense of belonging to the vision, mission, and fundamental core of the organization (Haugh & Talwar, 2010). This link between organization and stakeholder must be cultivated through active learning which makes participation in the organization interesting and worthwhile (Haugh & Talwar, 2010); this aligns with the Gift Giving Theory in which volunteer resources are being used and appreciated by the organization (Zollo et al, 2017). Organizational sustainability also goes beyond the volunteer and incorporates the work, values, goals, and outputs of the organization. Sustainable organizations last well beyond their volunteers and continue to meet the needs of a market despite this stakeholder turnover.

Sustainability does come with a cost. Bansal and DesJardine (2014) suggest that organizations must be willing to accept trade-offs to increase sustainability; these trade-offs may include additional resources during a developmental phase or engaging in exploratory practices to keep up with market trends. The greatest threat to sustainability is an organization's participation in "short-termism,"the focus on an idea or product that is currently relevant without consideration of its relevance or value over time. Organizations cannot simply focus on the value and importance of now; they must forecast the future and their place in it. The authors add that sustainability is most effectively developed using an organization's sustainable competitive advantage which is an organization's development of "valuable, rare, and inimitable resources" (Bansal & DesJardine, 2014, p. 74).

Waheed, et al. (2011) suggest that a sustainable organization works to ensure that the organization and its stakeholders' vision and goals are aligned. Waheed et al.(2011) argue that this alignment is not just based on feelings, but is best determined through surveys that gather quantifiable organizational data. This alignment and the collection of data has become an integral part of decision-making and planning; the ability to quantify

start-up decision making would decrease costs and increase the chances of institutional success. Organizations must survey their volunteers and receive feedback to ensure alignment between volunteer and organization; a task that CodeVA is working to incorporate more effectively.

The importance of 'the strategic plan' with a reflection component cannot be over-emphasized. The need to reflect upon data obtained and to adjust to feedback from all stakeholders, as well as providing ongoing support and professional development ensures the success of the program. Feedback analysis can streamline processes and produce best practices through identifying successful or unsuccessful commonalities. The feedback and reflection process can be broken down into four simple stages (1) problem identification, (2) the framing of the problem (3) evaluation of the problem (4) corrective action (Bazhenova, Zerbato, Oliboni, and Weske, 2019; Scholta, Niemann, Delfman, Rackers, and Becker, 2019; Armas-Cervantes, Baldan, Dumas, and Garcia-Banuelos, 2016; Ceret, Dupuy-Chessa,Calvary, Front, and Rieu, 2013).

Chapter 3: Methodology

Procedure

The process began in the late spring of 2019 with an initial capstone meeting with the team and capstone chair. During the meeting, the team focused on discussion of individual strengths, establishment of team norms, review of VCU capstone process, and critical analysis of the CodeVA capstone application (see Appendix A). Furthermore, the initial meeting set the stage for what was relevant to the project to include review of the application, scheduling client meetings, and team discussion of organization functions. The first face-to-face client meeting at CodeVA followed in early summer of 2019. Discussion of overall organizational functions and specifics related to the Elementary Coaches Academy (ECA) took place with an agreement to exchange available data and the establishment of processes to request additional information from the client.

The team debriefed following the client meeting and used the "5 Whys" iterative interrogative technique to determine any cause-and-effect relationships that may be underlying in the ECA implementation. Possible project outputs were organized as well as brainstorming regarding collection methods and potential early recommendations. The team developed a problem statement and created research questions to focus an investigation for the literature review. A project timeline was developed by the team.

Research questions were organized and a list of questions were formulated to be asked of the client in another midsummer meeting. Additional resources, data, and information being requested from the client were recorded to share with the client. The second client meeting was a virtual meeting, using Zoom.

Research questions were finalized after the client meeting, and the team reviewed and updated the timeline to the client. The team studied a previous logic model that was presented to the client and discussed information gathered as part of the research and literature review. The team focused discussion on emerging themes and findings. One member of the team attended the ECA held in Harrisonburg during the week of July

15-18; following that experience, the team debriefed on the researcher's first-hand experience. Based on the team member's experience, the entire team gained an insight into the model of instructional delivery and the range of experience of the attendees. The observations and information gathered were used throughout as the capstone team discussed deliverables and due dates for CodeVA. The team also discussed additional information that may be needed from program attendees.

Using a combination of research, face-to-face meetings, paired sessions of editing, and Zoom conferences, the team conducted a literature review focused on coaching models, sustainability, adult-learning principles, marketing, non-profit volunteerism, and strategic planning. The team finalized the literature review ending with a full and final review of the Request For Application (RFA). Summer ended with a client meeting to further discuss the purpose of the study and review of possible research questions. The client agreed to the purpose and scope of the study as well as sharing contact information and resources within the organization. During early fall of 2019, the team developed and refined a prospectus that included an introduction, a literature review, and methodology. The prospectus presentation to committee took place in early October of 2019.

Research Design

The research design of the study was a mixed methods approach including qualitative and quantitative research. The aim of the research was to gather an in-depth understanding of the behaviors, feelings, and perceptions of facilitators and participants towards the Elementary Coaching Academy (ECA) and the effect those perceptions had (i) on the academy and (ii) the impact of the academy itself. The aim of the quantitative research was to take data from the review of organizational documents and databases (secondary data) as well as data from surveys (primary data) to determine how effective the organization's coaches academy program has been in delivering professional learning for those who attended. Quantitative and qualitative data was collected through interviews, focus groups, survey collection and evaluating secondary data sources.

Primary Research

Through interviews, surveys and focus groups, the researchers gained insights that answered research questions to better support the needs of the client. Team members directly interviewed two coaching program facilitators using an interview protocol developed with input provided by the advisory team, CodeVA representatives, and the investigative team. To conduct the interviews with the coaching program facilitators, the research team created an interview protocol (see Appendix C) that included seven open ended questions for the researchers to ask the facilitators. Each of the questions were centered around research question 2D, which looked to solicit feedback about the effectiveness of CodeVA's Elementary Coaches Academy.

Focus groups, which included nine ECA attendees, received a different question protocol specifically developed with recipients of CodeVA training in mind. The nine attendees made up two separate focus groups who were interviewed on two separate occasions by two members of the research team. To conduct the focus groups, the research team created a focus group protocol (see Appendix C) that included eight questions for the researchers to ask the attendees. As mentioned above, these questions also looked to solicit feedback about the effectiveness of CodeVA's Elementary Coaches Academy.

Quantitative review included one survey developed by the investigative team and administered to CodeVA coaching academy attendees. The survey (see Appendix D) consisted of two sections and consisted of a total of ten questions that was distributed through the organization to attendees of the ECA from the previous three years. Section one of the survey solicited information regarding which training the attendees participated in and information regarding what topics and professional development attendees took back to their respective schools and school divisions. The final question of section one was an open response question that allowed survey respondents to address how the organization could be more effective in training coaches as part of the Elementary Coaches Academy. Section Two asked six likert scale questions that were intended to gain information regarding participants' perceptions regarding the effectiveness of the ECA.

Secondary Research

The review of the data and documents primarily focused on data available from CodeVA, which included attendees responses to surveys collected after summer training, Saturday sessions, online sessions, and the October demographics survey. Secondary survey data received from the organization captured survey responses from the Summer 2019 attendees. A detailed look at this information helped the researchers gain insights into the elements that impact the effectiveness of the coaches academy.

Setting and Participants

Interviews and focus groups were completed in settings that were more natural to the participants of the study. For the facilitators interviews and the focus group, two members of the research team conducted these on October 29, 2019 at the Harrisonburg Hub training site. The date was picked to coincide with the Fall 2019 Saturday sessions, which are a continuation of the summer sessions.

The survey developed by the investigative team was shared with CodeVA for approval. In turn, CodeVA shared the survey with coaching academy participants who attended ECA from 2017-2019. Completion of the survey was voluntary and anonymous. Secondary data was shared by CodeVA; further, questions about the data were asked of CodeVA during interviews and by email.

Informal interviews took place with the leaders of the organization in particular, the Executive Director and Director of Education. A total of three face to face meetings took place with the two above mentioned organization leaders at both the Richmond office location and an offsite location. Additionally, several emails that included data and other information from the organization were shared from other members of the organization outside of the direct leadership.

Much of the data collected was obtained from coaches who have participated in the summer professional learning academies offered by CodeVA and facilitators of the ECA. These coaches all have some affiliation

with school divisions within the Commonwealth of Virginia and serve in some capacity for individual schools or divisions in aiding implementation of computer science standards within their respective roles. The coaches who served as participants represent seven geographic regions within the Commonwealth that have been identified by the organization. These geographic regions vary in size, student populations, student socio-economic status, readiness to implement the new computer science standards, and several other factors. The geographic regions that have been identified by the organization are: Abingdon, Danville, Fairfax, Harrisonburg, Richmond/Central Virginia, Roanoke, and Suffolk-Tidewater. These geographic regions also represent a combination of urban, rural, suburban, and private school settings which help to further the diffusion of computer science principles to students across Virginia.

The participants also serve a variety of roles in their respective school divisions; they serve in roles that give them direct access to students either within their school or across multiple schools within their respective divisions. The majority of the participants in this research study were current classroom teachers with motivation to learn more about the new computer science standards and ways to implement them in their classrooms. Current classroom teachers provided a unique perspective that proved to be beneficial to the research team in evaluating the impact and effectiveness of the ECA. Other roles that participants represented within their respective school divisions were, media specialists, instructional technology resource teachers, Science Technology Engineering and Mathematics (STEM) coordinators, and division level coordinators and specialists. While these participants in these roles are not in classrooms on a day-to-day basis, they still have the opportunity to impact how their respective schools implement computer science standards. They also have influence on how students and teachers increase their competence with learning computer science principles. Additionally, division level coordinators and specialists play critical roles in the implementation of computer science principles across entire divisions; a challenge due to the varying needs of divisions depending on the number of students and schools and geographic location of the division. For example, division level coordinators and specialists who attended the elementary coaches' academy representing Fairfax County Public

Schools are tasked with serving roughly 180,000 students who currently attend 222 schools within the county. This means that the training they bring back from the ECA requires the flexibility to differentiate in order to implement what they have learned to have a major impact on students learning computer science standards and how to be life ready students with knowledge of computer science principles.

The research project also included work with facilitators who trained the coaches during the summer professional learning academies and key personnel within the organization. Within the organization, the facilitators are paid trainers who spend time working with coaches and participants across the seven identified geographic regions of the Commonwealth. These facilitators are similar to the coaches who attend the ECA in the sense that they represent various educational settings with diverse student populations and varying roles within the respective school divisions they serve. Through the research process, the facilitators played a critical role in providing data that helped to evaluate how their feedback and input could be valuable to the organization for strategic planning purposes in regards to the planning and execution of the coaches academy. Using the facilitators as participants within the research also provided the research team with unique perspectives regarding the perceived effectiveness of the coaching academy from those who work directly with the coaches and attendees of the academy. The feedback provided was invaluable when looking to answer the research questions that were identified by the research team.

Instrumentation

For this study, the instrumentation methods that were used were focus groups and evaluation surveys. With the focus groups, the researchers were looking to engage in dialogue with selected participants to gain insight regarding their experience with the coaching academy and their overall understanding of computer science principles and how the training has impacted their practice. A collaboratively-developed protocol for questions was developed to maximize the impact of the focus group, the aim of the researchers was to select participants for the focus groups that represent diversity regarding the following factors: geographic, cultural,

and socioeconomic locations. In particular, the focus group protocol included eight open ended questions that focused around the effectiveness of the CodeVA's elementary coaches academy. The focus groups were split into two groups, one containing four coaches and the second group containing five coaches. Each focus group was conducted by one member of the research team and that member took notes according to the questions that were created. After completing the focus group, both research team members debriefed and transcribed the notes into the same protocol google form (see Appendix C). Once the transcription was complete, all members of the research team reviewed the notes for themes, quotes, key points, and big ideas captured from the focus group participants.

With regard to the evaluation surveys, the aim of the researchers was to answer the questions of the 'impact of' and 'impact on' the ECA. The researchers created a new survey after reviewing current surveys used by CodeVA and an evaluation tool that was created for CodeVA in 2017 by two Virginia Commonwealth University students, Mike Flanigan and Kristen Weidle, during their capstone research project. To create the survey, the research team created a draft survey template (see Appendix B) to evaluate the following aspects: research question alignment, actual research question, response type, and the topic the research question would cover. For the research question alignment, only survey questions that had direct ties to the research questions selected were picked to be in the final survey. In regards to response type and topic, the research team looked to create a balance of open ended and likert scaled questions that focused on the participants perceptions of the summer sessions or "workshop" results.

The final survey (see Appendix D) consisted of two sections and consisted of a total of ten questions that was distributed through the organization to attendees of the Elementary Coaches Academy. Logistically, the survey was distributed on November 19,2019 to ECA participants from the 2017-2019 summer sessions and was open through November 30, 2019 for a period of twelve days. When the survey closed, 88 Elementary Coaches had responded to the survey, providing the research team with information from all of the summer session hub training sites. Section one of the survey solicited information regarding which training the attendees

participated in and information regarding what topics and professional development attendees took back to their respective schools and school divisions. The final question of section one was an open response question that allowed survey respondents to address how the organization could be more effective in training coaches as part of the Elementary Coaches Academy. Section two, asked six likert scale questions that looked to gain information regarding participants' perceptions regarding the effectiveness of the ECA. With the data collected the researchers used the results to draw conclusions and make decisions that helped to answer the questions that had been identified by the client.

Data Processing and Analysis

Interview and focus group responses were recorded electronically and then transcribed. Themes or anchors were identified from an analysis of the transcriptions. Themes were also identified in the survey shared with those that attended the CodeVA coaches academy. Calculation of mean was used for responses that were likert based. For questions that were open-ended, themes were identified and labeled. Google Data Studio was used to visualize both qualitative and quantitative data. Work was guided by approximate weekly meetings among team members and advisor.

Ethical Considerations

Ethical considerations in this research occur at all stages of the research process. For the ethical considerations for this research project, the researchers focused on voluntary feedback from all participants in the study. The research team also wanted to ensure that any instruments used were aligned to the vision and mission of the organization. Particularly, prior to the survey being administered, it was sent to the organization for their approval. Once the survey was approved, the organization sent the survey out on the behalf of the research team. Additionally, confidentiality was critically important to the success of the research and participants will not be reported by name in the results of the research.

Chapter 4: Findings

The project, procedures and research answered the two key questions. Question one focused on the impacts that the program has on computer science integration across the state and question two focused on variables that impact the program.

The qualitative nature of the interviews/focus groups allowed the investigative team to identify themes. The themes provided insight on what CodeVa's coaching program does well, as well as highlighting areas that need development. In general, the data collected suggested that CodeVA has been effective in reaching its intended audience and meeting the goals and the needs of cohort participants, but that there is room for improvement. The data offers areas of growth for the organization and allowed the researchers to determine the impact of the program and what impacts the program. Additionally, data collected allowed for the development of logic models see Appendices E-J for the coaching academy which can align with surveys used by CodeVA. The data collected helped the researchers refine questioning strategies to be used by coaches. To improve coaching impact, researchers developed observation cycles and protocols for facilitators/coaches see Appendices K-M.

Question 1A - What is the impact of the elementary coaches academy? What are evidence-based coaching and coaching academy models/best practices?

Comparing ECAs Teaching Model With Best Practices

In order to fully understand the impact of the Elementary Coaches Academy, it is imperative to understand what evidence-based coaching strategies are being implemented to prepare coaches to train teachers and other school division personnel in their home schools. As discussed at length in the Review of Literature, research indicates that effective coaching models include several best practices. The following three best practices will be compared to the ECA's model in order to highlight gaps which show areas that can be improved. The specific data will be examined in greater depth later in the findings chapter. Firstly, high-quality

coaching models are centered around the learning needs of adults attending the professional development opportunity (Brookfield, 1986). This is an area of growth for the ECA as little is done on the front end, to meet the incoming needs of the attendees. The 'where they are' and 'how attendees learn' is not identified, leading to a one-size-fits-all academy.

Secondly, high-quality coaching models engage in a series of observation and feedback exchanges that provide data analysis that influences future practices (Reddy, Dudek, & Lekwa, 2017). This is another area of concern for the ECA, as the academy incorporates a direct instruction approach with limited feedback.

Lastly, high-quality coaching models recognize that coaches need time to effectively develop and implement CS integration lessons to a wide range of learners with diverse needs and-self-reflection after providing these PD sessions. Coaches' self-reflection on their lesson delivery requires numerous attempts at implementing professional development and receiving critical feedback from both those attending the professional development and those supervising the coach (Wang, 2017). Again, this is an area of growth for the ECA due to its limited opportunity for observed practice, which puts a greater emphasis on the need for collegiality and the associated feedback in order to better support adult learning.

These researched-based best practices for adult learning must serve as the foundation for the ECA. For the organization to meet the needs of adult learners, these best practices must be implemented to ensure that coaches are being effectively trained so that they can return to their schools and provide effective training on their own.

Roles and Responsibilities

While some ECA participants self-reported that they felt prepared to implement professional development at their home school divisions, other participants did not feel adequately prepared to successfully implement training. Interview respondents stated that they were unaware of additional commitments to training and professional learning obligations; one respondent stated "We were also not aware it was a ten session thing

not just a summer commitment. I know that there were others in the class that were caught off-guard by that … the fact that there were follow-up sessions. Which is fine, I just didn't realize that when I was signing up. It wasn't made clear." (ECA Focus Group Participant). Not having a clear understanding of their roles and responsibilities indicates that coaches may not be able to take full advantage of all of the offerings by CodeVA's ECA, ultimately, limiting their ability to effectively implement professional development opportunities.

Question 1B - What are evidence-based or best practices in effective PD? What do we consider success from PD? What can adult learning principles tell us about how to make an impact?

Just as important as understanding the various aspects of effective coaching models is identifying the necessary components of effective professional development. In the education field, many professional development opportunities center around best practices for working with school-aged children; CodeVA requires effective practices for adult learning. As mentioned previously, adult learning should be primarily focused on meeting the specific needs of the learner, most specifically related to their experiences and fulfilling their roles within an organization. Research suggested that volunteers are more likely to be committed to an organization, both in quality of work and longevity, when they understand their connection to the mission and goals of the organization (Zollo, Faldetta, Pellegrini, and Ciappei, 2017). Additionally, adult learning is enhanced when participants are connected with like-minded individuals and are provided with the necessary resources to be successful. Lastly, adult learners value training that is relevant and meets the changing needs of their profession. A focus group respondent described an experience in which their needs were not necessarily met during training. "I wish that the instruction had been delivered by someone with a strong background in computer science. Instead, it was taught by a teacher and focused on her skills in coaching. Those are skills that many of us had already acquired. As a result, it was a missed opportunity for gaining foundational knowledge and skills in computer science" (ECA Focus Group Participant).

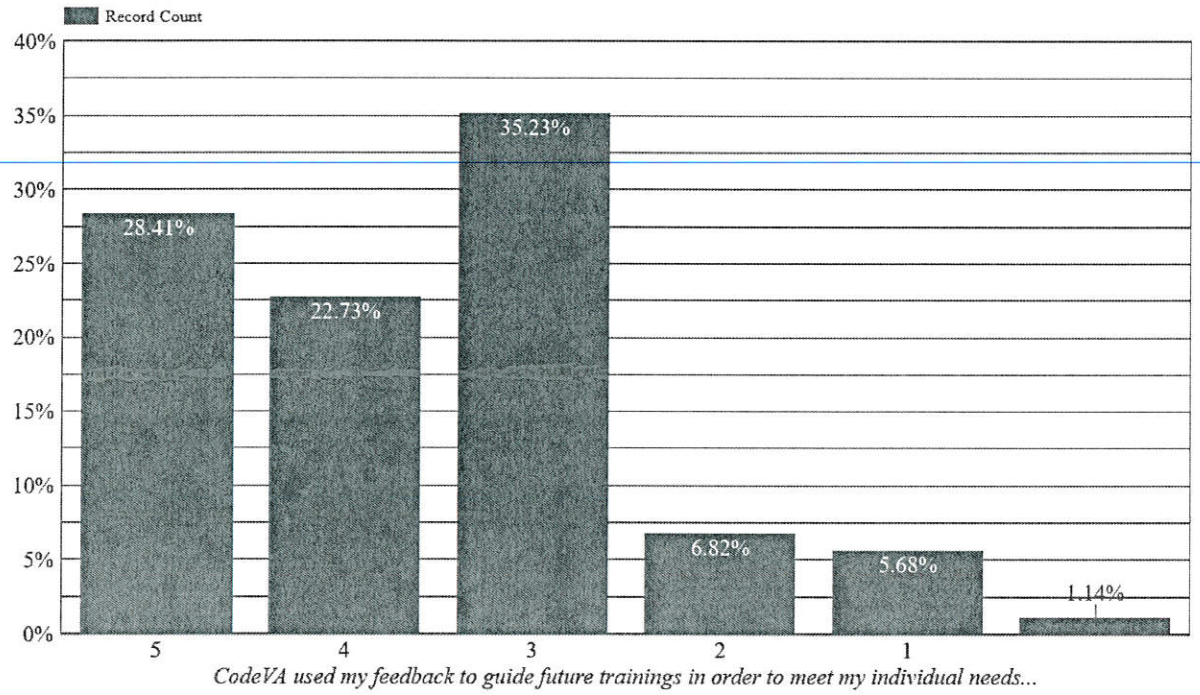
Related to the above mentioned adult learning principles, respondents of the survey and in the focus group desired an increase in connection and collaboration among coaches and facilitators from their Elementary Coaches Academy cohorts. One survey respondent felt as though the Elementary Coaches Academy training was beneficial, but stated, "I would appreciate more follow-up sessions and support to continue to share/reflect/extend my experiences with others who have shared this training" (ECA Survey Respondent). Data collected from attendees indicated that four out of five participants believed they had access to either individuals or learning communities that could assist in implementing professional development sessions. While 80% felt as though CodeVA has adequately connected them with resources, both human and informational, 20% of respondents indicated that they did not have access to adequate resources in order to meet the goal of connecting adult learners to a professional learning network. This indicates that CodeVA requires only slight adjustments to meet the needs of all coaches in connection and collaboration.

Attendee Feedback and Understanding of Mission and Vision

Survey respondents did indicate a possible area of growth with regards to using respondent feedback to adjust professional development resources or provide differentiated learning opportunities. Figure 4.1 shows that over half (51.8 percent) of respondents had agreed to some extent with the statement that their feedback was being used to guide learning opportunities for future training. This finding is promising given that over half agreed with the statement; however, CodeVA has the opportunity to reach the portion of respondents who are not in agreement with the statement about using feedback.

Figure 4.1

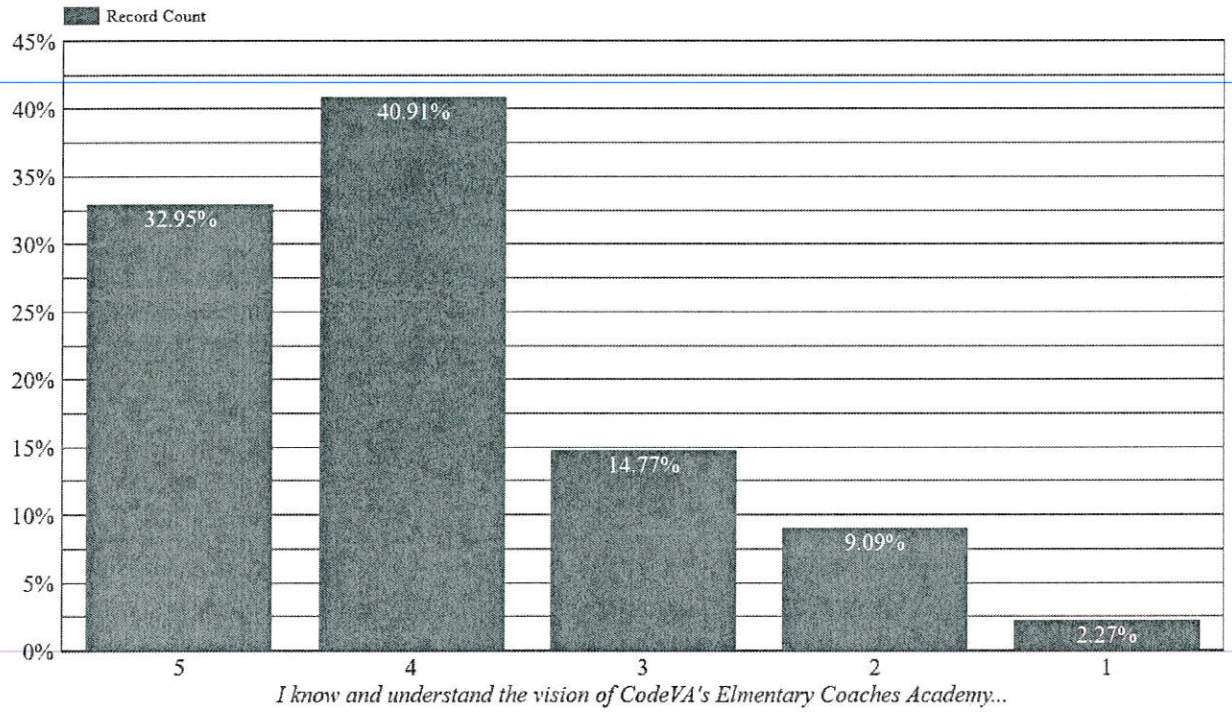
Feedback Informing Future Trainings



Respondents did suggest that CodeVA was providing a clear understanding for participants with regards to the mission and vision of the organization. Figure 4.2 provides participant feedback about their level of understanding of the mission and vision of the organization. Three out of four respondents agreed to some extent that they understood the vision of CodeVA's Elementary Coaches Academy. As mentioned previously, a clear understanding of an organization's objective increases a volunteers' work production and commitment. However, this still leaves one in four respondents who do not have a clear vision of the organization's mission and their place within the organizational structure. Therefore whilst being a positive there is still room for improvement.

Figure 4.2

Participant Understanding of Organizational Vision



Question 1C - How do training programs assess/evaluate/spread impact? How do new concepts & learning (like CS) spread? How can diffusion of innovation theory help increase effectiveness of coaches (i.e. identifying early adopters, etc)?

Diffusion of Innovation theory states that individuals accept new innovations at fairly predictable rates; with some individuals adopting innovative practices fairly quickly (early adopters), due to the meaningful content and how aligned the information is to the individuals prior knowledge. Other individuals may be slow to adopt innovative practices (laggards), as the information may hold no real world application and is therefore meaningless to the learner.

During the ECA survey, respondents asked for instructional delivery that was more in line with the evidence based research on adult learning theory including modeling, coaching and making sure the content had

real world application. The attendees wanted more coaching that built on their prior knowledge and allowed them to actively learn and receive critical feedback in order to reflect and improve their practise. Examples of this included comments such as, "provide instructors that actually teach and follow the activities on the agenda each day" (ECA Focus Group Participant). The attendees felt that more coaching and best practice in adult learning theory would make the ECA more effective which was supported by statements such as, "modeling or examples of coaching strategies using the resources we explored during our session" (ECA Focus Group Participant) and "hands on and observations." (ECA Survey Respondent).

For the purposes of evaluating the effectiveness of CodeVA's Elementary Coaches Academy (ECA), diffusion of innovation may be a useful way to consider responses by attendees who self-reported comfort with the various coding skills learned during the ECA summer learning sessions. Respondents were asked to respond indicating their level of comfort in understanding the computer science curriculum strands on a scale of one (not confident) to five (confident). The following table outlines the average level of confidence from respondents across the various computer science strands.

Table 4.1

Average Level of Comfort by ECA Attendees

Level of Comfort	Computer Science Integration	Algorithms and Programming	Computing Systems	Cyber-security	Data and Analysis	Impacts of Computing	Networking and the Internet
5	30	24	22	19	17	21	19
4	21	26	29	32	29	30	29
3	23	23	21	17	25	23	26
2	1	2	3	5	1	1	1
1	0	0	0	2	2	0	0
Average	4.07	3.96	3.93	3.81	3.78	3.95	3.88

Respondents who self-reported a Level 5 as their comfort level with the various strands of computer science integration could be considered early adopters while respondents who self-reported a Level 1 as their comfort level could be considered laggards. Based on those assumptions, the strands of computer science integration and algorithms and programming are areas in which attendees would most likely feel adequately prepared to begin curriculum integration while attendees may feel less prepared to adequately provide effective professional development for the cybersecurity and data and analysis strands.

Two themes emerged from survey and focus group responses that relate to how an organization can spread the impact of professional learning. First, respondents mentioned the need for clearly stated purpose and expectations of the program that provide for greater preparedness for coaches. Several attendees reported not having a clear grasp of what to expect from the training or their responsibilities moving forward. One attendee stated they would have benefitted from, "clear expectations, clear itinerary of class dates" (ECA Survey Respondent). Another survey respondent echoed those sentiments, stating, "I also think that what the coaches academy is should be more in detail. I had no idea what I signed up for, that it would be for more than one week. I honestly thought I was going to learn how to teach my students to code. I had no idea that it was going to be about implementing the computer science standards. I am so glad that I went and got a good grasp on how to implement the new standards, because honestly I had no idea we even had new computer science standards" (ECA Survey Respondent). While some attendees desired more formal structures, some respondents thrived with the transient nature of the academy. One facilitator stated, "I have on-boarded one of my friends. It's bumpy. It is not a well - oiled machine. It is still very new; we're learning and growing. [CodeVA] allows for creativity and options and moving forward with it. Building the plane as it is being flown is the enticing part for me." (ECA Focus Group Participant).

Secondly, respondents expressed the need for a larger cache of instructional tools and resources to facilitate professional development by coaches. Attendees believed these resources would provide additional support to coaches when a facilitator was not available. The type of resources necessary is dependent on the

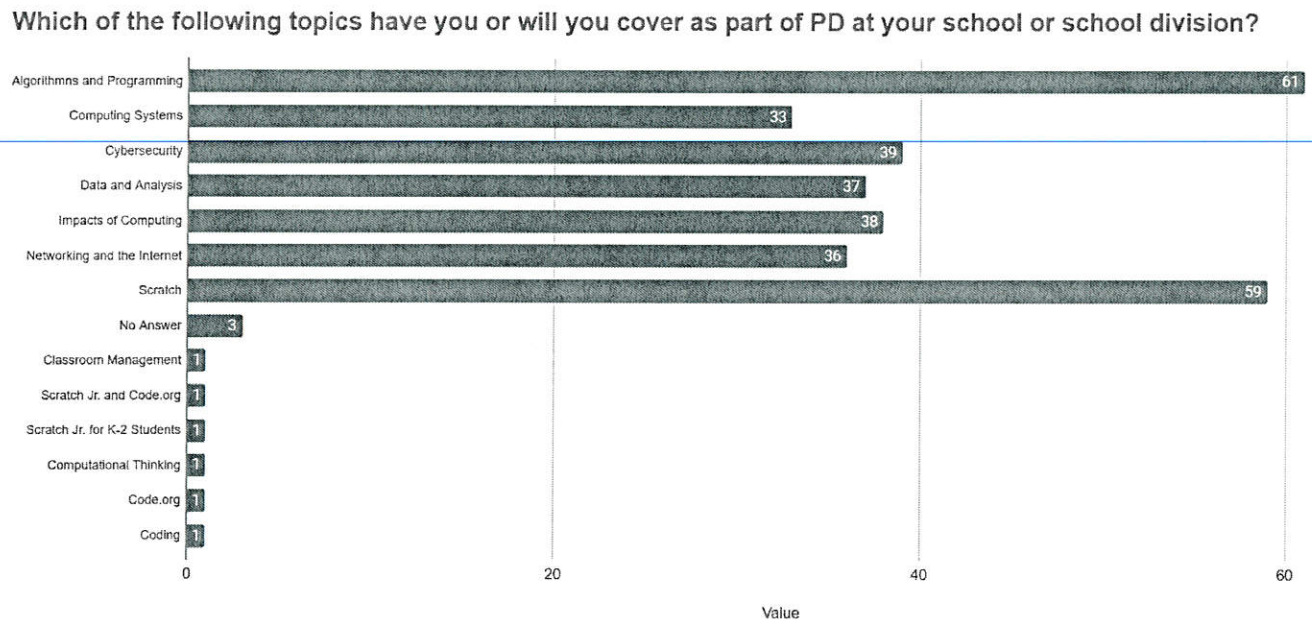
attendees skillset navigating the computer science and coaching elements being integrated as well as the job functions of their position. A librarian with ten years of experience integrating computer science lessons does not require the same fundamental resources that a second-grade teacher who has no background knowledge of computer science may require. Both can be effective coaches, but their needs are different. The need for a differentiated approach is not limited to after the training has occurred. Understanding the various needs of attendees was noted by one survey respondent, "I think it would be beneficial if CodeVA took the time to figure out everyone's knowledge level before starting the training. I really came in not knowing much about computer science and it wasn't until the last day that the instructors realized that many people in the room did not know half of what they were talking about" (ECA Survey Respondent). Pooling these resources also provides greater ease of use after training. Respondents indicated frustration about the accessibility of documents as they have had to "ask permission" (ECA Survey Respondent) to view or make a copy of shared documents.

Question 1D - How do training programs sustain? How do training programs ensure that the output of coaches sustain? How can PD be crafted so it leads to lasting change? How do the attendees conduct the PD back at the school?

The themes of greater organizational structures as well as cached resources also greatly impact how training programs sustain. Confident coaches, who have knowledge and access to effective training resources, are more likely to provide high-quality professional development opportunities than an individual who is unclear about how, what, and why they are training others. Nearly all respondents indicated an ability to implement computer science integration into grade-level curriculum; teacher level of confidence varied. Additionally, what computer science strands and topics are being taught varies as well. Figure 4.3 depicts which computer science strands coaches self-reported as part of their professional development learning at their home schools. Only algorithms and programming and scratch were implemented by more than half of the respondents.

Figure 4.3

Topics Covered by Coaches

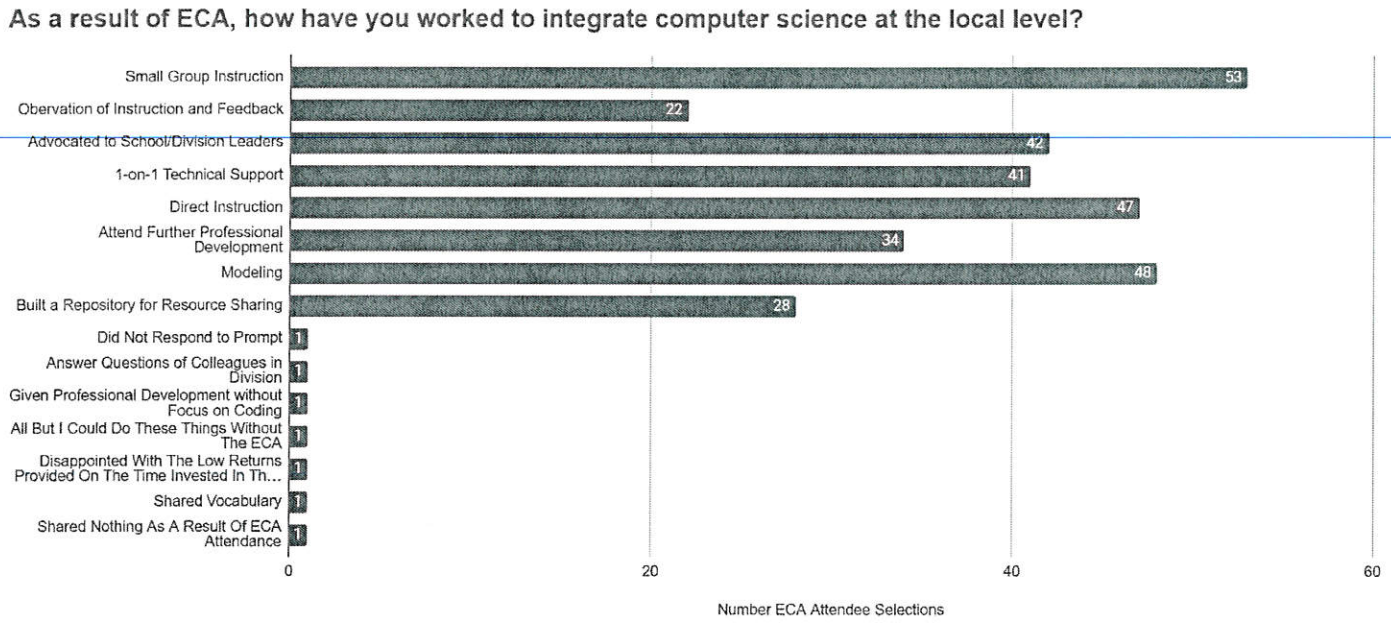


The challenge of spreading the impact of learning is not just contained to what is taught, it also pertains to how coaches are teaching content. Figure 4.4 shows how survey respondents indicated the methods used to provide professional development at the local level.

CODEVA ECA

Figure 4.4

Methods of Delivering Professional Development by Coaches



Timing of Professional Development Reporting

The timing on when information is gathered by CodeVA also has an impact on the effectiveness of the program. For reporting purposes, coaches self-report the number of professional development opportunities and participants they have trained. This self-reporting occurs during October, which only allows for training to occur in the first two months of a traditional school year in the Commonwealth of Virginia (August and September). This practice may be problematic as professional learning opportunities that occur during this time period are often focused on the opening of school and are generally scheduled several months prior to being implemented. A newly trained coach would most likely be unprepared to fully implement a high-quality professional development opportunity so quickly with such little prior notice.

Question 2A - How do you motivate volunteers or unpaid employees designated by their respective school division to participate, lead change, create buy-in among others? What is their motivation to accurately report outcomes & follow up?

Intrinsic Motivation.

There are numerous reasons as to why coaches are motivated to attend the Elementary Coaches Academy (ECA), but from the qualitative research conducted, intrinsic motivation was a major theme. The theme of professional growth in order to serve students re-occurred throughout the research, as shown in responses to the open-ended questions in the survey. Such as; "I attended to expand my abilities as a teacher and to help my students" (ECA Survey Respondent). Another stated " this was a quest to further my knowledge and skills, to share with my students" (ECA Survey Respondent). And yet another, "I wanted to increase my knowledge so I could help the teachers and students" (ECA Survey Respondent).

This desire to self improve was also substantiated in the secondary data as reported by the coaches in their comfort level of the computer science SOL strands after attendance of the ECA.

CODEVA ECA

Figure 4.5

Coaches' Level of Comfort with SOL Strands

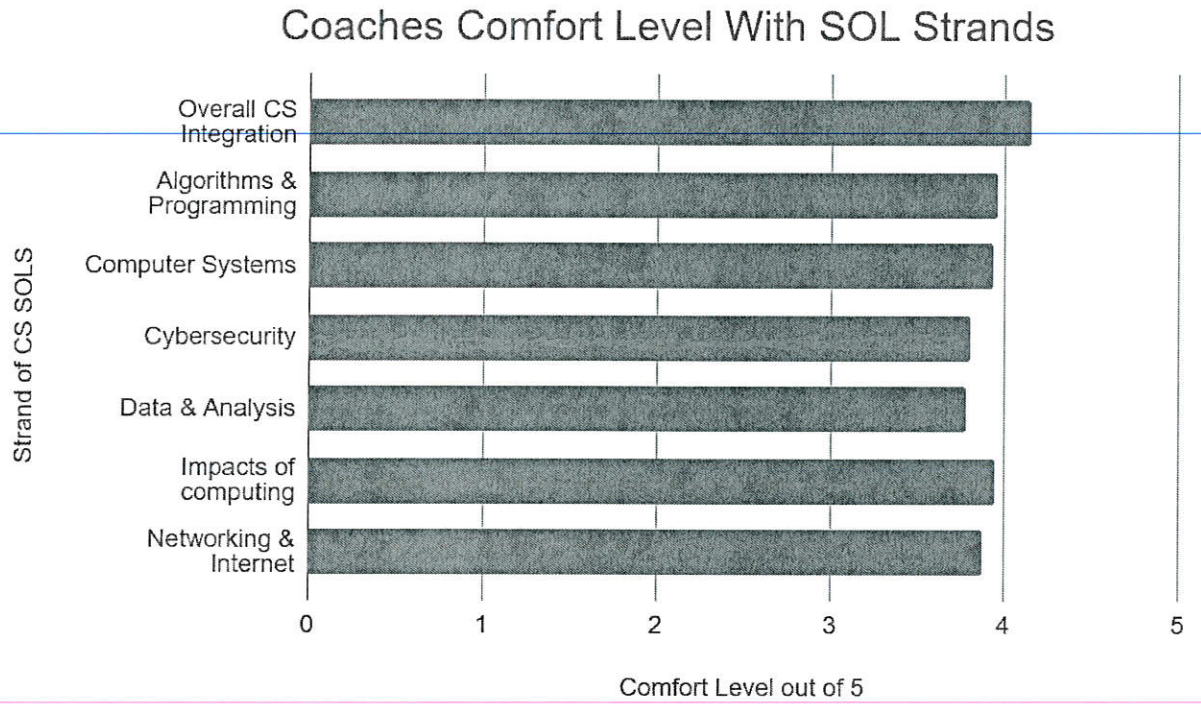


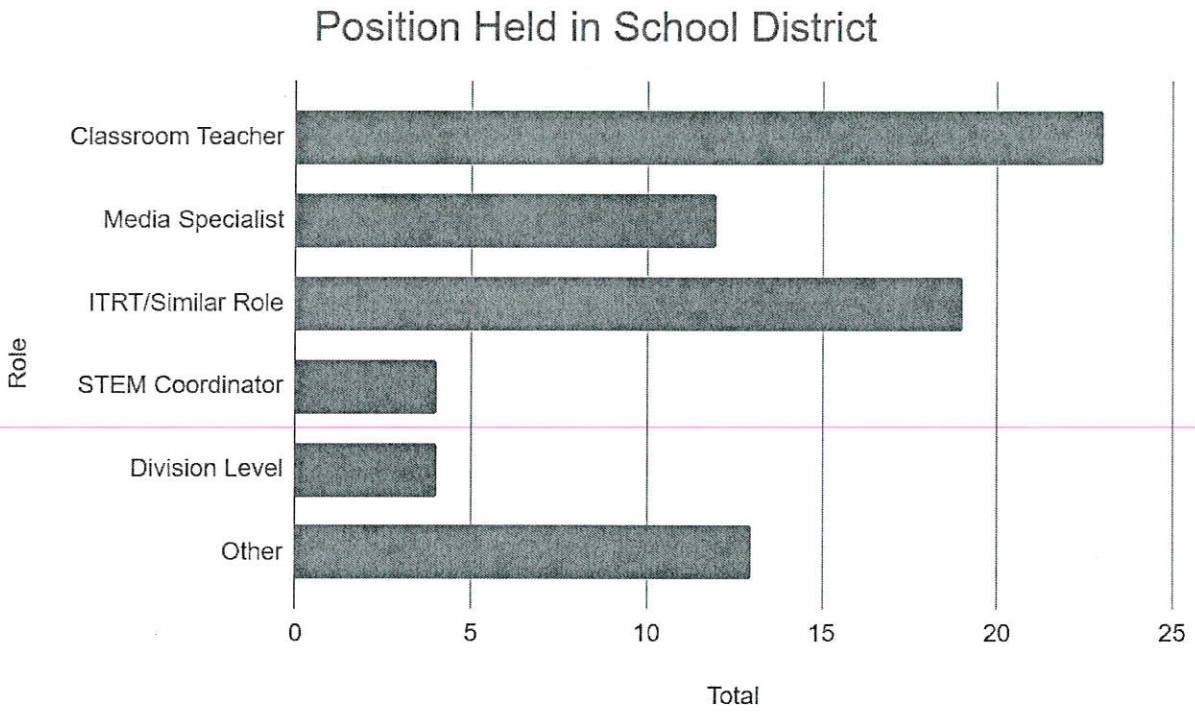
Figure 4.5 points out that the respondents to the CodeVA survey suggested that their overall average comfort level with computer science integration was at a 4.15 on a 5 point Likert scale. This score is higher than the respondents' assessment of their comfort levels of the six individual computer science SOL strands including algorithms and programming, computer systems, cybersecurity, data and analysis, impacts of computing, networking and internet, which all failed to record an average score above four out of five. This would suggest that the coaches feel as if they have a general understanding of computer science integration, but have a lower comfort level when asked about specific areas of computer science integration, which could impact the efficacy of professional development within their respective school districts and decrease the diffusion of innovation.

Position that Attendee Held in School District

Another major motivation for attendance at the ECA was the position the coach held in their respective school division.

Figure 4.6

Positions Held by ECA Coaches



Quite a few of the attendees of the summer 2019 ECA were Instructional Technology Resource Teachers (ITRTs) or media specialists. The ITRTs and Media Specialists would have attended the ECA, as part of their preparation for their job, which would have been an extrinsic source of motivation. In fact 41% of the attendees were either ITRTs or media specialists. This leaves 23% of attendees who were classroom teachers and 4% who were STEM coordinators. Division level employees with decision making authority in their respective districts accounted for only 4% of the attending population; a noticeably small percentage of the attendees. Those districts who are represented by decision making personnel at the ECA may have a head start and be better

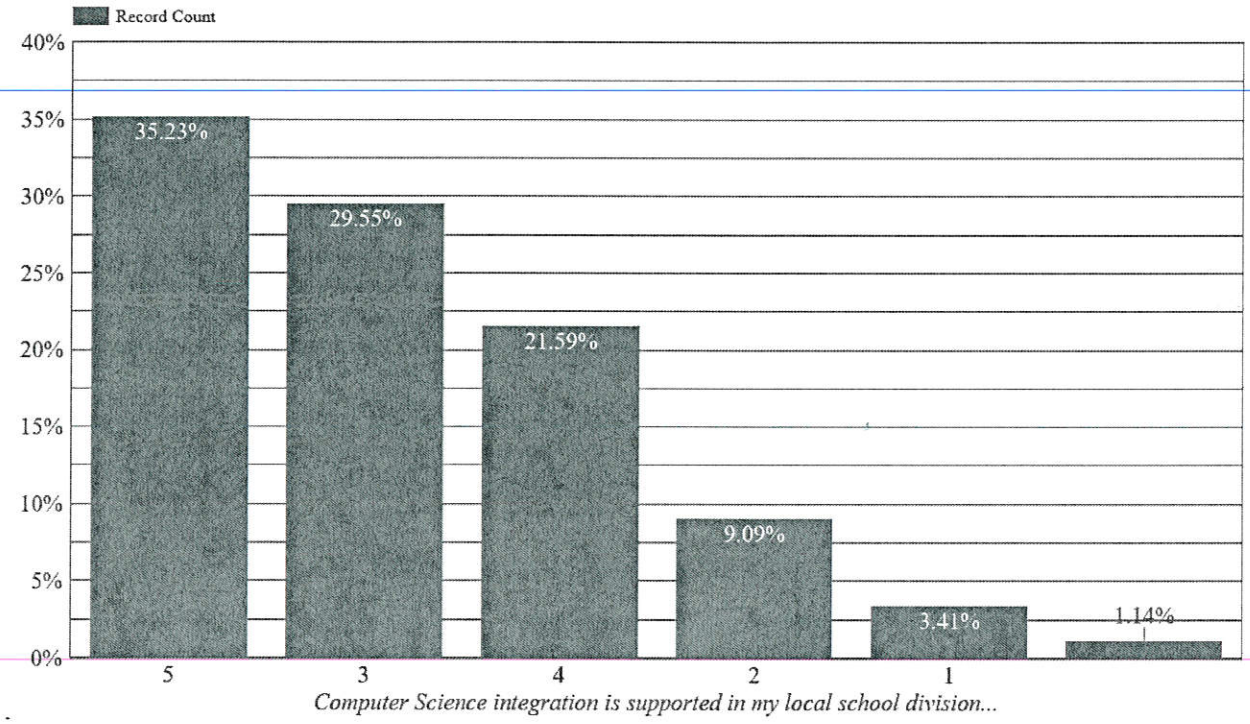
positioned to implement CS within their district. This may have far reaching implications regarding the diffusion of innovation and the equity of computer science across the state.

Extrinsic Motivation

The graph below shows the attendees' ratings of the level of support for computer science integration within their district. Approximately 36% of respondents felt their school division were very supportive of their attendance and scored it a 5. Three respondents reported that they were devoid of support from their school district, but overall the respondents gave their school districts an average score of 3.77 out of 5. This suggests that the attendees are more motivated to attend the ECA if computer science is supported within their district. This falls in line with the theory of positive reciprocity as outlined in the review of literature. The theory suggests that individuals are more motivated within their job if they feel more supported in their workplace. This is an area of concern for CodeVA, as it shows that there is inequity between school districts regarding CS support. However, this is also a positive and a compliment to the ECA and CodeVA as it highlights the need for and the work they are carrying out to complete their mission.

Figure 4.7

Coaches' Reporting of Level of Support for Computer Science from School Division



Question 2B - How does analyzing/assessing processes help programs improve?

A process can be broken down into smaller component parts in order to more easily analyze and better understand the overall procedures involved. This is important as it helps to identify patterns and links between individual processes within an organization. If greater understanding of the processes involved in an organization is acquired; it follows that improvement, better management and greater efficiency of an organization can result (Palmatier, Houston, & Hulland, 2018). In the case of CodeVA the following data and themes gave insight into its organizational processes.

From the open ended questions in the survey and the focus group responses a need for improved and streamlined communication was made clear. Even though there were no specific questions relating to communication in the survey or focus groups, communication was a subject that was specifically brought up in 25 responses out of a total of 262, which makes up nearly 10% of the respondents' answers. The qualitative data made specific reference to communication in two areas: pre-ECA, and post-ECA.

Pre-ECA Communication

Comments such as the following showed the lack of clear pre-ECA communication as to what the ECA actually encompassed. "I echo that and it needs clear communication to teachers about when and what it (CodeVA) is." (ECA Survey Respondent). Another survey respondent gave the suggestion that, " Having all the dates required listed when someone signs up for the training will help new people decide if this is something they can commit to before signing up." (ECA Survey Respondent). This increased transparency of the ECA commitment for attendees along with improved marketing of the program would have a positive impact on the diffusion of innovation, which is a major goal of CodeVA.

Another layer of the pre-ECA communication involved the type and scope of audience that the ECA was being marketed towards. Marketing to specific populations would enhance the diffusion of innovation and have a more efficient impact. To support this survey question, respondents and focus group participants responded to questions with suggestions that administrators and those with decision making authority should be more involved; "get more administrators involved so they can better understand the benefits of having trained elementary computer science coaches." (ECA Focus Group Participant). Other comments championed the involvement of the instructional departments due to their concerns regarding implementation and assessment of the computer science standards, "I wish the instructional department were here, especially with the latest VDOE memo regarding assessment. Who is going to do that and what does it look like?" (ECA Focus Group Participant).

Even coaches who are aware of the mission and vision of CodeVA realize that the communication has not reached all quarters of the necessary audience in order to maximize the diffusion of innovation. This was conveyed by an informed ECA coach who suggested that, "Unless I was misinformed, I think their mission is to bring computer science to Virginia and meet the need in our economy for computer science jobs, and I think our first and biggest hurdle is getting teachers aware of what computer science is" (ECA Focus Group Participant).

Post-ECA communication

The reported post-ECA's lack of or poor communication involved the need for and ease of navigation of the online database and the need for "ongoing training and support" (ECA Survey Respondent). Focus group coaches and survey respondent coaches felt that there needed to be improved access to resources, such as the website lesson bank and a greater emphasis on the coaching aspect of the program that allowed for self reflection and the creation of professional learning communities in order to prompt greater collegiality after ECA completion. This was reinforced with comments such as; "continue making resources available to current and former participants as they are developed" (ECA Focus Group Participant). Other coaches thought the resources present created some challenges, "I've been struggling with the lessons built over the summer. Going back and into the classrooms looking for the lessons that everybody built. That's been a struggle. I've gone to the agenda and spreadsheet where they were posted, but the links and everybody didn't make them 'view all' so we have to ask permission. This is very frustrating. I don't have time for that … so I just move on." (ECA Focus Group Participant).

Communication and Social Media

The secondary data also looked into the diffusion of innovation through the forms of communication and social media platforms that the participants were comfortable with and used the most, in order to receive information and feedback.

Figure 4.8

Types of Social Media Used by ECA Coaches

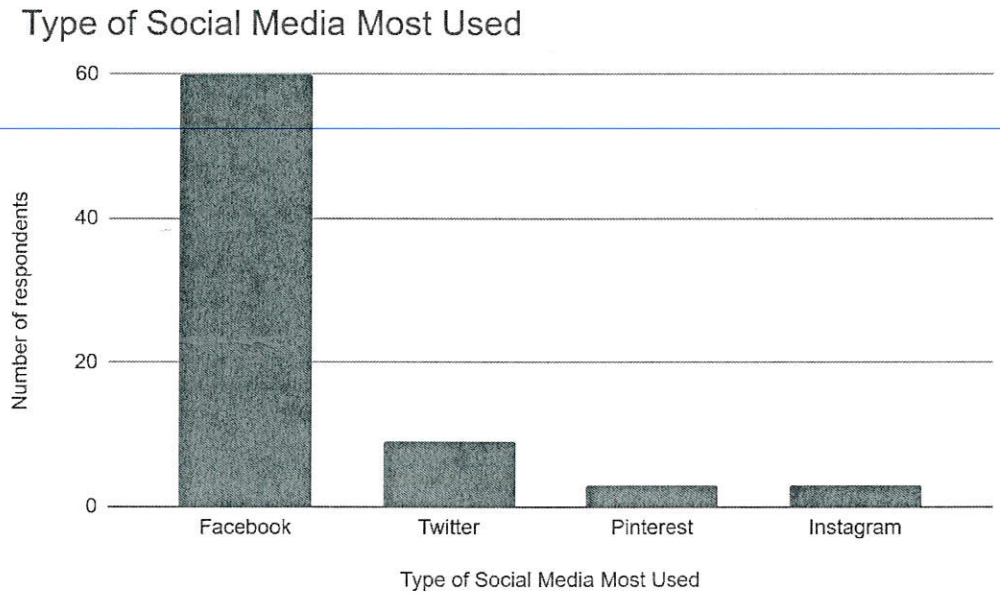
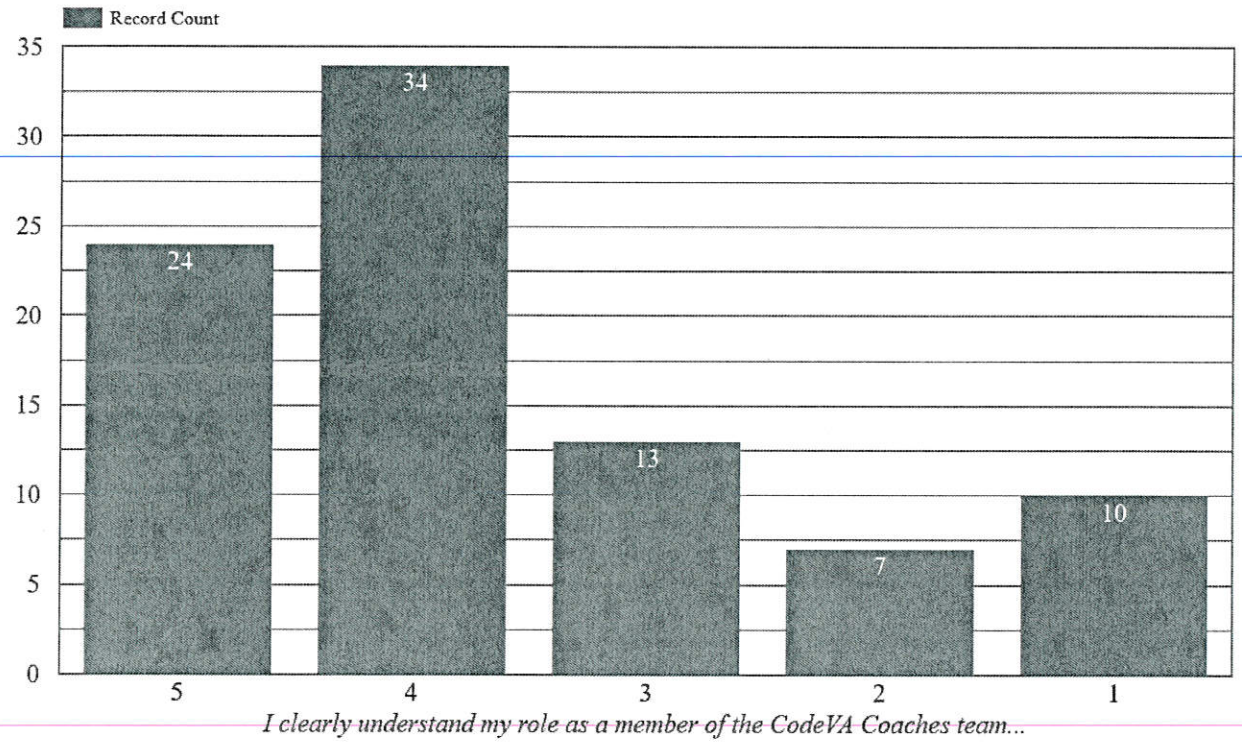


Figure 4.8 clearly shows that Facebook is the preferred form of social media. This information could have far reaching effects on streamlining the communication process and the accessing and facilitation of the cache of computer science lesson information.

There was also room for improvement concerning the communication and diffusion of information regarding the roles that coaches play within CodeVA. Figure 4.9 shows that 70% of coaches who responded scored four or five on a likert scale when asked about their understanding of their role within the CodeVA organization. At first glance this suggests a good score of 70%, but with 30% scoring their knowledge of role as three or less it would definitely suggest that this is an area of communication that could be improved. It also shows an area of growth for the marketing of the ECA.

Figure 4.9

Coaches Acknowledgement of Understanding Role in CodeVA



Geographical Area

A further finding among the coaches that impacted the process was the geographical area. Figure 4.10 identifies where the the highest concentration of students in K-5 are located in the state that are served by at least one ECA trained coach.

CODEVA ECA

Figure 4.10

Student Population Density in Virginia

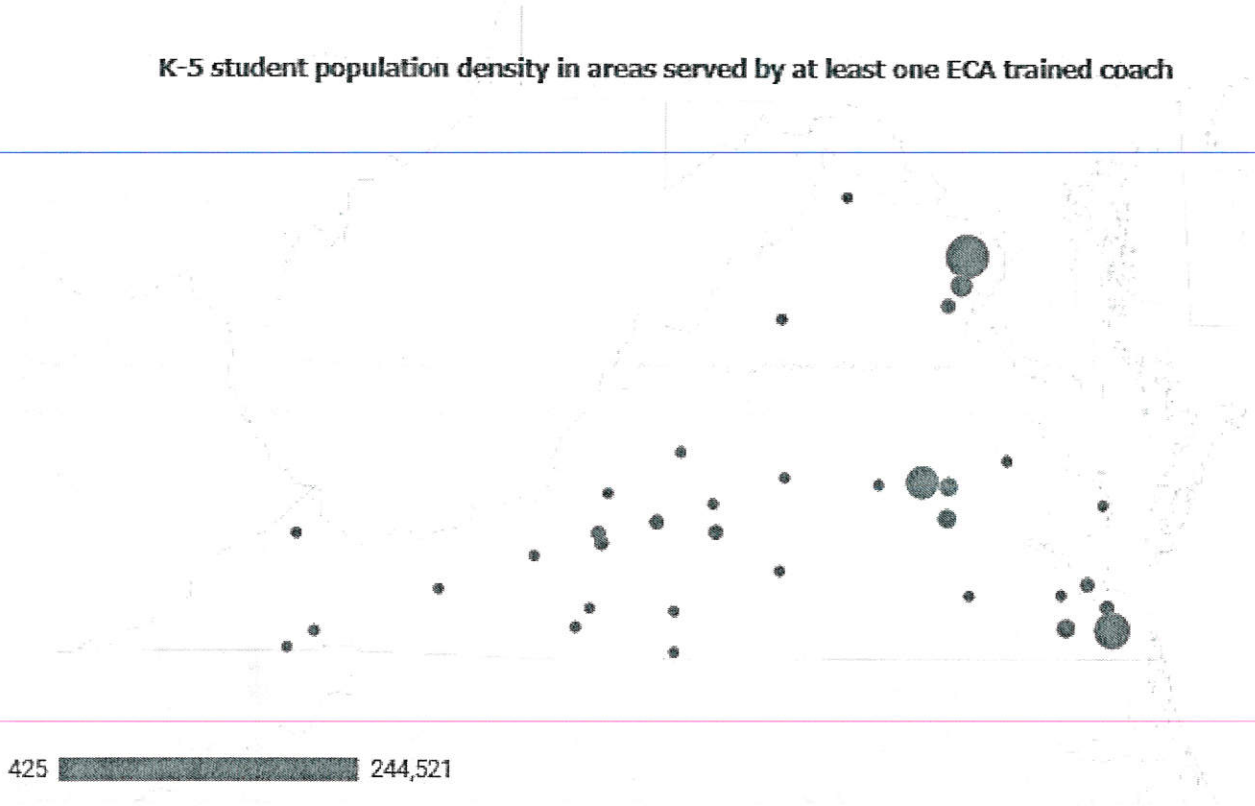


Figure 4.11

Population Density of CodeVA ECA Coaches

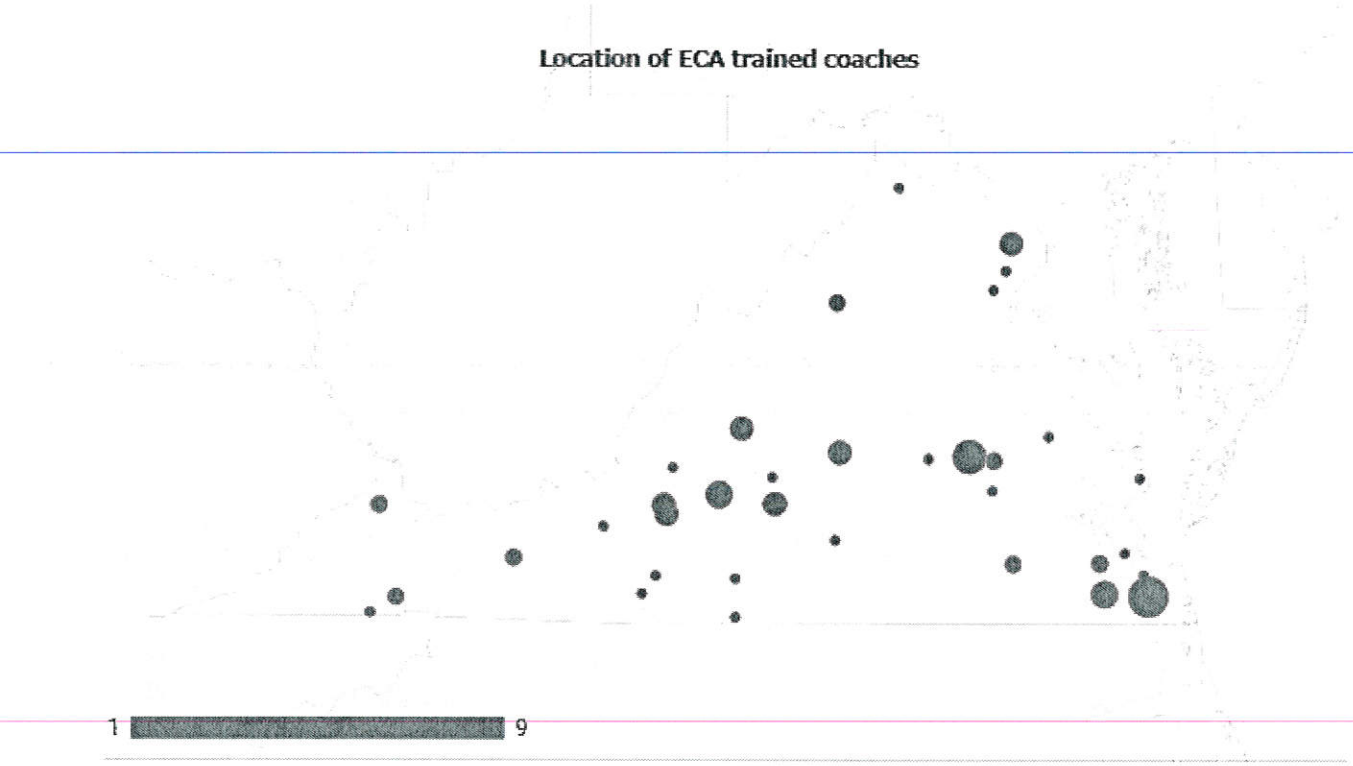


Figure 4.11 clearly shows the bulk of attendees occurs in Central VA 23.9% with the fewest number of attendees occurring in Western VA. This could have ramifications when considering resource efficiency and popularity of attendance when measured against population density. It also brings up questions regarding equity of finance, resources, and time. For a non-profit organization the financial cost of conducting the ECAs is a consideration when comparing participation rates and geographical regions. The fact that Central VA's ECA has better attendance rates than Northern VA could have financial implications regarding return on investment for CodeVa.

Survey respondents thought there was a need for more ECA training in certain areas and a greater need for online resources to ensure equitable sharing. "I thought it was great training, but would like to see more offerings in my area" (ECA Survey Respondent). Other respondents stated, "Additional virtual training resources for those who can't attend face to face sessions" (ECA Survey Respondent). The online sessions

would also facilitate collegiality and allow coaches to feel connected to other coaches, "More collegiality and opportunities for teachers to join into the movement, not just by attending academies" (ECA Survey Respondent).

Chapter 5: Recommendations

Our team's review of literature, primary, and secondary data pointed to five overarching anchors for our recommendations: adult learning principles, coaching feedback cycles, motivation, diffusion of innovation, and equity. Improving impact and effectiveness of the CodeVA ECA depends on careful reflection and attention to one or more of these anchors. By considering organizational capacity, CodeVA can prioritize these recommendations for implementation.

Recommendation: Use evidence-based coaching models to increase impact

The review of literature stated that best practices for coaching models include instruction centered around the learning needs of adults, observation-feedback exchanges, and time for adult learners to develop and implement lessons. The qualitative research showed that CodeVA coaches and facilitators did not engage in any observation and feedback practices during and after they had attended the Elementary Coaches Academy's summer sessions.

Observation-Feedback Process for Critical Evaluation

During the ECA facilitators should incorporate observations of attendees delivering lessons followed by specific feedback. See Appendix K for an example of a facilitator to coach feedback cheat-sheet. Closure to this coaching model cycle will be an observation of the attendee in the workplace setting of lessons delivered with peer and facilitator feedback. This could be accomplished in part by providing an online method for managing feedback and critical reflection of ECA attendees. The rubric or instrument used should be developed by representatives, both coaches and facilitators, from each of the regions in Virginia.

Another potential concern that arose was the timing of the self-reporting of learning gains in computer science which takes place in October only two months after the start of schools in the Commonwealth of Virginia. An adjustment to the data collection timeline from October to December would allow more time for

coaches and facilitators to conduct observations and provide feedback as they look to increase the implementation and integration of computer science principles in their respective schools.

Recommendation: Utilize adult learning principles to develop more effective professional development

CodeVA currently provides professional development opportunities that fail to differentiate for the learning needs of a diverse group of individuals. While training is effective, it does not take into account the unique backgrounds and needs of each individual. Rather than a one-size-fits-all approach, the researchers recommend CodeVA utilize Knowles' six principles of adult learning to anchor the development of future professional academies. Knowles' principles focus on how best to set conditions where adult learners will be most successful. CodeVA should make ECA learner-focused and driven by gathering data to inform attendee practice.

A pre-survey for all attendees can be used as an assessment to gain information about attendees' viewpoints and experiences prior to their arrival to the session. Specifically, CodeVA should focus on the pre-screening of attending coaches' knowledge. Through analysis of advance data on participants and considering their levels of skill and knowledge, a more targeted learning experience can be created where the learner has the opportunity to participate in the academy in meaningful ways specific to the learner, CodeVA could also benefit by using an analysis of data by geographic regions to develop more effective professional development. By customizing training by region, professional development can be tailored to the needs of potential participants as evidenced by survey results sorted by location. Ultimately, consideration must be given to differentiating the academy learning based on region need, ability of those attending, by job title/description of attendee, and by attendee experience.

Create a Returning Coaches Academy to Offer a Differentiated Approach

Based on the feedback from participants, there is a need to create a more differentiated learning experience that continues the growth of coaches who attended one year of the ECA. Identify the need for

individual breakout sessions by using pre-assessment or through formative assessment that takes place during the training. Provide for individual breakout sessions based on learner interests as well. Considerations of breakout sessions support the findings that adult learners need differentiation and real world application to remain motivated and engaged in the content.

Recommendation: Create a more structured Professional Learning Community (PLC) for ECA participants

The researchers recommend developing more structured Professional Learning Communities (PLCs) for facilitators and coaches. ECA attendees expressed interest in more opportunities to communicate with each other outside of the ECA which takes place primarily over the summer. To develop more structured PLCs, the organization needs to leverage the platforms that are currently used by most educators for information sharing and communication.

Strategic Use of Social Media

CodeVA should utilize Twitter more; both facilitators and coaches could engage with each other outside of scheduled training. Through the use of Twitter, CodeVA could hold slow-chats, an example of which can be seen in Appendix O, where a facilitator poses a question for group responses. Also, a live-shared document that includes a directory along with their location and area of expertise would benefit ECA attendees. CodeVA could hold livestream PLC events on their YouTube or Facebook page. The mode of creating connectivity online is not as important as the need for a level of connectivity to motivate adult learners and facilitate diffusion of innovation.

Recommendation: Improve advanced communication of ECA professional development opportunities

Given that 25 people mentioned problems with communication of expectations and schedule, even when not prompted, CodeVA must have clear expectations to allow for ECA attendees to prepare for learning. Feedback suggested that information about the training and additional commitments were not communicated prior to coaches attending the training. Miscommunication also included not having a clear understanding of what would be covered during the ECA training. CodeVA should provide clear learning objectives prior to the ECA and should advertise upfront the meeting dates and itineraries for the upcoming year.

Create an ECA specific FAQ

The frequently asked questions (FAQs) section for the website can be expanded and delineated directly to the ECA, an example of which can be seen in Appendix N. Currently, the organization's website only has FAQs for educators and it answers questions at a surface level. The creation of FAQs for the ECA can help to address concerns that are raised as a result of this research and helps future attendees make decisions about how they want to engage with the organization. The ECA FAQs can clearly explain the time commitment, attendee expectations, and the benefits for taking part in the coaching academy. This includes better communication on

the front end of ECA to include vision and mission as well as specifics of what is required in taking part in the ECA. There should be clear expectations that are repeated in a variety of formats.

Increase frequency and type of communication

Further, CodeVA could increase the frequency of communication to attendees of the ECA so that the information and knowledge gained during the summer session is reinforced. Some examples could be a monthly newsletter, video message, a resource-share by automated email, or sent through social media and this would be reinforced and displayed on the organization website. It would benefit the organization to leverage existing platforms to streamline communication that helps to keep participants informed and engaged before, during, and after ECA. CodeVA already utilizes a website to communicate with all stakeholders. Are web page hits, click throughs, and downloads analyzed before, during, and after academies to provide data on attendee follow-up?

Recommendation: Create a cache of resources for all facilitators and coaches to have access to outside of the ECA

Feedback from the participants indicated that they were interested in accessing materials and resources that could help with the implementation of computer science standards in their respective classrooms and school divisions. The current resources CodeVA shares should be expanded to be sortable by CS standard, training program, resources needed, and target audience. A cache of resources helps to facilitate learning outside of the academy. Attendees should be able to add to the cache to foster collaboration and continue the integration of computer science standards around the Commonwealth. The cache should be easy to navigate and should be specific with differentiated lessons. One way to organize the resources so that navigation is user friendly would be to sort content by specific topic, SOL strand, length of time required for lesson, comfort level with CS integration, or job title requirements (i.e ITRT, administrator, teacher, etc.). Once an attendee has completed the ECA, they should be given unfettered access to this cache without having to request access to individual resources.

Recommendation: Increase connections with division-level decision-makers

The research team recommends developing an attendee profile sheet or "cheat-sheet" for school divisions to help with the appropriate identification of attendees from the school divisions of the Commonwealth. Providing school divisions with an attendee profile sheet can help divisions recruit and send the right educators to the training which could lead to a greater impact on the implementation of computer science standards across multiple classrooms. Classroom teachers represented the majority of participants who attended the training but individual teachers may have limited impact on diffusion across schools and divisions. The organization could benefit from targeting division-level personnel to attend the ECA.

The creation of an attendee profile sheet can also help to target more participants who identify as Media Specialist or Instructional Technology Resource Teachers (ITRTs). The research found that 41% of survey participants identified in the two above mentioned roles, and if the organization targets these roles then divisions may be more inclined to send those who are in these two positions. Media Specialists and ITRTs are ideal attendee's because of the access they have to more teachers and students. Participants who identify as one of these two roles are afforded more flexibility due to their job, to train more teachers to integrate computer science. This helps with the diffusion of innovation and the execution of the organization's mission and vision. Division-level stakeholders can make decisions, allot resources, and plan professional development in ways that positively impact equity.

Identify Division-Level Contacts and Cultivate Connection

To make divisions more supportive of computer science standards and raise the motivation of attendees, CodeVA should identify a division-level contact at each school division. To further leverage the division-level contacts, marketing and advertising could be shared directly with them regarding the ECA. On a state scale, CodeVA should present about the ECA at statewide conferences including VASCD and VAESP. If school

division leaders are identifying, recruiting, and sending the right educators this could have a positive impact on participant motivation and the successful implementation of computer science integration.

Recommendation: Create a Social Media Platform to increase connection between participants and CodeVA after the ECA

The research team suggests a deeper analysis of both social media platforms and the organization's website as sources of information that attendees can access for specific information about ECA. Feedback via the secondary data revealed that roughly 60% of participants selected Facebook as their preferred form of social media, with Twitter being the second highest preferred form of social media. The use of social media platforms has been a proven marketing technique to connect target audiences (participants) to businesses (CodeVA). With participants already on social media, it would be in CodeVA's best interest to leverage the platform to provide connection points outside of ECA. Specifically, CodeVA could put out consistent information from the organization that would help with carrying out the organization's mission and vision and this would also reach a wider audience than just ECA attendees. Social media platforms could also be used by the organization to promote information regarding ECA and other programs the organization offers see Appendix P. For example 30% of survey respondents reported not having a clear grasp of what to expect from training or their responsibilities moving forward. Utilizing social media through a Facebook page/group or Twitter page/group, the organization could create a social media timeline where information is shared out in advance of the ECA. The social media platform could also be used to share resources as well as connect participants virtually. Thorough advertising of expectations and ideas in advance would help cultivate trust and motivation from participants through more access to the organization outside of the ECA.

Conclusion

Computer science education affords opportunities for successful careers, can be a catalyst for innovation, supports/links the sciences, and has the potential to guide research in solving many societal problems (Zendler & Klaut, 2012). By infusing computer science into the K-12 curriculum, we can lessen the educational disconnect between content and career. CodeVA is an innovative force in the nonprofit world of bringing equitable computer science instruction to all students in Virginia. CodeVA's intention to make computer science education relevant, meaningful and equitable through real world, collaborative engaging programs benefits from careful examination of their educational programs such as ECA.

When making decisions regarding how to increase the impact of CodeVA's ECA, researchers recommend examining decisions, where appropriate, through the lenses of motivation, equity, diffusion of innovation, adult learning, and a coaching-feedback loop. These considerations provide for short, medium, and long-term positive impacts. These themes also take into account the stakeholders, activities, and products that correlate to a substantive positive impact for CodeVA. These lenses have the most direct link between a lasting, positive ECA experience leading to the realization of increased student achievement through computer science integration.

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APPENDICES

Appendix A

Timeline to Committee Review (Lift OFF)

9.17.19	Introduction Lit Review Methodology	Introduction & Methodology Draft 1to KB Wednesday morning Lit Review Draft 3 - Combine Q1 & Q2 into single doc
9.25.19	[redacted]	Revisions to 3 chapters (combine into 1 doc) Mark Fowler in the UK for a week.
10.2.19	Prepare presentation - Capstone Proposal Review	Dr. Bridges out of town Proposal to committee in advance
10.7.19	Capstone Proposal Review (Prospectus) presentation	formal presentation which includes approximately 20 minutes of presenting followed by questions. Following the meeting, complete and sign the Capstone Initial Review by Committee form (Appendix D) authorizing data collection and deliver to Kelly Winn in the Graduate Studies Office IRB process
October - December (or as client requests)	Meet with client Complete data collection	At this meeting, students will discuss the progress of the study, preliminary thoughts about the data, and next steps (such as the Capstone completion date).

August 12 - 18	• 8.14 1st DRAFT LIT REVIEW • Logic model & Research methods	[redacted]

	○ logic model & analysis of program design impacts ○ Evaluation framework ■ Existing evaluations & measurements ■ Mapping impact (outcomes vs. outputs) ■ geographical (breadth) ■ PD observation (depth) • Literature Review
8.17	• Additional research complete • 40 minute Zoom discussion - findings & divvying up themes/remaining writing
8.21	• KB review of possible intro • Draft document READY for initial review • Discuss research methods • Client proposal draft & presentation
8.24	TBD
8.28	• Literature Review • Client proposal draft & presentation

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8.29	• RFA meeting with client 29 • Determine Capstone Committee
September	Write background, literature review, project design, and timeline
September	Complete analysis for IRB determination
October	"Prospectus" - review of the proposed project (background, literature review, project design, and timeline) by the committee.
December	Client check in meeting - students will discuss the progress of the study, preliminary thoughts about the data, and next steps
June 26 - June 30	Data gathering - Finalize client questions (from CodeVA)
July 1 - 7 Team meeting July 3	Client communication - ST information & solidify presentation date ○ Research • Questions • additional (long-term) data needed • methods ○ Literature Review Topics - prelim search
July 8 - 14 Team meeting July 10	Out of town July 8th-12th (Ken)
July 15 - 21 Harrisonburg training (Mark) Out of town (Bryan)	Further organizing of literature & takeaways (Bryan will create) Mark will gather information from academy observations

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Out of town July 17th-20th (Ken)		[redacted]
July 22 - 28 Team meeting July 24 (after July 27 class too if needed)	• Literature Review	
July 29- August 4 Team meeting July 31	8.4 DUE Lit Review Phase 1 1. ALL articles by category (1st pass) 2. Reference list 3. Narrative summaries of findings 4. Search tracking	
August 5 - 11	• Literature Review check in	
9.3.19	Lit Review	Rough draft ready for chair review - Tuesday morning 9.10
9.10.19	Introduction & Methodology	project design, timeline LR ready for chair review - Tuesday morning 9.10 Committee member invitation & Proposal Review (Prospectus) scheduling (KB)

Appendix B

Draft Survey Questions

Suggestions & lingering thoughts about the form:

1) Move thank you statement to end (so they know they are done.)
2) On the likert scale questions, are these the essential things to know from the coach about how the ECA helped THEM?

To what extent do you disagree or agree with the following statements. "As a result of attending the ECA, **I:**"

- Understand CS elementary standards
- Understand my role as a member of the coaching team
- Know and understand the vision
- Can conduct PD that will help others teach…

3) Then does it make sense to have 2 more Qs about

- their district's level of support
- CodeVA's responsiveness to their feedback

4) Last but not least, is it important to know which aspect of CS they will include in PD? It may be so push back if so!

Research Question Alignment	Question	Response Type	Topic
2D	As a result of the Elementary Coaches Academy I have a better understanding of what computer science is?	Dis/Agree 1-5	Workshop Results
2D	This _____element of the Elementary Coaches Academy helped me to have a better working knowledge of the Virginia Computer Science Standards of Learning and how they can be applied to my	Open-Ended	Workshop Results

	current role.		
	This _____element of the Elementary Coaches Academy could be improved to help me have a better working knowledge of the Virginia Computer Science Standards of Learning and how they can be applied to my current role.		
2D		Open-Ended	Workshop Results
2D	What should CodeVA be aware of to make the Elementary Coaches Academy more effective?	Open-Ended	Workshop Results
2D	I am confident that I understand the vision and purpose of CodeVA and how it incorporates the VA Computer Sciences Standards of Learning.	Dis/Agree 1-5	Workshop Results
	To what extent do you disagree or agree with the following statements:		
Question 2A	I clearly understand my role as a member of the CodeVA Coaches team?	Dis/Agree: 1-5	
Question 2A	My opinion influences how CodeVA prepares me as a coach?	Dis/Agree: 1-5	
Question 2A	CodeVA acknowledges my work as a coach?	Dis/Agree 1-5	

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Question 2B	I provided accurate feedback to CodeVA regarding training at the Elementary Coaches Academy?	Dis/Agree
Question 2B	CodeVA used my feedback to guide future trainings in order to meet my individual needs?	Dis/Agree
Question 2C Motivation of non-profits	What motivated you to attend the Summer Elementary Coaches Academy and can you think of any ways others may be motivated to attend?	Open Ended
Question 2C Geographical for equity, motivation and sustainability This could go at the beginning. I think it is necessary to find out how motivation and support is spread geographically,	Which Hub did you attend when taking the Elementary Coaches Academy?	Open Ended
Question 2C Geographical for support equity	How is computer science integration supported in your school district?	Dis/Agree 1-5
Question 1D	As a result of the Summer Elementary Coaches Academy, what PD is likely to be shared with staff at your school/division first?	Open Ended
Question 1D	I am aware of professional	Dis/Agree 1-5

	development activities that can be used to prepare my faculty to implement the Computer Science SOLs.		
Question 1D	What is the most important support CodeVA can provide you to sustain your impact within your school division?	Open Ended	

Appendix C

Focus Group Protocol

Focus Group Protocol for October 26, 2019 OR November 2, 2019

Question 2D: **What impacts the effectiveness of CodeVA's elementary coaches academy?** What are key elements (Mission, Value, Vision, etc.) that would be helpful for strategic planning/long-term planning for CodeVA's Elementary Coaches Academy? How can feedback, input and communication from participants be used in conjunction with the strategic planning of the Coaches Academy for continued success? How is volunteer feedback, input, and communication used to evaluate the Coaches Academy planning and implementation processes?

Focus Group Protocol		
Questions	Target	Responses
1. How can the elementary coaching academy be more effective?	Coach	
2. Are you aware of the mission and vision of CodeVA ? Could you describe what it looks like from your viewpoint?	Coach	
3. Given the nature of your school system, how can the coaching academy best serve you moving forward in 3, 6, 12 months' time?	Coach	
4. If you could speak with the planners of the coaching academy, what would be the most pressing need to	Coach	

discuss with them? Give your top 3.		
5. What made you attend the summer coaching academy?	Coach	
6. What barriers to adopting computer science education is your school system experiencing?	Coach	
7. What other resources for computer science implementation do you use outside the CodeVA elementary coaching academy?	Coach	
8. We are researching factors that impact the effectiveness of the elementary coaching academy. What have we missed? What do we need to know from your experience?	Coach	
1. How can the elementary coaching academy be more effective?	Facilitator	
2. Are you aware of the mission and vision of CodeVA?	Facilitator	
3. Describe feedback you receive about serving as a facilitator from CodeVA? From coaches?	Facilitator	
4. How are new computer science	Facilitator	

initiatives communicated to you? eg. From Code VA or your district?		
5. Could you explain the direction that the elementary coaching academy is taking? If so, what?	Facilitator	
6. What motivated you to become an elementary coaching academy facilitator and why do you continue?	Facilitator	
7. We are researching factors that impact the effectiveness of the elementary coaching academy. What have we missed? What do we need to know from your experience?	Facilitator	

Appendix D

Final Elementary Coaches Academy Survey Questions

Thank you for taking the time to answer the following questions about the CodeVA Elementary Coaches Academy. This information is being collected by a graduate team in the Ed.D. program at Virginia Commonwealth University School of Education in conjunction with CodeVA. The anonymous results will be used in a doctoral capstone project and for program improvement. Your responses will not be identifiable as this Google Form does not collect any personal information. Thank you again for taking the time to complete the following survey.

Question #1: At which hub did you attend training?

- Hub 1: Richmond- Central Virginia
- Hub 2: Suffolk-Tidewater
- Hub 3: Roanoke-Western Virginia
- Hub 4: Fairfax-Northern Virginia
- Hub 5: Harrisonburg-Valley
- Hub 6: Danville/IALR-Southside Virginia
- Hub 7: Abingdon-Southwest Virginia
- I'm not sure…

Question #2: Which of the following topics have you or will you cover as part of professional development at your school or school division? (Check all that apply)

- Algorithms and Programming
- Computing Systems
- Cybersecurity
- Data and Analysis
- Impacts of Computing
- Networking and the Internet
- Scratch
- Other

Question #3: As a result of the Elementary Coaches Academy, how have you as a coach worked to integrate computer science at the local level? (Check all that apply)

- Observation of instruction and feedback
- One-to-one technical support
- Direct Instruction
- Small group instruction
- Modeling
- Building a repository for resource sharing
- Attend further professional development
- Advocated to school or division leadership

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- Other

Question #4: How can CodeVA be more effective in training coaches as part of the Elementary Coaches Academy?
(Open Response Format)

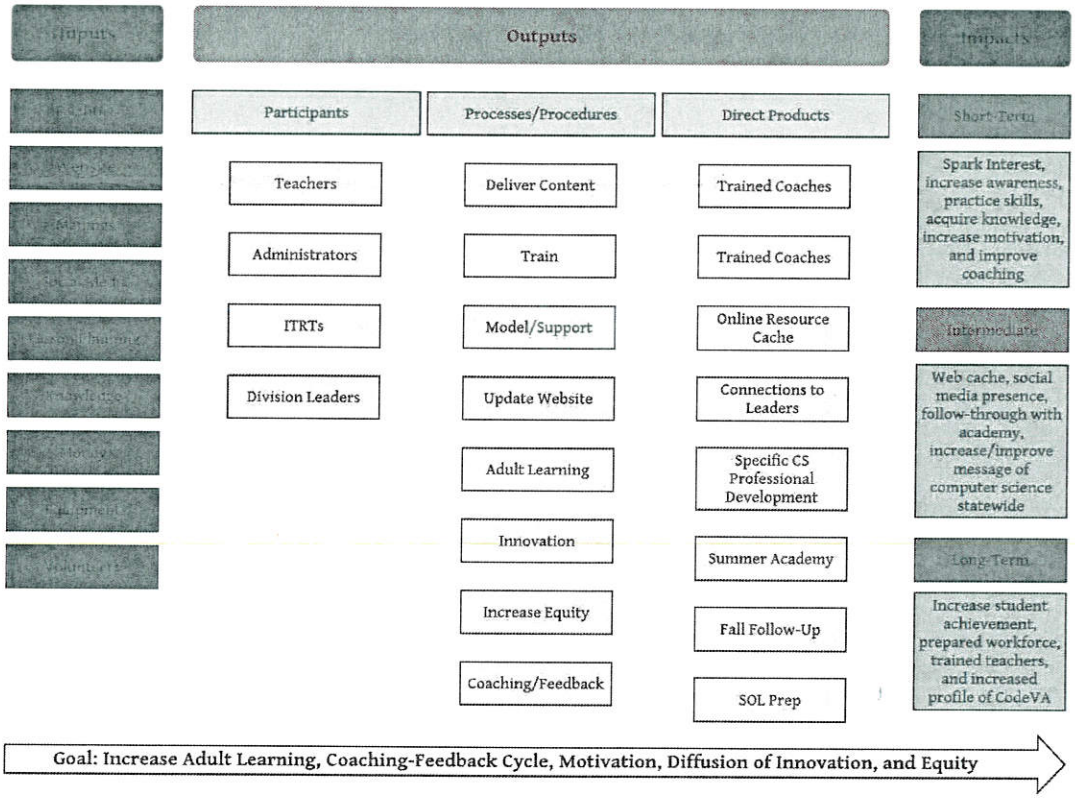
Section #2: To what extent do you disagree or agree with the following statements: (1- Disagree, 2-Somewhat Disagree, 3-Neither Disagree or Agree, 4-Somewhat Agree, 5-Agree)

Question #1: I am aware of professional development activities that can be used to prepare my faculty to implement the Computer Science SOLs as a result of the Elementary Coaches Academy …
Question #2: I clearly understand my role as a member of the CodeVA Coaches team…
Question #3: CodeVA values my work as a coach in my school/school division…
Question #4: CodeVA used my feedback to guide future training in order to meet my individual needs…
Question #5: Computer Science integration is supported in my local school division…
Question #6: I know and understand the vision of CodeVA's Elementary Coaches Academy…

Appendix E

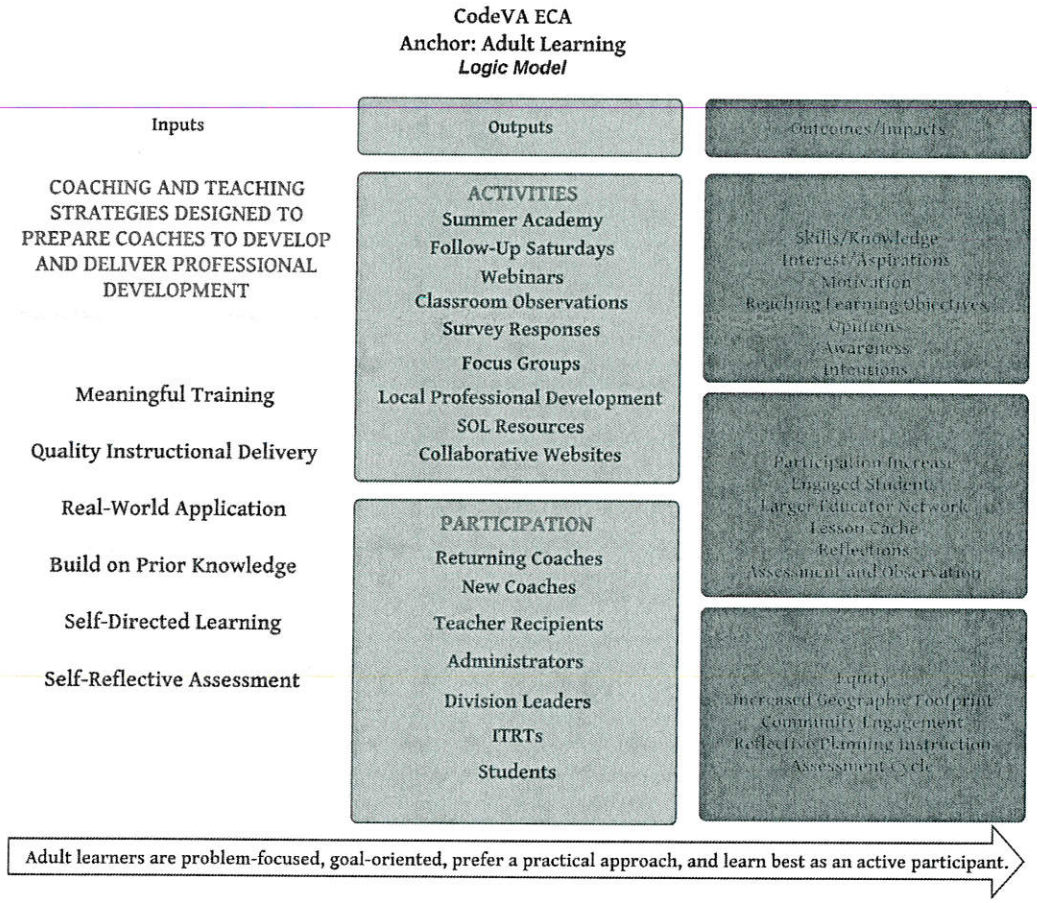
CodeVA Elementary Coaching Academy Logic Model

CodeVA Elementary Coaching Academy
Logic Model



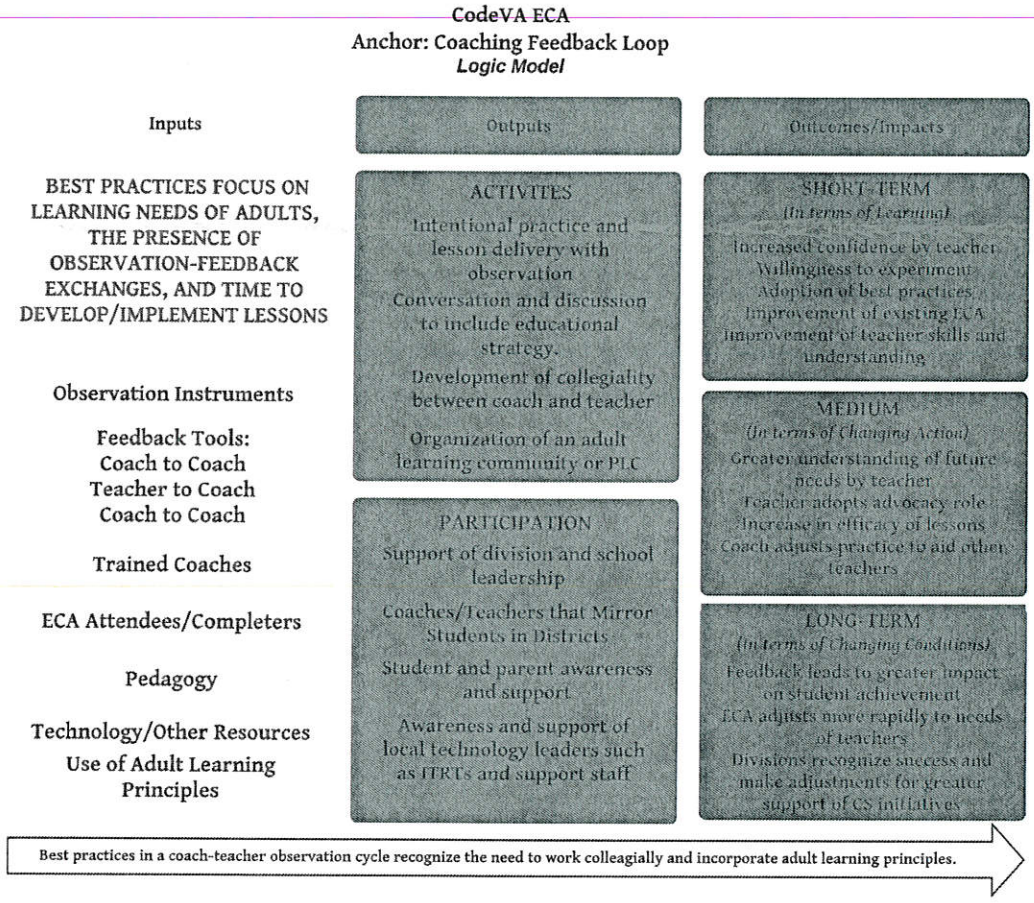
Appendix F

Anchor: Adult Learning Logic Model



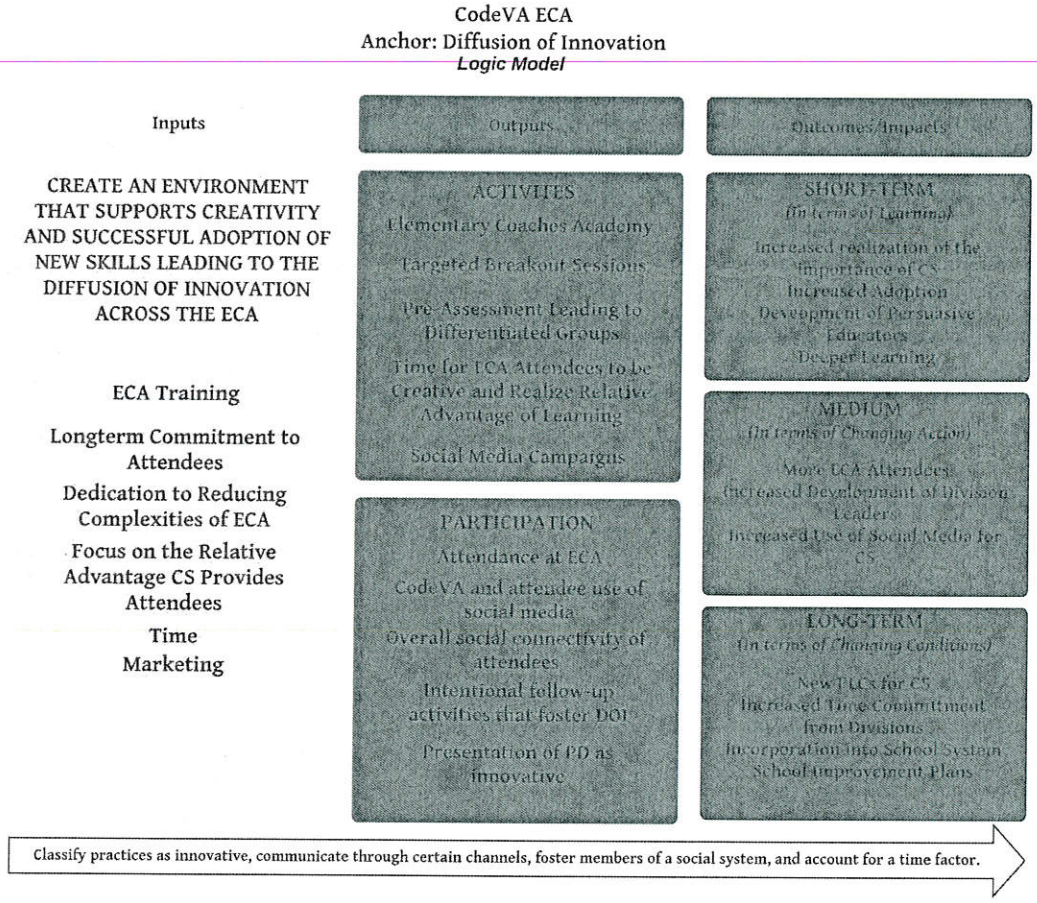
Appendix G

Anchor: Coaching Feedback Logic Model



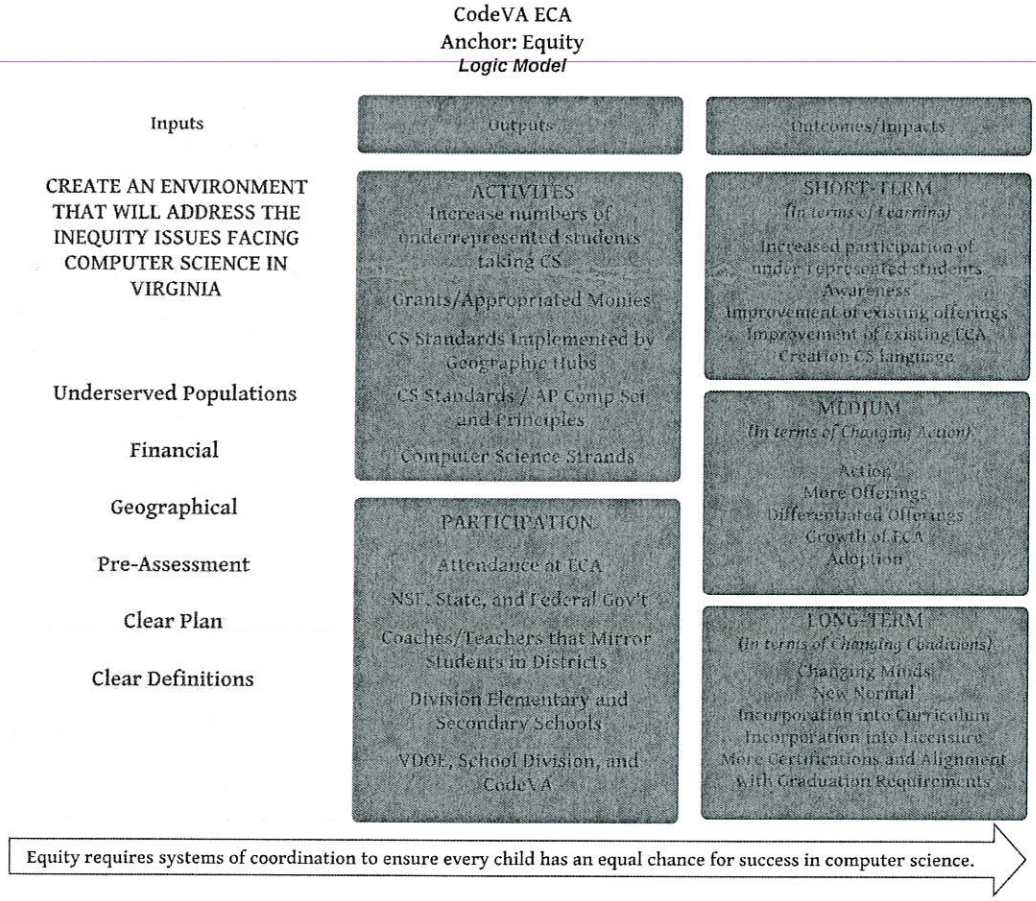
Appendix H

Anchor: Diffusion of Innovation Logic Model



Appendix I

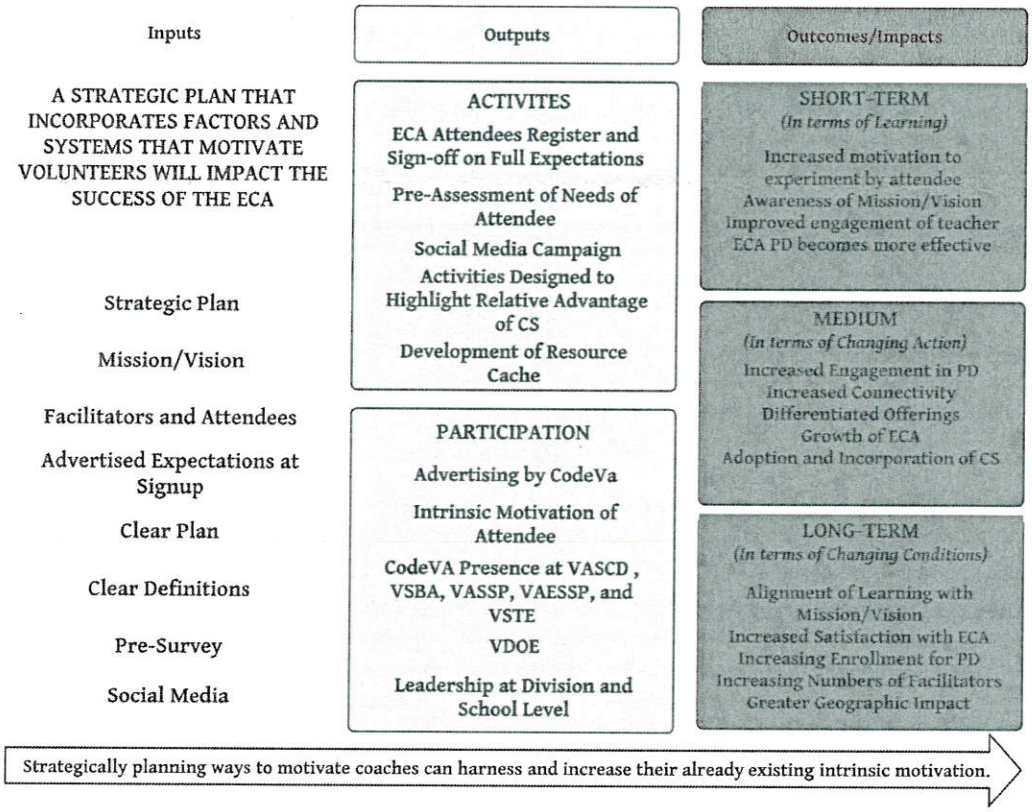
Anchor: Equity Logic Model



Appendix J

Anchor: Motivation Logic Model

CodeVA ECA
Anchor: Motivation
Logic Model



Appendix K

Feedback Facilitator to Coach

School Location _____ **Teacher Name**_____

Observation Date _____ **Class/content Area** _____

Learning Target: __Posted in the room __ Student can articulate __ Used in self-reflection __ None

Content Knowledge

1 2 3 4 5 Exhibits knowledge of the subject matter

1 2 3 4 5 Relates content to the VA Standards of Learning

1 2 3 4 5 Has an understanding of the content based on high expectations

Planning for Learning

1 2 3 4 5 Creates opportunities for differentiated instruction

1 2 3 4 5 Plans lesson time appropriately for content and difficulty level

1 2 3 4 5 Aligns lessons to county curriculum

Delivery for Learning

1 2 3 4 5 Engaged teachers in hands on activities

1 2 3 4 5 Links content to prior knowledge

1 2 3 4 5 Models best instructional practices

1 2 3 4 5 Creates opportunities for peer evaluation/collegiality

Assessment of Learning

1 2 3 4 5 Collaborates with teachers in creating learning goals

1 2 3 4 5 Reinforces constructive and frequent feedback

1 2 3 4 5 Gives opportunities for teacher self-reflection

1 2 3 4 5 Knows impact of lesson at its completion

Learning Environment

1 2 3 4 5 Creates a trusting atmosphere based on competence and character

1 2 3 4 5 Arranges classroom to maximize learning

1 2 3 4 5 Works with teachers in groups and individually

1 2 3 4 5 Content advances 21st century skills (6 Cs)

Appendix L

Feedback Coach to Teacher

School Location _____ **Teacher Name**_____

Observation Date _____ **Class/content Area** _____

Learning Target: __Posted in the room __Student can articulate __Used in self-reflection __None

Content Knowledge

1 2 3 4 5 Teacher exhibits knowledge of the subject matter

1 2 3 4 5 Teacher relates content to the VA Standards of Learning

1 2 3 4 5 Teacher has an understanding of the content based on high expectations

Planning for Learning

1 2 3 4 5 Teacher creates opportunities for differentiated instruction

1 2 3 4 5 Teacher plans lesson time appropriately for content and difficulty level

1 2 3 4 5 Teacher aligns lessons to county curriculum

Delivery for Learning

1 2 3 4 5 Teacher engages students in hands on activities

1 2 3 4 5 Teacher links content to prior knowledge

1 2 3 4 5 Teacher models best instructional practices

1 2 3 4 5 Teacher creates opportunities for student evaluation/collegiality

Assessment of Learning

1 2 3 4 5 Teacher collaborates with students in creating learning goals

1 2 3 4 5 Teacher reinforces constructive and frequent feedback

1 2 3 4 5 Teacher gives opportunities for student self-reflection

1 2 3 4 5 Teacher knows impact of lesson at its completion

Learning Environment

1 2 3 4 5 Teacher creates a trusting atmosphere based on competence and character

1 2 3 4 5 Teacher arranges classroom to maximize learning

1 2 3 4 5 Teacher works with students in groups and individually

1 2 3 4 5 Teacher delivers content that advances 21st century skills (6 Cs)

Appendix M

Feedback from Teacher to Coach

School Location _____ **Teacher Name**_____

Observation Date _____ **Class/content Area** _____

Learning Target: __Posted in the room __ Student can articulate __ Used in self-reflection __ None

Content Knowledge

1 2 3 4 5 Coach exhibited knowledge of the subject matter

1 2 3 4 5 Coach related content to the VA Standards of Learning

1 2 3 4 5 Coach has an understanding of the content based on high expectations

Planning for Learning

1 2 3 4 5 Coach created opportunities for differentiated instruction

1 2 3 4 5 Coach planned lesson time appropriately for content and difficulty level

1 2 3 4 5 Coach aligned lessons to county curriculum

Delivery for Learning

1 2 3 4 5 Coach engaged teachers as students in hands on activities

1 2 3 4 5 Coach linked content to prior knowledge

1 2 3 4 5 Coach modeled best instructional practices

1 2 3 4 5 Coach creates opportunities for teacher self-evaluation/collegiality

Assessment of Learning

1 2 3 4 5 Coach collaborates with teachers in creating learning goals

1 2 3 4 5 Coach reinforces constructive and frequent feedback

1 2 3 4 5 Coach gives opportunities for teacher self-reflection

1 2 3 4 5 Coach knows impact of lesson at its completion

Learning Environment

1 2 3 4 5 Coach created a trusting atmosphere based on competence and character

1 2 3 4 5 Coach arranged classroom to maximize learning

1 2 3 4 5 Coach worked with teachers in groups and individually

1 2 3 4 5 Coach created content that advanced 21st century skills (6 Cs)

Appendix N

Frequently Asked Questions for ECA

The research team suggests creating a FAQs page for CodeVA's ECA to help provide future attendees with quick information about the program. If information is more pronounced and highlighted, it can help to motivate both future and current attendees by arming them with basic information about the ECA program.

- **FAQs for ECA**
  - **Is the training really free? (Needs to be included for FAQs for ECA)**
    - Yes, all the trainings are free for public school teachers. However, CodeVA cannot cover the costs of travel and living expenses.
  - **I've never coded before, is there any experience required? (Needs to be included for FAQs for ECA)**
    - No coding experience is perfectly fine! Our programs are designed to support both novices and experienced computer science teachers. Also, computer science is not just coding. The sessions will cover coding, but you'll also learn the fundamentals of what computer science is such as algorithms, binary, and much more!
  - **I already know how to code, Why do I need this training? (Needs to be included for FAQs for ECA)**
    - Computer science is more than just coding. It's about breaking down problems and finding the best solutions to solve those problems. During these workshops, we'll show you the best methods to teach your students this complex, but rewarding topic. The sessions also include free curriculum and resources.
  - **Can I use a Tablet? (Needs to be included for FAQs for ECA)**
    - No, the programming environments used require the use of a laptop or Chromebook.
  - **How can I add on a Computer Science Endorsement?**
    - There are two routes to the add on endorsement – a Praxis exam or college coursework.
  - **How long is the CodeVA Elementary Coaches Academy?**
    - The program includes online modules covering core content, a week-long in-person practicum, and four follow up sessions during the school year.
  - **When are the four follow up sessions during the school year?**
    - **This information will need to be included in the FAQs by CodeVA.**
  - **What if I don't want to commit to a week long in-person practicum?**
    - **CodeVA offers one-time shorter sessions during the summer that have no follow up sessions during the school year.**

Appendix O

Twitter Slow Chat SMART Goal w/Template

- **Specific**
  - The Twitter Slow Chat will be used to help CodeVA expand the organization's Social Media presence while engaging those who interact with the organization on Social Media.
- **Measureable**
  - Currently, CodeVA has 1,880 followers and that number can grow by using the Twitter Platform more effectively. To measure the effectiveness of the slow chat, will be how many followers engage in the chat through direct tweets, retweets, and replies to those who join the chat. Another measureable will be how many followers join the platform after the initial twitter message and the email message.
- **Attainable**
  - With the organization already having a twitter profile, conducting the slow chat is more attainable. Additionally, this is a free resource that allows the organization to connect with followers across the globe to forward the organization's mission. Furthermore, the organization currently employs a Web Administrator and managing the platform can be something that falls under the administrator's duties and responsibilities.
- **Relevant**
  - The use of a slow chat allows for the organization to pick topics that are relevant to the organization and followers. By using feedback CodeVA, can tailor chats based on relevant topics to the organization and their followers.
- **Timely**
  - The goal for the Twitter Slow Chat will be to engage with followers once a month to expand the organization's social media presence. As the organization engages in Twitter Chats and other uses of Social Media, we will be able to track the number of new followers and the analytics behind what is being posted.

Twitter Slow Chat Question Template/Script:

Initial Twitter Message: @CodeVA is excited to hold our 1st Slow Twitter Chat! In a few moments we will be engaging in a slow chat to discuss topics around Computer Science Principles! We will be using the hashtag #VACodes! You can get involved by following us @CodeVA and engaging in the chat at 12:30!

Email version: CodeVA Nation! We are looking to expand our Social Media presence and we need your HELP! If you do not currently follow us, please follow us on Social Media @CodeVA and encourage others to follow us! Once you follow us, join us on March 26th at 12:30 and engage in our 1st Slow Twitter Chat! With a slow chat, you can tweet back to our questions at any time! You have all day to tweet, retweet and reply to those who will join us! We look forward to seeing you online! We will be using the #VACODES for our 1st chat!

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- **30 Minute Twitter Warning:** CodeVA Nation we are 30 minutes away from the launch of our 1st Slow Twitter Chat! Will you join us?? We're excited are you?! See you in 30 minutes!
- **15 Minute Twitter Warning:** CodeVA Nation we are 15 minutes away from the launch of our 1st Slow Twitter Chat! We will be posting questions for you to engage with us through Twitter! We will be using the #VACODES! Will you join us?? We're excited are you?! See you in 5 minutes!
- **5 Minute Twitter Warning:** CodeVA Nation we are 5 minutes away! The time is now! Follow us @CodeVA! Watch for the questions and use the #VACODES! Will you join us?? We're excited are you?! See you in 5 minutes!

Opening Twitter Chat Message: Welcome CodeVA Nation! We are excited to welcome you to our 1st Slow Twitter Chat! For Q1 tell us who you are, your role and where you are checking in from?

- **Q1: Tell us who you are? What is your role and where you are checking in from?**
- **Q2: What do you know about the new Computer Science Standards and how can CodeVA help you understand them more?**
- **Q3: How do you teach your students to use the Computer Science Standards?**
- **Q4: What is one new or innovative strategy you have used to engage your students through the new Computer Science Standards?**

Appendix P

Social Media Campaign SMART GOAL (What CS means to me? #VACODES)

- **Specific**
  - To increase the social media presence of the organization, a Social Media Campaign centered around followers posting 30 second to one minute videos answering the question of (What Computer Science (CS) means to me?) has been created.
- **Measureable**
  - Currently, CodeVA has 1,880 followers, and that number can grow by using the Twitter Platform more effectively. To measure the effectiveness of the campaign, data will be collected to show how many followers engage with the campaign through videos posted, direct tweets, retweets, and replies to those who have posted videos.
- **Attainable**
  - With the organization already having a Twitter profile, launching the campaign is quite easy. Additionally, this is a free resource that allows the organization to connect with followers across the globe to forward the organization's mission. Furthermore, the organization currently employs a Web Administrator, and managing the platform can be something that falls under the administrator's duties and responsibilities.
- **Relevant**
  - The use of a slow chat allows for the organization to pick topics that are relevant to the organization and followers.
- **Timely**
  - The goal for this campaign will be to engage with followers through a 30 day challenge to have them share why Computer Science means so much for them. As the organization engages in the campaign and other uses of Social Media, we will be able to track the number of new followers and the analytics behind what is being posted.