Camdenton R-3 Status of Technology and STEM Education Report

Spring 2017

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DRAFT

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1. Camdenton R-III School District: Strategic Plan 2015-2020: Technology & STEM Education

Technology & STEM References

The following are excerpts from the district strategic plan that are related to ==technology== and ==STEM== ==education==:

Camdenton R-III School District
Strategic Plan 2015-2020
Vision Statement
Everyone Learning Every Day!

Mission Statement
The Camdenton R-III School District will create a learning community that maximizes each individual's performance for future success.

Organizational Values
1. Student success, both individually and collectively
2. Engaging, encouraging environment for faculty and staff
3. Supportive district leadership and Board of Education
4. Active, ongoing engagement with stakeholder groups
5. Responsible use of all resources

Competitive Advantages
1. Recent bond issue passage leading to new and updated facilities
2. Commitment to communication and transparency
3. Effective financial management practices

4. ==Evolving academic programming aimed at expanding college and career readiness==

5. Growing relationships (formal and informal) with all communities being served

Strategic Issues
1. Large geographic footprint makes it difficult to develop a singular school district "community"
2. Changing government policies, not all of them met with total support among stakeholders, which can impact district/patron relationships
3. Delivering education that targets the needs of each individual student
4. Continuous funding uncertainty at the state level

5. ==Making certain that facilities and technology for student and staff use remain current enough to enable, rather than inhibit, the delivery of a quality education==

Organization-wide strategies

1. Camdenton R-III will have a facilities plan for the next five years that incorporates anticipated building and technology needs, and that will keep stakeholders informed as milestones are reached and steps are taken.

2. ==Camdenton R-III will expand its academic offerings to better serve students of all skill levels and interests, and will seek to provide equitable opportunities to all students, no matter where they live in the district.==

3. Camdenton R-III will have plans in place to build stronger, mutually beneficial relationships with a broader array of stakeholder groups.

Goal area: College and career-ready curriculum

Objective: ==The Camdenton R-III School District will offer curriculum that prepares students effectively for the next phase in their lives and will keep that curriculum current with changing student and marketplace needs.==

Persons Responsible: Central Office and Building Administrators

Progress measures:

1. ==Students will achieve performance in the top 10% statewide on the Annual Performance Report from DESE.==

2.   S.T.E.M. courses will increase in number by the 2016-2017 school year, will be equivalent to peer districts by the 2017-2018 school year, and will offer at least one unique course in this area (not available in all peer districts) by the start of the 2020-2021 school year.

3.   Building-to-building course equivalency will improve each school year, with the goal of full equivalency (or documentation as to why that is not possible or not appropriate in specific cases) by the start of the 2020-2021 school year.
4.   Courses that teach "skills for life" (or the inclusion of such skills in existing courses) will begin by the 2016-2017 school year.
5.   By the end of each academic year, 90% of students will show at least one year's growth in their communication arts scores.

Strategies and tactics (action steps)

Strategy: A plan to expand course offerings in S.T.E.M. will be created and executed.

1.   A district team (faculty, staff, administration, students, etc.) will be selected to be responsible for researching leading-edge S.T.E.M. courses in regional peer districts, statewide and, where appropriate, nationally.

2.   Research will be conducted with recent (within the last four years) alumni who are attending/attended college to determine S.T.E.M. areas where they felt well-prepared and those that fell short once they were introduced to college-level curriculum on the same subject areas.

3.   From this research, a prioritized list of courses to be added will be prepared, identifying the challenges – budget, staffing, facility shortcomings, etc. – that will need to be overcome to add identified courses.

4.   A timetable for implementation of identified courses will be set, along with identifying responsible parties for various steps in the implementation process.

Goal area: Facility effectiveness

Objective: The Camdenton R-III School District will have facilities that are safe, and that enable, rather than inhibit, the delivery of a high-quality education.

Persons responsible: Central Office, Maintenance Director, Building Administrators, Safety Coordinator.

Progress measures:

1.   A connected learning community will be developed through a comprehensive technology plan that identifies, develops, and provides access to the digital tools, devices, and support that will expand visionary administrative leadership, improve teacher effectiveness, and raise student achievement. This plan will be drafted during the 2015-2016 school year and launched in time for the 2016-2017 school year.

Strategy: Current and anticipated student and staff technology needs will be determined during Strategic Plan period and matched with an appropriate protocol for updating technology.

1.   An independent technology audit will be conducted to compare the district's status and current plans for upgrading with model school districts.

2.   Using this audit as the starting point, a committee of parents, faculty, staff and, if possible, the author of the audit will create (and monitor the execution of) and assemble a plan to keep the district current with student and staff technology needs and industry improvements.

As a result of the strategic plan, two primary district committees were formed: the Technology committee and STEM committee. From these committees various subcommittees have been formed to address important issues within these frameworks (see below). Details of these committees will be addressed later in this report.
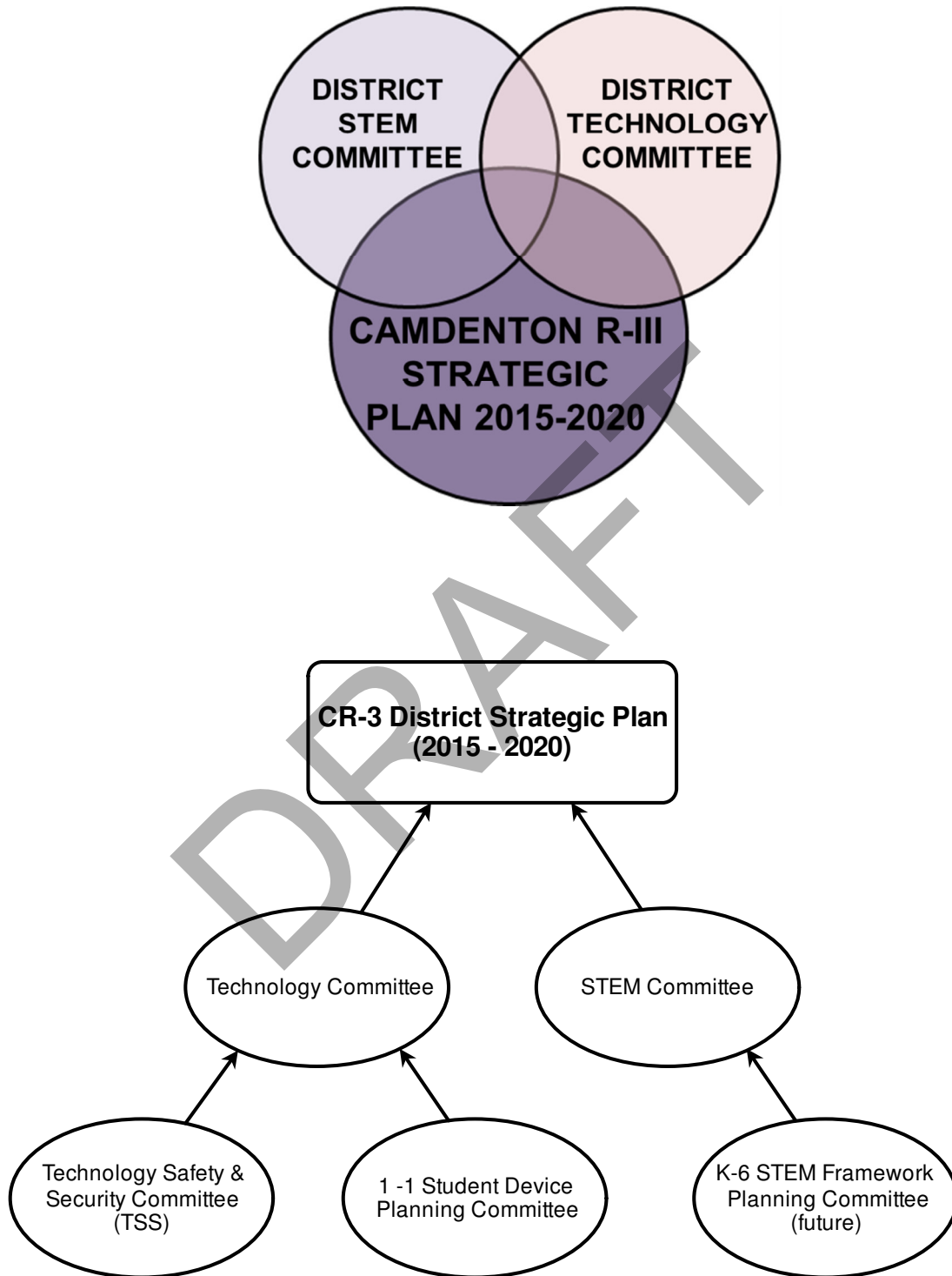
2. Technology Committee

Technology Plan

As a result of the technology initiatives in the strategic plan, the technology committee was formed last year. The committee went on site visits and after extensive research and surveying of district stakeholders, a district technology plan was created with goals and objectives for 2016-2020. The plan is broken up into four key areas of focus: 1) Innovative Teaching and Learning, 2) Systems and Procedures, 3) Ethics, Responsibility, and Equity, and 4) Connected and Collaborative Learning Community. For the 2016-2017 year, the committee has focused on a number of goals and objectives from the four key areas. The following is an example template used to identify and focus efforts towards meeting the intended goals. The committee has met twice this year to assess progress, review artifacts, and evaluate effectiveness towards meeting the goals of the technology plan.

Goal Area: Innovative Teaching and Learning

Objective 1: To effectively integrate technology into instruction to enhance learning for all stakeholders and ensure college and career readiness.

Strategy	Action Step	2016-2017 Focus Area	Artifacts	Persons Responsible
Improve teaching and learning through digital age learning experiences and assessments.	Utilize technology resources to personalize student learning, provide relevance, and inspire creativity.	1-1 initiative, technology infrastructure, and bandwidth upgrade	Comparison data for district devices year-year - compare with student enrollment E-rate documentation for new infrastructure upgrades Bandwidth provider documentation STEM stakeholder baseline survey results (BrightBytes)	Technology Department Instructional Coaches
	Provide opportunities for students to use critical thinking skills to solve real-world problems using technology. Design student learning activities in which students are actively using technology (collaboration, communication, critical thinking, and creation) as opposed to passively consuming content.	District STEM Committee Team efforts Utilize a STEM inventory tool to select STEM framework. District Site Visits STEM stakeholder initiative using BrightBytes	Site Visit Meeting Minutes District STEM Committee Meeting Minutes STEM stakeholder baseline survey results (BrightBytes) District STEM Inventory Tool Status Report PLTW Pilot Documentation School Board STEM Committee presentation	District Technology Committee and District STEM Committee STEM Director Instructional Coaches Director of STEM Education

3. 1 – 1 Student Device Plan & Teacher/Lab Replacement Plan
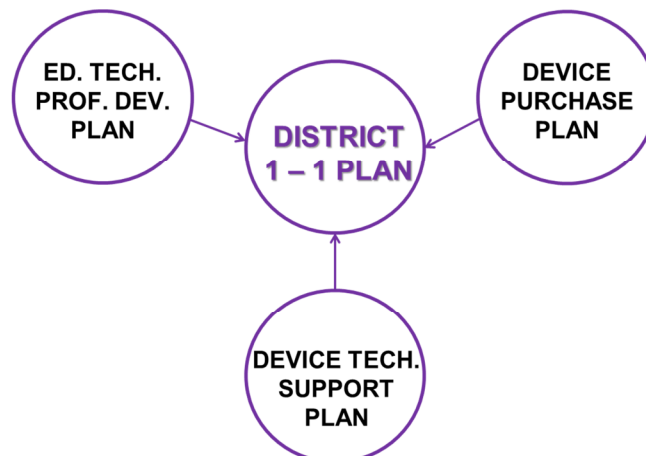
A direct result of several of the goals and objectives of the district technology plan was the creation of a 1 – 1 Student Device Plan. This plan is a multi-phase approach toward the long-term goal of equipping every student grades 5 – 12 with a district-issued computing device. The goal is to be 1 – 1 with students 5 – 12, 2 – 1 for grades 3 – 4, and 3 – 1 for grades K – 2 by the final year of the strategic plan in 2020.

The motivation for going 1 – 1 for the district is motivated by extensive research that shows a significant increase in student achievement through improved student engagement & motivation, enhanced research skills, improved collaboration & teamwork skills, and personalized learning & real-time interventions. There are also studies that show the following benefits (Greaves, T.; Hayes, J.; Wilson, L.; Gielniak, M.; & Peterson, R., The Technology Factor: Nine Keys to Student Achievement and Cost-Effectiveness, MDR 2010):
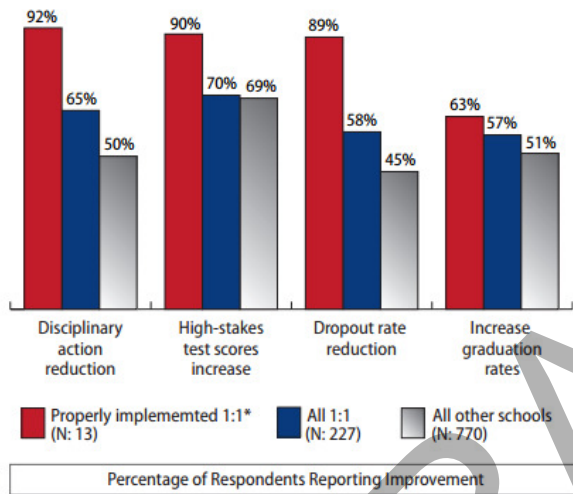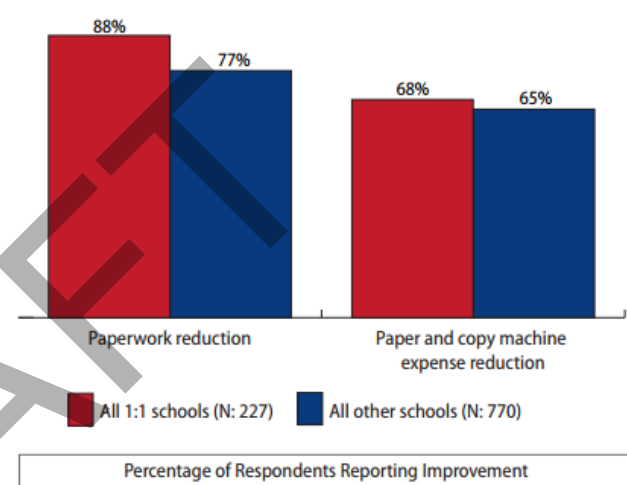
Due to the prohibitive cost of going 1 – 1 immediately, a plan was devised to phase it in by the 2020-2021 school year. *The cost for year one is covered with no additional funding by reallocating existing funding.* In year 1 (i.e. 2017-2018), grades 5,7, & 9 will purchase enough new Chromebooks so that combined with their existing new models they will be 1 – 1. Existing computer labs and computers in carts will provide computer resources for grades 6,8, & 10 – 12. In the interest of equity, grades 5 – 12 will also gift half of their existing Chromebooks to grades K – 4 in order to raise their device densities towards meeting their device ratio goals. In year 2, students in grades 5,7 & 9 will take their Chromebooks to the next grade (6,8, & 10) and grades 5,7 & 9 will purchase enough new Chromebooks for 1 – 1. Older Chromebooks K – 4 will be replaced and new devices purchased to maintain student to device ratio goals. *Figure 1* below shows the exisiting student device numbers in the K – 4 buildings along with the number they will be receiving from 5 – 12 buildings as well as the approximate value of the gifted devices. *Figure 2* shows the current student to device ratio versus next year following implementation of year 1 of the plan – the student device ratio decreases substantially in each building toward the final goals mentioned above. *Figure 3* is the long term Chromebook purchase and replacement plan on the path to 1 – 1. It assumes the cost of replacing an entire grade of devices is $120,000 and a Chromebook lifecycle is 4 years. *Figure 4* represents a replacement plan for existing desktops and laptops assuming a 10 year replacement for desktops and a 5 year replacement cycle for laptops. This also assumes that as the 1 – 1 device plan is implemented, computer labs in buildings will no longer be necessary.

Building	Chromebook models				Total current Devices	Gifted #	$ value received
	C7	720	740	11			
Dogwood	27	113	88	1	229	139	$22,259
Hawthorn	51	71	138	81	341	207	$33,145
Osage Beach	19	11	125	0	155	94	$15,066
Hurricane Deck	0	2	72	1	75	46	$7,290
TOTALS	97	197	423	83	800	486	$77,760

Figure 1: Existing Chromebook Inventory (K – 4) & Devices received from 5 – 12 Buildings

Building	Student Population	# of Devices (2017)	Student Device Ratio (2017)	# of Devices (2018)	Student Device Ratio (2018)
Oak Ridge	633	477	1.3	542	1.2
High School	1350	353	3.8	540	2.5
Hawthorn	466	341	1.4	548	0.9
Middle School	640	298	2.1	472	1.3
Dogwood	747	229	3.3	368	2.0
Osage Beach	316	155	2.0	249	1.3
Hurricane Deck	199	75	2.7	121	1.6
TOTAL (district)	4351	1928	2.3	2840	1.5

Figure 2: CR-3 student to device ratio per building comparison 2017 to proposed 2018

Grade	5	6	7	8	9	10	11	12	COST / YR
Cbook(yr)	11(1)		11(1)		11(1)				2017-2018
									-
Grade	5	6	7	8	9	10	11	12	
Cbook(yr)	12(1)	11(2)	12(1)	11(2)	12(1)	11(2)			2018-2019
	$120,000		$120,000		$120,000				$360,000
Grade	5	6	7	8	9	10	11	12	
Cbook(yr)	13(1)	12(2)	11(3)	12(2)	11(3)	12(2)	11(3)		2019-2020
	$120,000								$120,000
Grade	5	6	7	8	9	10	11	12	
Cbook(yr)	14(1)	13(2)	12(3)	11(4)	12(3)	11(4)	12(3)	11(4)	2020-2021
	$120,000								$120,000
Grade	5	6	7	8	9	10	11	12	
Cbook(yr)	15(1)	14(2)	13(3)	12(4)	15(1)	12(4)	15(1)	12(4)	2021-2022
	$120,000				$120,000		$120,000		$360,000
Grade	5	6	7	8	9	10	11	12	
Cbook(yr)	16(1)	15(2)	14(3)	13(4)	16(1)	15(2)	16(1)	15(2)	2022-2023
	$120,000				$120,000		$120,000		$360,000
Grade	5	6	7	8	9	10	11	12	
Cbook(yr)	15(3)	16(2)	15(3)	14(4)	17(1)	16(2)	15(3)	16(2)	2023-2024
					$120,000				$120,000

Figure 3: Long term student 1 – 1 device purchase and replacement plan with annual cost estimates
Note: 11(1) represents 11 for the model number and (1) indicates the year in the Chromebook's life cycle. The assumption is that every year the model number increases. So for example, 14(4) indicates a Chromebook that was new in 2020 and it is in the 4th year of its life cycle.

Model	Vendor	Release Date	Age	Type	Number	REPLACE OLD DEVICES WITH NEW					
						2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
E2610	Gateway	2006	11	Desktop	105	105					
745	Dell	2007	10	Desktop	11	11					
755	Dell	2008	9	Desktop	201		100	101			
ThinkCentre M58	Lenovo	2008	9	Desktop	5		5				
760	Dell	2009	8	Desktop	224			112	112		
ThinkCentre M58e	Lenovo	2009	8	Desktop	46			23	23		
780	Dell	2010	7	Desktop	17				17		
ThinkStation E30	Lenovo	2011	6	Desktop	17					17	
7010	Dell	2012	5	Desktop	183					91	91
7020	Dell	2014	3	Desktop	55						55
T400	Lenovo	2008	9	Laptop	5	5					
T410i	Lenovo	2010	7	Laptop	4	4					
T420	Lenovo	2011	6	Laptop	20	20					
X131e	Lenovo	2012	5	Laptop	187		93	93			
E6530	Dell	2012	5	Laptop	44		22	22			
Edge	Lenovo	2012	5	Laptop	7		7				
M4700	Dell	2012	5	Laptop	1		1				
x140e	Lenovo	2013	4	Laptop	102			51	51		
M4800	Dell	2013	4	Laptop	18			9	9		
E6540	Dell	2013	4	Laptop	11			6	5		
E5540	Dell	2014	3	Laptop	39				39		
1225B	Asus	2014	3	Laptop	6				6		
EDU 11e	Lenovo	2014	3	Laptop	4				4		
E5550	Dell	2015	2	Laptop	183					91	91
E5570	Dell	2016	1	Laptop	62					31	31
Total					1557	*145*	*228*	*417*	*266*	*230*	*268*
Year						*2017-2018*	*2018-2019*	*2019-2020*	*2020-2021*	*2021-2022*	*2022-2023*
***Annual Cost**						*$130,500*	*$205,200*	*$375,300*	*$239,400*	*$207,000*	*$241,200*
***Annual Cost Assuming 1 - 1 Grades 5-12 by 2020-2021**						*$117,450*	*$164,160*	*$243,945*	*$131,670*	*$82,800*	*$96,480*

Figure 4: Long term replacement plan for replacing teacher and computer lab devices

4. Technology Infrastructure Upgrades

District Bandwidth

Over the last few years, district need for bandwidth has increased substantially due primarily to increased device density, widespread use of videos and live streaming, and computerized testing. As a result, the district bandwidth has gone from 250 Mbps last year and the start of this year to 500 Mbps in November and next year it will double again to 1 Gbps. The following are actual data usage graphs from Spring 2016, Fall 2016, and then 10 days in mid-February 2017.   Ideally, the average bandwidth usage for the day should not exceed 40% of the maximum available bandwidth (red dashed line).
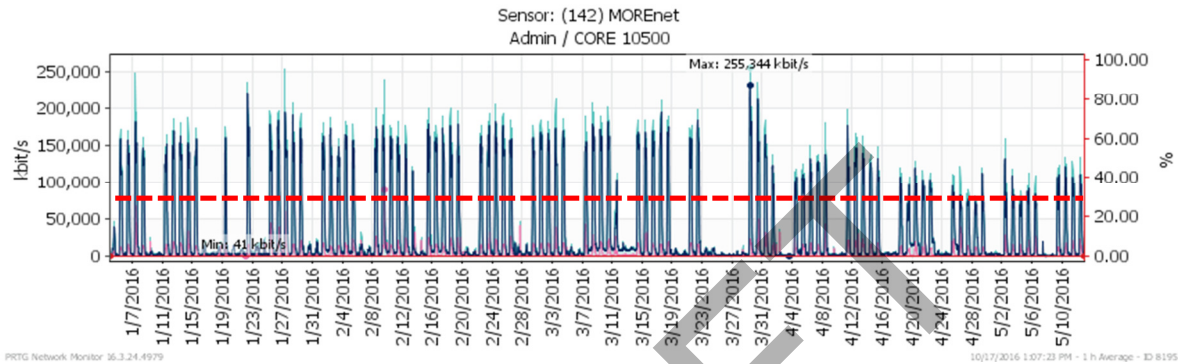

Figure 5: District bandwidth data <u>Spring 2016</u> (250 Mbps max) wired and wireless throttled
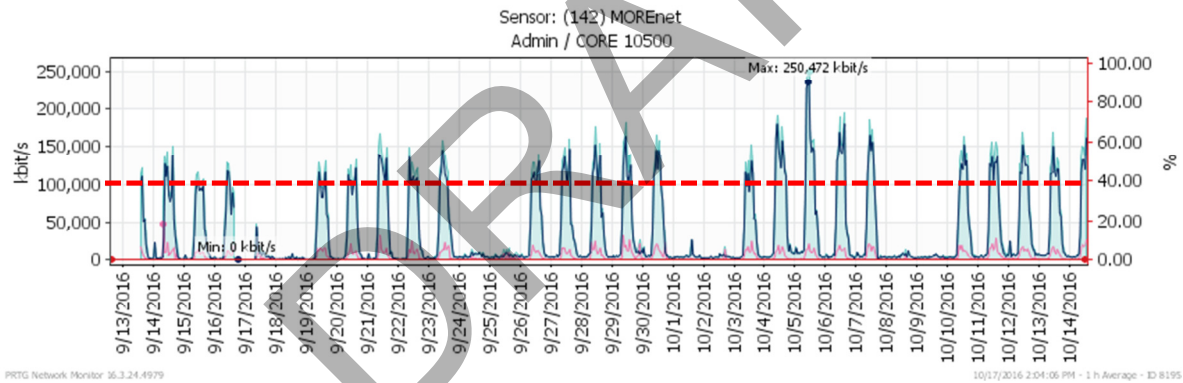

Figure 6: District bandwidth data <u>Fall 2016</u> (250 Mbps max) wired and wireless throttled, R3 public blocked and services such as audio streaming and video streaming blocked
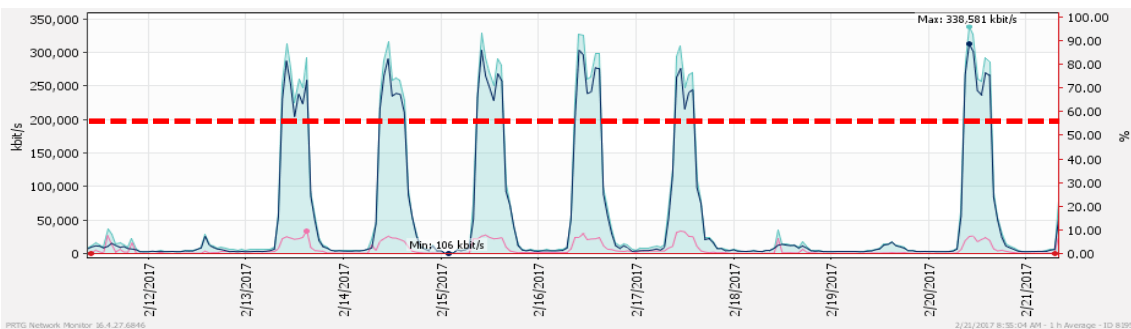

Figure 7: District bandwidth data <u>Feb. 2017</u> (500 Mbps max) wired and wireless throttled

IT Infrastructure

The district network infrastructure has seen significant improvements in the last year. These upgrades are necessary primarily because of the same reasons that the district requires a higher bandwidth capability. The demand for wireless internet access in all educational spaces has prompted the purchase and installation of 144 new wireless access points in various district buildings this year. Next year we will be adding an additional 120 wireless access points. In addition, we have purchased several network switches, switch mount racks, and uninterruptible power supplies to improve the speed and reliability of our existing network. Next year we will be purchasing and installing extensive intra-building fiber optic cabling to ensure that our network hardware can support the higher demand for more bandwidth going forward. The majority of funding (80%) for these projects comes from USAC E-rate funding (Category 2).

VoIP Phone System

The technology group has also supported the transition of our existing PRI phone system to the new VoIP system that runs on our district network. We have worked extensively with Missouri Bell Telephone, Charter, and Midwest Computech to ensure that our network infrastructure will support the additional requirements and functionality of the new system. We are now fully functional on the new VoIP system and are piloting a transition from Charter's T1 line access to SIP trunking which will allow us to take full advantage of the VoIP system. This crossover should be complete within few weeks.

5. State of Technology: Data Acquisition & Analysis (BrightBytes)

Results for Students, Teachers, Parents

In support of numerous district technology initiatives (technology committee, STEM committee, PD committee, curriculum, etc.), our district partnered with GOCSD (Greater Ozark Cooperating School Districts) to complete a data acquisition effort aimed at gauging the state of technology in our district. There were 5 other districts within GOCSD that also participated in their respective districts and served as cohort group for the data analysis. Participants included students, teachers and parents. The data acquisition focused on 4 key technology areas Classroom, Access, Skills, and Environment (CASE). Each general area was given an overall score from beginning/emerging up to advanced/exemplary (800 – 1300). Within each technology area participants were asked numerous detailed questions that allowed for a better picture of technology knowledge and utilization within those specific areas. *Figure 8* shows the district data on the participation rate for the survey. *Figure 9* shows an overall rating comparison for the data nationally (All Technology & Learning), with the GOCSD cohort, and our local district data. It also shows an overall rating for each of the four specific areas (CASE). Overall, the data indicates that the district is proficient and similar in performance to the national and cohort data. Similarly, the district is similar in performance to the other entities with regard to the CASE areas. *Figure 10* shows the district performance data with regard to specific areas related to each CASE area with indicators on the beginning to exemplary scale.
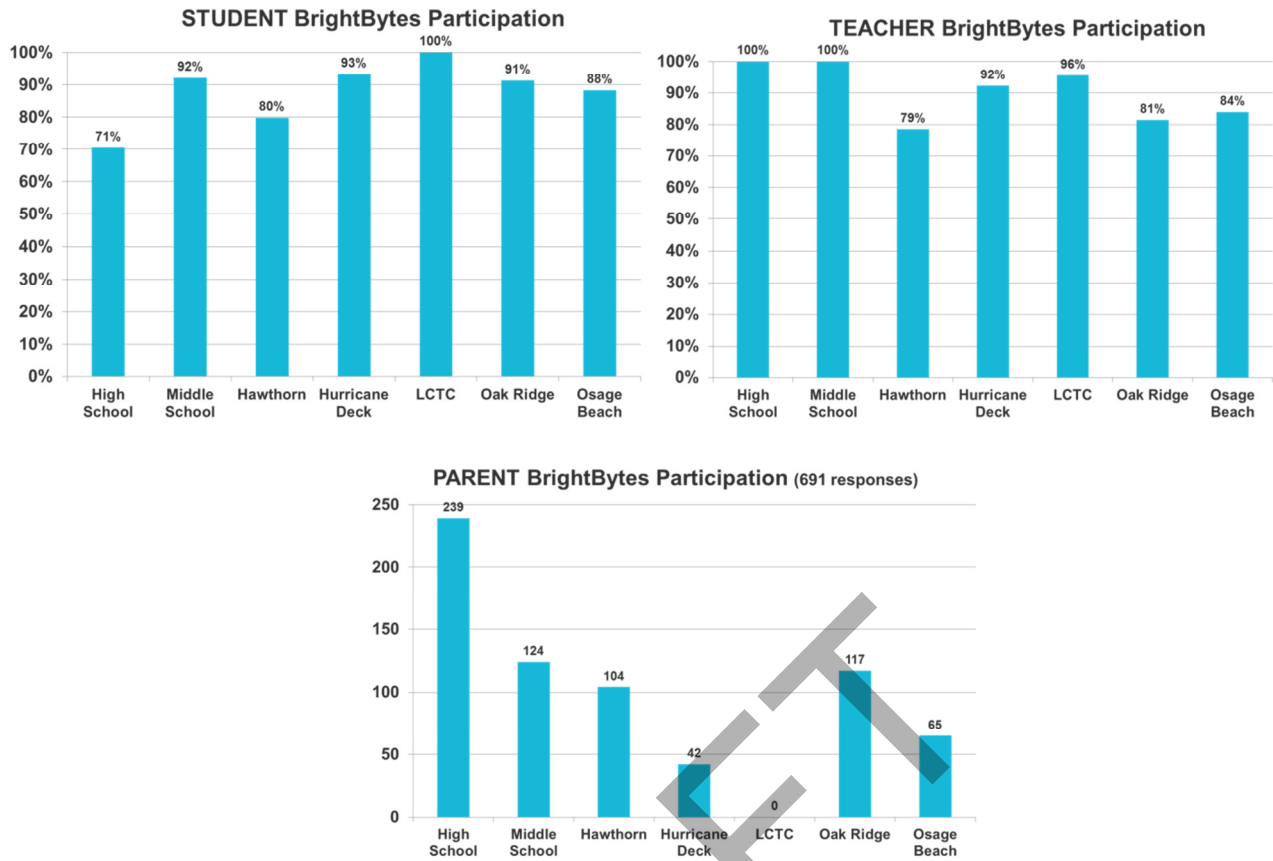
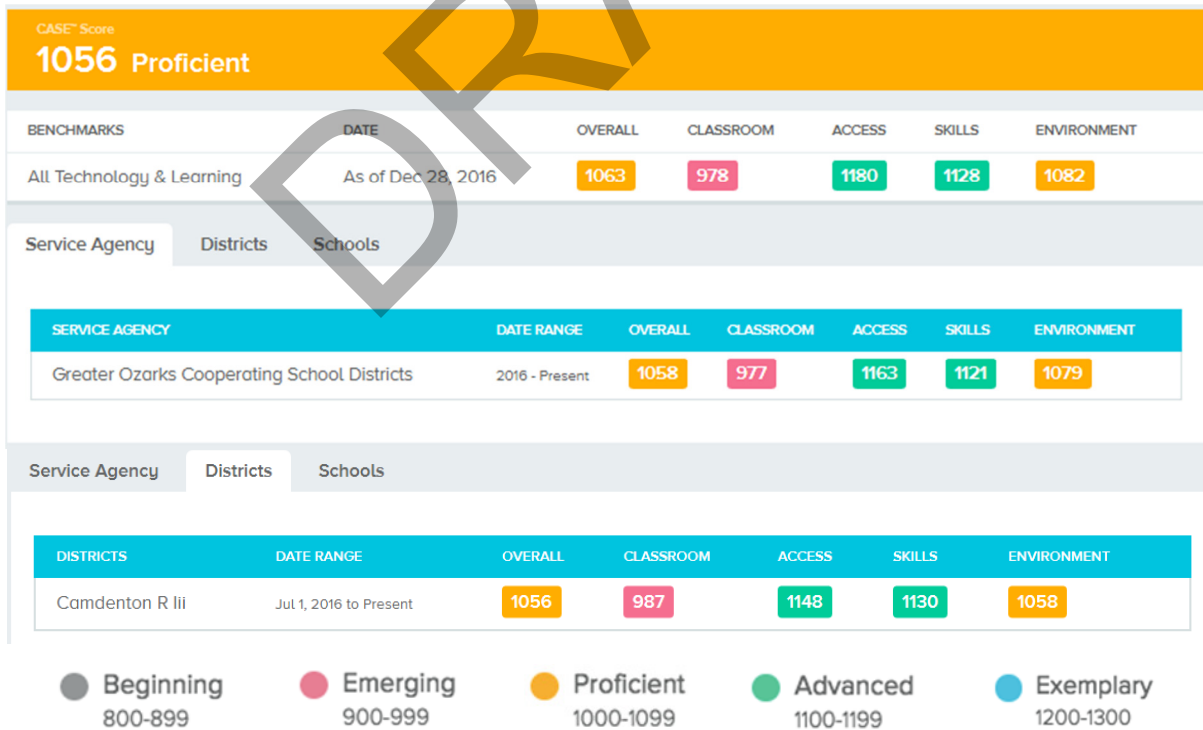**Figure 8: BrightBytes technology data acquisition participation data**

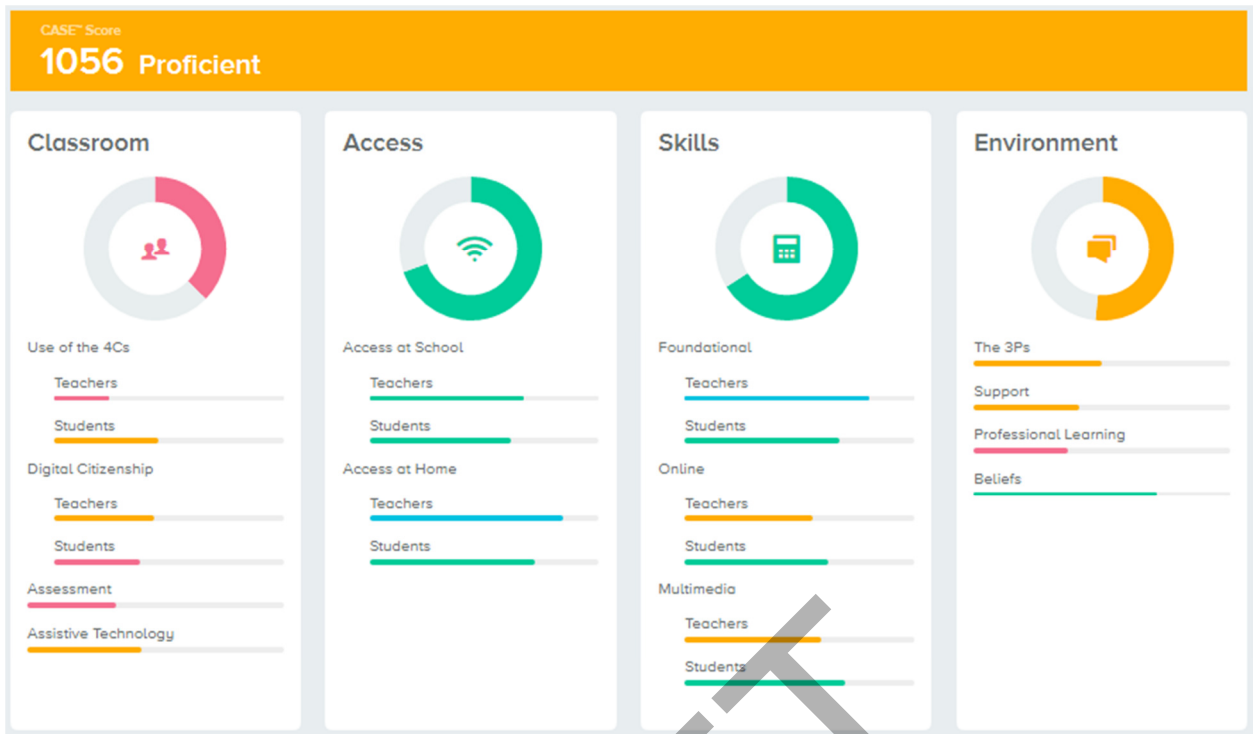**Figure 9: Overall & CASE scores comparisons: National, GOCSD, CR-3 district**

Figure 10: CR-3 district data for CASE framework by specific area

Advanced Areas

The data in *Figure 10* indicates several areas of strength for strength for the district. The strengths are primarily in the areas of access and skills. District stakeholders have confidence that they can access the technology they need at both home and school including access to computing devices and wired and wireless internet. In addition, they are confident in their ability to engage in foundational, online, and multimedia skills.

Emerging Areas

The data also indicates there are key areas that should be targeted for improvement. The need for improvement is focused primarily in the areas of classroom and environment. *Figure 11* shows areas identified as "emerging". They are identified as "Teacher Use of the 4C's", "Student Digital Citizenship", "Assessment", and "Professional Learning". The 4C's refers to communication, collaboration, creativity, and critical thinking.
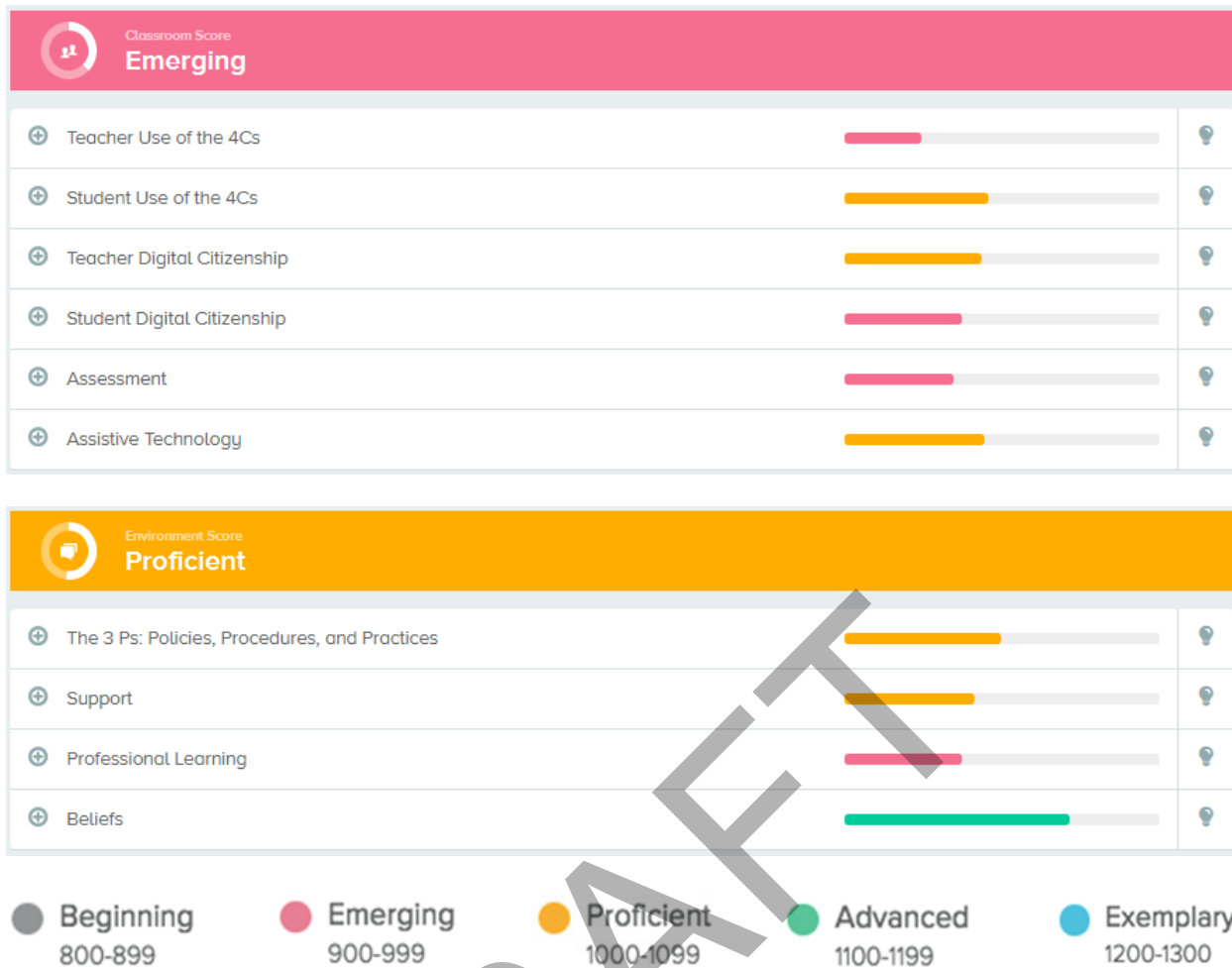
Figure 11: Emerging areas targeted for improvement

Action Plans

The district technology and STEM teams are in the process of analyzing the BrightBytes data and creating action plans to address the areas targeted for improvement. The following table shows the emerging targeted area and the corresponding remediation to address the issue. This is an ongoing improvement and these remediation initiatives are not final.

Emerging Area	Remediation
Teacher Use of the 4C's	Implement PLTW STEM Framework K – 12
Student Digital Citizenship	Expand Oak Ridge program as a model for district
Assessment	1 – 1 Device Rollout and associated PD
Professional Learning	Coordination of PD, Technology & STEM Committees

Figure 12: BrightBytes Emerging Areas and Remediation

6. Technology Policies & Procedures

The technology department has implemented an initiative to create policies and procedures for all technology-related district processes. This is an ongoing effort, but to date the following have been approved: Technology Purchasing Process, New Project Initialization (NPI), & New Pilot Request (NPR), Technology Buying Guide, Service Level Agreement (SLA). There is also a new Support Portal for the district that all stakeholders can access to obtain these and all other relevant technology documents. *Figure 13* shows an example of the new technology purchasing workflow as part of the new process.
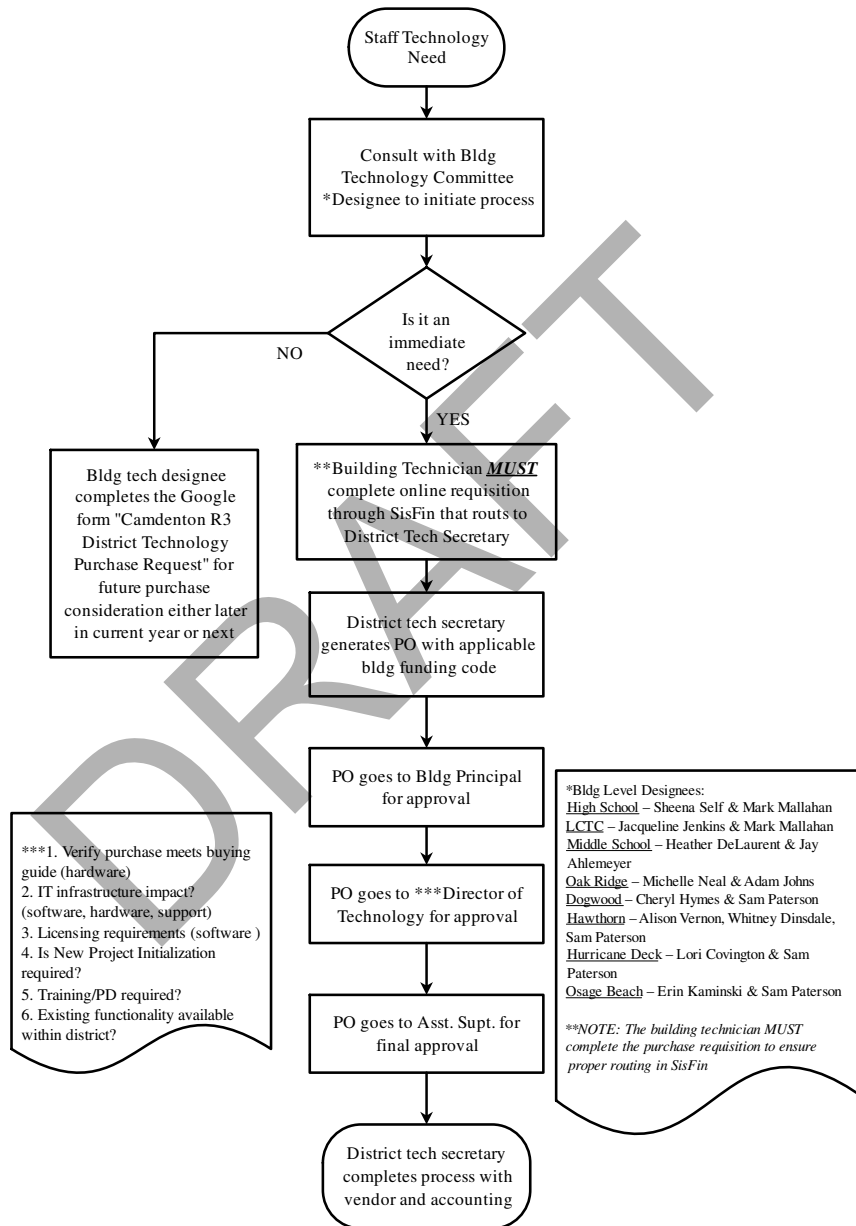

Figure 13: District technology purchase workflow

7. STEM Education

The district STEM committee consists of a diverse group of stakeholders that was formed last year (2015-2016) in order to address the large number of STEM-related issues in the district strategic plan. Since its inception, the committee has achieved a number of milestones with regard to implementing the STEM components of the plan. The committee first identified a framework structure to plan and assess progress toward the team goals and objectives. The committee has been utilizing the Carnegie Science Center STEM Excellence Pathway Rubric Tool. **Figure 14** shows the flowchart for implementing a STEM program using the pathway.
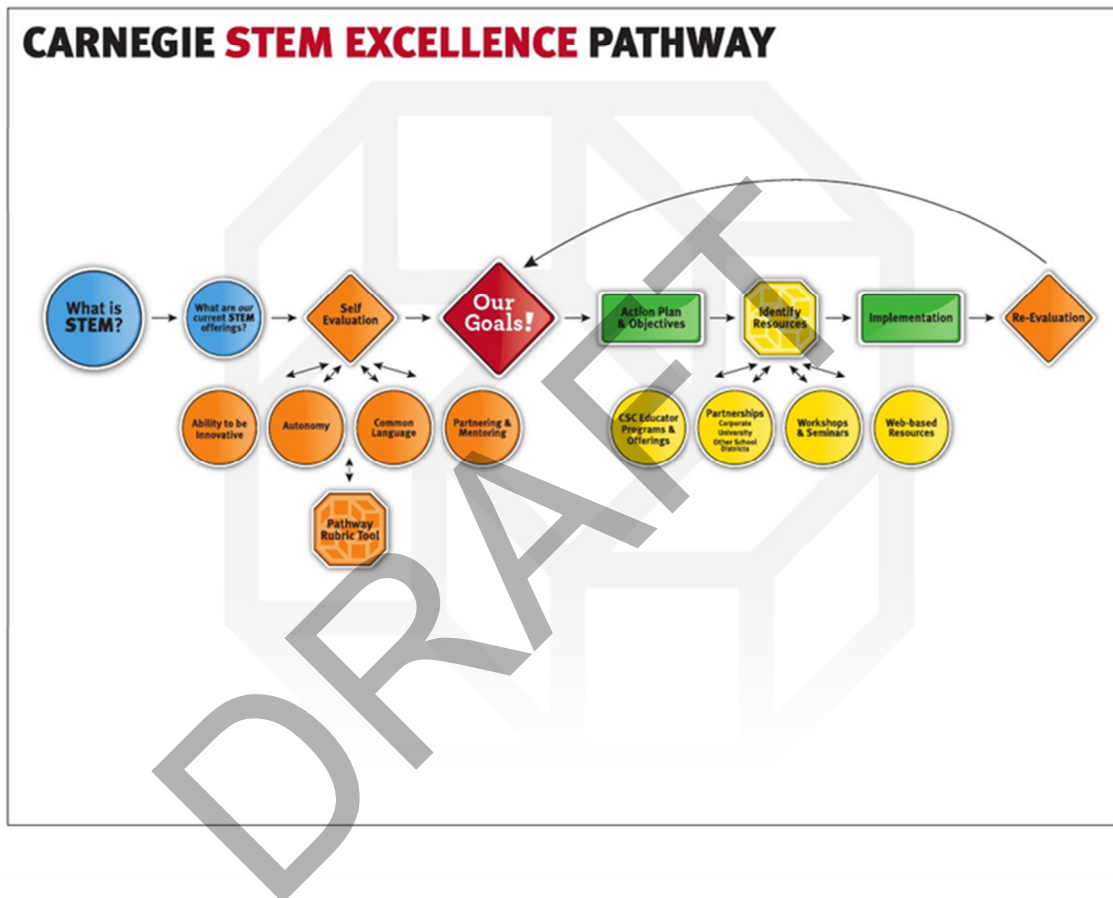

Figure 14: Carnegie STEM Excellence Pathway Flowchart

The STEM committee has achieved a number of the strategic plan objectives including the following:

1. Added <u>PLTW Principles of Biomedical Science</u> (BMS) and <u>PLTW Engineering Design & Development</u> (EDD) at the High School.
   a. The BMS course represents the beginning course of an entire 4 course pathway for students interested in the medical field. EDD is the capstone course for the PLTW engineering sequence. The engineering sequence has been offered at the high school since 2004 and this course completes that implementation.
2. Added <u>PLTW App Creators</u> and <u>PLTW Computer Science for Innovators & Makers</u>.

    a. These courses provide students an introductory experience to computer programming to prepare them for more advanced computer science courses in High School.
3. Researched and finalized decision on K – 6 STEM framework
    a. Completed site visits to Blue Springs, Liberty, Nixa, West Plains as part of the research phase for determining a K – 6 framework
    b. Recommended PLTW Launch program as framework and presented to principals for approval. Performed a standards analysis for comparing NGSS standards to PLTW Launch.
4. Created a Phase I plan for implementing PLTW Launch K – 6
    a. In the process of finalizing implementation details. Currently planning for each teacher to teach one of four modules for phase 1 (year 1) and teach all four modules by 2020.

8. Technology Professional Development

There have been extensive professional development opportunities for technology within the district. Our new membership within GOCSD has allowed our district to participate in a wide variety of professional development opportunities at no extra cost. These include Tech Meet Up's, Open Resources Workshops, Instructional Coaches Meet Up's, and the annual GOCSD Innovation Summit. Our district has played a key role in the planning and preparation for this year's GOCSD Innovation Summit that will host all of the nearly 40 districts in the consortium. In addition, the technology department is planning a number of future technology-focused professional development opportunities including a district-wide technology PD day, STEM and educational technology district monthly newsletter, and fully implementing a badge system and/or PD flex time initiative.