Department of

**Industrial Technology
Grades 7-12**

K-12
Program Review

2019

Introduction

It is the goal of the Bridgewater-Raritan Regional School District (BRRSD) to develop and implement a thorough, data-based process for analyzing curriculum, instruction, assessment, student performance, professional development, and resources in all curricular areas ensuring that professional practice is always current, relevant, and aligned to the most updated standards. Each curricular area will be reviewed on a, at most, five-year timeline. The results of each process will be presented publicly.

Acknowledgements

The following individuals were directly involved in gathering information/data and contributed to the completion of the Industrial Technology (IT) Department's program review, which is presented in this document

- Nicholas Basile, Industrial Technology Teacher
- Christopher Black, Media Communications Teacher
- Colleen DiMonte, Special Education - Resource Room/Co Teacher
- Mark Dubyna, Industrial Technology Teacher
- Adam Huntington, Industrial Technology Teacher
- Chester King, Industrial Technology Teacher
- Scott Linzer, Media Communications Teacher
- Jacqueline Loughridge, Assistant Principal
- Earl Maragh, Industrial Technology Teacher
- Michael Russell, Gifted and Talented Teacher
- Scott Strungis, Industrial Technology Teacher
- Kristen Taylor, Supervisor of Special Education
- Leigh Woznick, School Library/Media Specialist
- Laura Zamrock. Assistant Principal

The IT Department teachers that provided feedback to the guiding questions are listed below:
- Margaret Tkach, Technology Teacher (retired)

Goals and Purpose

In this document, we will present the following:

- A description of the physical program
- Current course offerings including enrollment data
- A review of the curriculum, instruction, assessment, resources, staffing, and professional development
- Student performance data
- Recommendations leading into the curriculum revision process

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Philosophy Statement

The IT Department recognizes that citizens of the 21st Century need to possess a variety of diverse competencies. Therefore, our students are exposed to and develop skills in areas of communications, design, career awareness, leadership, and artistic expression. This knowledge is then applied, adapted, and utilized to further encourage students to develop the desire to become lifelong learners. To achieve this goal, courses are designed to support the development of critical thinking skills, problem solving abilities, information gathering and analysis, cooperative learning, and aesthetic awareness.

We further believe that our program should:

- Inspire, Engage, and Educate
- Improve our world and make it great
- Challenge all to grow and exceed
- Prepare our students will lead the way

Students who go through the IT Program are better prepared to meet life and career goals in a rapidly changing technological world. As a result of the exposure to courses and curriculum, students gain an understanding of the necessary balance of form versus function. It is the goal of the IT Department to create an atmosphere in which students are encouraged to explore creativity, design, analysis, aesthetics, and their physical abilities. Students are challenged throughout the curriculum to transfer those talents to the world they will encounter upon graduation.

Description of Current Program

The IT Department at the BRRSD consists of eight full-time certified teachers. Currently there are two IT teachers working at the Bridgewater-Raritan Middle School (BRMS) and six IT teachers working at the Bridgewater-Raritan Regional High School (BRRHS). The teachers in the IT Department have a wide range of educational experience as well as real-world experience. The teachers have direct field experience in many disciplines including cabinetry, woodworking, building trades, electrical engineering, sound engineering, as well as machinery sales and repair. There are 19 different IT (IT) courses offered between the Bridgewater-Raritan Middle School and Bridgewater-Raritan Regional High School.

Grades 7-8
The IT Program starts at the middle school in grade 7 with an Innovation and Design Cycle. The Innovation and Design cycle allows students to become a technological thinker and innovator through practical applications of math, science, and technology. It provides students with essential core strategies for acquiring and using technological knowledge. The course allows students to develop 21st Century problem-solving skills through hands-on challenges. The learning occurs by engaging students in complex, strategic problem-solving activities that require higher-order thinking. The grade 8 3-D Modeling Cycle focuses on computer-aided drafting,

rapid prototyping, design applications, and related career connections. Students will develop a base proficiency using 3-D modeling software as they navigate a series of technical and creative design challenges.

The students attend their assigned cycle class for 40-minute periods every day for seven weeks then rotate to the next cycle class in the progression. All students rotate through the middle school cycle program during their grade 7 and 8 school years and the courses are in the areas of IT, Technology/Computers, Family and Consumer Sciences, Art, and Music.

Grades 9-12

The IT Program at the high school is broken up into four major areas consisting of Media Communications, Woodworking and Construction skills, Electronics, and Computer-Aided Design. All courses are design to be hand-on laboratory experiences that challenge the students to utilize problem solving and life skills. The program in the high school is made up of electives and students have a choice of 17 different courses as well as Special Education IT courses. The courses are made up of either semester or year-long classes, which meet daily for 40- or 41-minutes depending on the assigned period. The students select courses based on their interest, which is determined during the scheduling process.

With the variety of course offerings, the IT department is able to meet the diverse needs of our student body. IT entry-level courses allow students to gain a working knowledge and understanding of vital life skills while the advance courses provide a solid foundation for students interested in pursuing careers in various fields. The department offers a number of programs that range from Special Education to in-depth advanced courses. The curriculum includes a partnership with Rider University in the Program for Advanced Scholastic Standing (PASS). This opportunity allows BRRHS students the opportunity to earn college credits under a Rider University transcript. The students who complete Media Communications I – IV with a grade of a B or better will receive three elective credits in Communications 131 Fundamentals of Video Production, which is transferable to any college in the country.

All courses in the IT Department are academic level offerings. The department designs all of its courses to be part of the comprehensive education to create a well-rounded student, preparing him or her for continuing post-secondary education, entering the workforce, military service, and/or admissions to an institution of higher education. All IT students are grouped heterogeneously and designed to meet the New Jersey Department of Education 21st Century Life and Careers and Career-Technical Education requirements for Graduation.

For a complete list of course offerings as well as the curriculum development date, please see Appendix A.

Three-year Course Enrollment Trends

The Three-Year Course Enrollment Trend table shows course enrollment over the past three years for the IT Department. By analyzing this data, it allows the district leadership team to make informed decisions about trends in students' needs and interest. This information was used to develop the student, staff, and parent surveys as well as recommend classes to be eliminated

from the program of study.

For a complete chart of Three-year Course Enrollment Trends, please see Appendix B.

Three-year Grading Trends
The Three-year Grading Trend table shows average grade in courses over the past three years for the IT Department. By analyzing this data, it allows the district leadership team to make informed decisions about trends in students' needs and interest. This information was coupled with the results of the student, staff, and parent surveys allow us to draw some conclusions about the students' ability to achieve in the course as well as show their overall performance. . It was found that 86.3% of the students agreed or strongly agreed, "The assigned tests, projects, and activities in the IT classes are challenging to students, but are fair." In addition, 100% of teachers strongly agreed that "The assigned tests, projects, and activities are designed to reinforce the learning that occurs in the IT classes." As a result, conclusions can be drawn about the mastery of learning objectives taught in IT classes.

For a complete chart of Three-year Grading Trends, please see Appendix C.

Three-year Enrollment Trends by Gender
The Three-year Enrollment Trends by Gender table shows enrollment broken down by gender in courses over the past three years for the IT Department. By analyzing this data, it will allow the district leadership team to make informed decisions about trends based on gender and course selection. This information coupled with the results of the student, staff, and parent surveys allows us to draw some conclusions about the students' interest based on gender. In addition, it allows for the development of curriculum that both interests male and female students as well as prepares all students with the necessary 21st Century skills.

For a complete chart of Three-year Enrollment by Gender, please see Appendix D.

Data Collection, Teacher Feedback and Reviews

Summary of Survey Data

The following information was gathered from surveys and analyzed during department and program evaluation meetings. All of the teachers in the IT Department completed the full list of guiding questions and submitted their responses via a Google form. A full list of these guiding questions is located in Appendix E of this document.

The survey was given to teachers in the spring of 2018. The survey results represent the beliefs of the entire department of eight staff members. When asked about their current position:

- Two teachers described themselves as cycle teachers
- Two teachers described themselves as media communications teachers
- One teacher described himself as a woodworking teacher

- One teacher described himself as both as woodworking and as a computer aided design teacher
- One teacher described himself as both as woodworking and as an electronics teacher
- One teacher described himself as both as woodworking and as a home improvement teacher

Teachers were asked about their years of experience in teaching IT courses. The results indicated that 87.5% had more than 11 years of experience.

Which category best describes your years of teaching?
8 responses

Legend:
- Less than 4
- 4-10
- 11-15
- 16-20
- 20 +
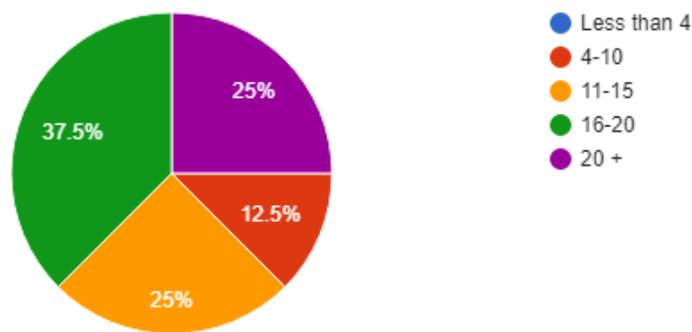
This finding was complemented by the fact that, in addition, 75% had three or more years in the private business sector in related fields. These fields include:

- Graphic Designer.
- Home Improvements
- Network Technician
- Professional Audio installations/Professional Audio Engineering
- Professional cabinet making experience
- Sales and technical coordination for Holtz Machinery, Rudolf Bass Inc., Delta Machinery, Porter Cable, Black and Decker, Stanley Tools.

Review of Curriculum (Grades 7 – 12)
The IT program begins in grade 7 through a cycle program design. The students are introduced to the world of IT through the Innovation and Design cycle. In BRMS, students are exposed to a variety of courses that are designed to spur their interests and introduce them to diverse subject matter. These cycles include Technology/Computers, Industrial Technology, Family and Consumer Sciences, Art, and Music.

As the students enter the BRRHS, the IT Department becomes a completely elective program. For a complete list of course offerings, please see Appendix A.

Although the high school program is elective, there are some graduation requirements that can be

fulfilled by taking certain IT courses. Students are required to take one year (5 credits) in 21st Century Life and Careers, or Career-Technical Education. The courses in the IT Department that meet these requirements are as follows:

Computer Aided Design Technology I, II	Home Improvement
Electronics	Introduction to Electronics
Engineering Computer Graphic I, II	Media Communications I, II, III, IV
Fundamentals of Automated Design	Wood Design and Fabrication I, II, III

For a complete list of courses that meet the five-credit graduation requirement in 21st Century Life and Careers, or Career-Technical Education, please see Appendix F.

The New Jersey Department of Education (NJDOE) has replaced the New Jersey Core Curriculum Content Standards (NJCCCS) Standard 9 with the updated New Jersey Student Learning Standards (NJSLS) Standard 9. The NJSLS describes what students should know and be able to do upon completion of a thirteen-year public school education. The NJSLS for 21st Century Life and Careers and Technology were updated by the NJDOE in 2014.

It should be noted the only the program in BRMS meets the NJSLS standards, because the curriculum was written in 2017. No high school IT courses aligns to the most current NJSLS.

NJSLS 9 is composed of the Career Ready Practices and Student Learning Standards 9.1, 9.2, and 9.3 which are outlined below:

- **The 12 Career Ready Practices**
  Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.

  - CRP1. Act as a responsible and contributing citizen and employee.
  - CRP2. Apply appropriate academic and technical skills.
  - CRP3. Attend to personal health and financial well-being.
  - CRP4. Communicate clearly and effectively and with reason.
  - CRP5. Consider the environmental, social and economic impacts of decisions.
  - CRP6. Demonstrate creativity and innovation.
  - CRP7. Employ valid and reliable research strategies.
  - CRP8. Utilize critical thinking to make sense of problems and persevere in solving them.
  - CRP9. Model integrity, ethical leadership and effective management.
  - CRP10. Plan education and career paths aligned to personal goals.

- o CRP11. Use technology to enhance productivity.
- o CRP12. Work productively in teams while using cultural global competence.

- **9.1 Personal Financial Literacy**
  This standard outlines the important fiscal knowledge, habits, and skills that must be mastered in order for students to make informed decisions about personal finance. Financial literacy is an integral component of a student's college and career readiness, enabling students to achieve fulfilling, financially secure, and successful careers.

- **9.2 Career Awareness, Exploration, and Preparation**
  This standard outlines the importance of being knowledgeable about one's interests and talents, and being well informed about postsecondary and career options, career planning, and career requirements.

- **9.3 Career and Technical Education**
  This standard outlines what students should know and be able to do upon completion of a CTE Program of Study.

The NJDOE has replaced the NJCCCS Standard 8 with the updated NJSLS Standard 8. The NJSLS describes what students should know and be able to do upon completion of a thirteen-year public school education. The NJSLS for 21st Century Life and Careers and Technology were updated by the NJDOE in 2014.

It should be noted the only the program in BRMS meets the NJSLS standards, because the curriculum was written in 2017. No high school IT courses aligns to the most current NJSLS.

NJSLS 8 is composed of the Student Learning Standards 8.1, and 8.2, which are outlined below:

- **8.1 Educational Technology**
  All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and create and communicate knowledge.

- **8.2 Technology Education, Engineering, Design and Computational Thinking - Programming**
  All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

When surveyed the students responded with 54.7% agreed or strongly agreed that IT classes are relevant in their lives. The current curriculum in the departments appears to be meeting the needs of our students, as evidenced by the fact 79.0% agreed or strongly agreed that they "use

the skills and knowledge that (they) learned in my IT classes." In addition, 66.7% agreed or strongly agreed that they "have shared what (they) have learned in IT classes with family or a friend." This is a result of the fact that the curriculum does not represent the instruction that is occurring in the classroom. However, when surveyed the students indicated that they would like to have additional curricular offerings in the area of IT.

I believe the IT Department should offer a course in the following areas:
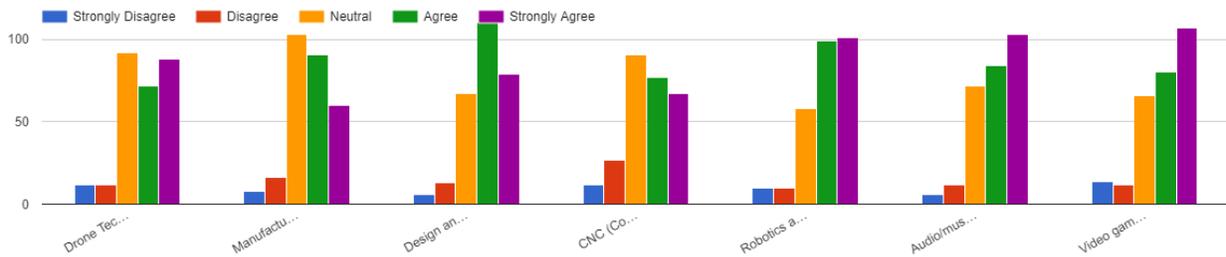
The key to the questions represented in the chart are as follows:

- Drone Technology
- Manufacturing Technology
- Design and Production
- CNC (Computer numerical control) machinery and software and other modern types of machinery
- Robotics and 3D Printing
- Audio/music engineering
- Video game design

In addition, the students would like the department to create a certificate program. A certificate program would acknowledge that a student has focused in a particular area of the IT program.

Review of Instruction
IT courses in the middle school are part of a cycle program and are taught for a 7-week block of time in 40-minute periods. At the high school, IT courses are taught in 40- or 41-minute periods over a semester or year depending on the course. Teachers employ a variety of teaching strategies, such as:

- Debate
- Group Projects
- Hands-on Activities
- Problem-solving
- Small Group Instruction
- Teacher-led Instruction
- Whole Class Discussion

Based on the teacher surveys, teachers report on the professional practices and teaching techniques that they use in their instruction, which is verified based on supervisory review of lesson plans. However, overwhelmingly the main forms of instruction are hands-on activities (labs). The hands-on activities allow the students to work in an environment that emulates the real world. In addition, these types of activities allow the students to build skills, confidence, and education needed to adapt to a changing professional environment, to continue to engage in lifelong learning, and to contribute value to their workplace and community.

When the students were asked about the types of instruction they would like to experience, they were much more balanced in their responses. This indicates that they would prefer larger variety of instructional methods. However, hands-on activities was something that they would like to see on a daily basis, which leads one to conclude that this is the reason students take IT classes.

Review of Assessment
Currently in the middle school, the two IT teachers teach both the grade 7 and 8 cycle classes. The teachers readily share assessments, including lab sheets, assignments, and rubrics. This results in the outcome that all students will share a common experience regardless of the teacher to whom a student was assigned. However, no common assessments have been developed for the BRMS program.

Currently at the high school level, assessments are primarily teacher-developed, which is shared amongst the teachers that teach different sections of the same course. The midterms and final exams are 90% identical with the teachers having the ability to focus the remaining 10% on special areas of focus. The majority of assessments are hands-on, problem-based simulations. This results in the outcome that all students will share a common experience regardless of the teacher to whom a student was assigned. However, no common assessments have been developed for the BRHS program.

When asked about assessment, 86.3% of the students indicated, "The assigned tests, projects, and activities are designed to reinforce the learning that occurs in the IT classes." In addition, 100% of the teachers agreed or strongly agreed, "The assigned tests, projects, and activities in the IT classes are challenging to students, but are fair." When asked, "What do you believe are the necessary components of a fair and accurate assessment of student learning?" teachers responded with the following:
:
- Ability to explain and demonstrate.
- Assessment through observation.
- Clear and detailed rubric communicated to students prior to starting assignments.
- Monitor class, checklist of steps to complete task.
- Scaffolding of activities in a given unit of instruction are always important. Practical applications of concepts are very important in assessment.
- Successful completion of projects using techniques and principles taught around that project.

- The necessary components to fairly and accurately assess student learning are: A comprehensive rubric that fairly grades all students and well thought out lessons and instructions.

When compared with the student results, the students overwhelming agree or strongly agree with the teachers' understanding about assessment and the way it is implemented in the IT Program. It was found that 79.7% of the students agreed or strongly agreed that "The assigned tests, projects, and activities in the IT classes are challenging to students, but are fair."

Review of Resources
The teachers were split on their opinions on curricular resources. The survey found that 62.5% of the teachers agreed or strongly agreed that "I believe that curricular resources (e.g., textbooks, workbooks, internet based, computer simulations) are up-to-date and meet my classroom/student needs."

The results are dependent on whether a teacher taught with a textbook or taught a computer-based IT course. The overwhelming feedback in the survey indicated that the age of the textbooks was a problem.

In addition to the closed-ended response, the teachers were given the opportunity to have an open-ended response as to what resources they would like to see in other areas. Their responses were as follows:

- Could use a better facility for Home Improvement.
- Most textbooks or workbooks are teacher created. A real text has never been used with me.
- Other than hardware, all resources used in my class are sought out evaluated and implemented by me.
- We need access to a computer lab or at the very least up to PC Laptops to teach CNC routing and Google sketch-up.

When surveyed the teachers indicated that the courses are not dependent on textbooks. They primarily use teacher created materials, as was stated above. If they do use textbooks, it is primarily used as a reference material for a specific example.

Due to the age of the textbooks, the teachers have developed supplemental resources that allow the students to learn and meet the learning objectives. The students did not note a significant a problem with the departmental resources. Of the students who responded to the survey, 54.9% agreed or strongly agreed that the curricular resources are up-to-date and meet their needs.

As for technology resources, there are five IT classroom in grades 9 - 12, which includes a Computer Aided Computer Lab, Computer Lab shared with the Business Education Department, a Woodshop, and a fully function television studio that has two classroom outfitted with iMacs. These teaching strategies appear to be working, as evidenced by the survey the students appear to be stratified with the technology resources in the IT Department. Of the students that responded

to the survey, 64.3% agreed or strongly agreed that the technology resources are up-to-date and meet their needs.

<u>Review of Professional Development</u>
The survey of faculty in the area of Professional Development focused on two major areas of focus. The areas were technology related professional development and curricular professional development.

In area of technology professional development, the teachers are looking for lower-level technology education. This is a result of the fact that 62.5% of teachers consider themselves "Advanced Technology Users."

The teachers indicated that they want to self-select and choose professional development that is tailored to their needs. This lends itself to the fact that teachers want variety and choice in their own professional development.

Professional Development should include the following:
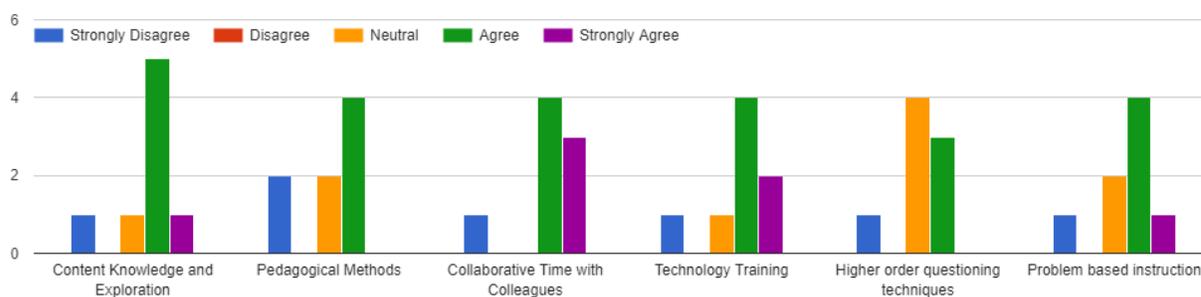
In addition to the closed-ended response, the teachers were given the opportunity to have an open-ended response as what professional development they would like to see in other areas. There were only two responses, which included, "A course on adolescent psychology with a view to making the class environment and instruction more effective" and "Workshops from industry SMEs."

<u>Comparison Programs</u>

As part of this program review, research of comparison programs, including school visits to other districts, were conducted. The size of district, as well as district performance, were considered when selecting districts for comparison. The program review committee reviewed the data from several school districts using websites to examine curriculum, pacing, and performance. Using this information, charts were created to examine what the IT programs entailed and where further exploration could occur. This process was deemed positive and beneficial to members of the teams. The opportunity to engage in professional dialogue regarding instructional practices and curricular programming with teachers from other districts was rewarding. The teams were grateful to the people who allowed a team to visit and observe their practices as a way to examine our own.

BRRHS was compared to ten other high schools with similar characteristics, such as student population, socioeconomic status, and district configurations. The data tables contained in appendices were assembled in order to give a perspective of BRRHS when viewed against our comparison counterparts. These tables contained in the appendices utilize specific data points for each high school as compared to BRRHS. The data was collected by committee members through the review of districts' websites, program of studies, and curricular documents.

For a complete list of vital data for comparison districts measured against BRRSD, please see Appendix G.
For a complete list of SAT data for comparison districts measured against BRRSD, please see Appendix H.
For a complete list of course offerings in BRRSD compared to like districts, please see Appendix I.
For a complete list of course offered in like districts, but not offered in BRRSD, please see Appendix J.

As a result of the comparison of districts, the Program Evaluation Committee sent a team to visit Watchung Hills Regional High School and Hunterdon Central Regional High School. This decision was made because of the like-nature of the districts as well as the review of programs of study. . In addition, both districts had course offerings that were identified as an area of interest through the program evaluation surveys.

School District	County	District Factor Group	District Spending Per Pupil	# of Students
BRRHS	Somerset	I	$17,080	2,882
Hunterdon Central Regional High School	Hunterdon	I	$21,700	3,043
Watchung Hill Regional High School	Somerset	I	$18,321	2,205

Overall Student Performance Analysis

In grades 7 through 12, students are given similar hands-on projects and assessments (90% identical and 10% teacher specific). However, due to the fact that the department has not utilized common assessments as well as a data management software program has lent itself to the department's inability to analyze student performance over time. This factor has resulted in the outcome that all students will share a common experience regardless of the teacher to whom they are assigned, but has resulted in the fact that overall student performance cannot be analyzed over time

Recommendations

Curriculum

As we reviewed the curriculum as part of the program evaluation process it was noted that all of the curriculum in the IT Department from grades 7 through 12 needs to be rewritten, revised and updated. Although the curriculum in grade 7 and grade 8 was updated in September of 2017 and meets current NJSLS and best practices, there have been recommendations made in the kindergarten through grade 6 program evaluation that will affect the curriculum taught in grade 7 and grade 8 technology cycle. However, the curriculum in grade 9 through grade 12 needs to be totally revised as a result of the age of each of the curriculum. The NJSLS for 21st Century Life and Careers and Technology were updated in 2014 and International Society for Technology in Education was updated in 2016. In addition, during the district-wide upload to our curriculum management program it was determined that the IT Department would not upload awaiting the outcome of this program evaluation. As a result, the IT curriculum needs to align to current standards and best practices as well as be upload to a curriculum management program.

The recommendations for curriculum writing are below:

Courses	Number of Teachers @ Number of Days	Number of Days (total)
IT Cycle – Innovation and Design	1 Teacher @ 2 Days	2
IT Cycle – 3D Modeling	1 Teacher @ 2 Days	2
Computer Aided Design Technology I	1 Teacher @ 4 Days	4

Computer Aided Design Technology II	1 Teacher @ 4 Days	4
Engineering Computer Graphics I	1 Teacher @ 4 Days	4
Introduction to Electronics	1 Teacher @ 4 Days	3
Media Communications I *	2 Teachers @ 2 Days each	3
Media Communications II *	2 Teachers @ 2 Days each	5
Media Communications III *	2 Teachers @ 2 Days each	5
Media Communications IV *	2 Teachers @ 2 Days each	3
Video Production Seminar *	2 Teachers @ 4 Days each	4
Wood Design and Fabrication I	2 Teachers @ 4 Days each	8
Wood Design and Fabrication II	1 Teacher @ 4 Days each	4
Wood Design and Fabrication III	1 Teacher @ 4 Days each	4
Total for Curriculum Revisions		55 Days
Total Cost for Curriculum ($300 per day)		$16,500

* - Names of these courses will be change pending BOE Approval

Through site visits, student surveys, and enrollment trends, it was determined that the IT Program is in need of change. Student survey enrollment trends indicate that students have a strong interest in certain areas while enrollment trends demonstrate a lack of interest in other areas. The changes that are being recommended:

Additions to Program of Study

- CNC production
- Drone Technology
- Robotics and 3D Printing
- Audio and Music Engineering

Elimination of Courses from the Program of Study

- Fundamental of Automated Design
- Engineering Computer Graphics II
- Electronics
- Home improvement

In addition, the following recommendations are being made to course names to represent better

the curriculum being offered in the course.

- Media Communications I to Filming and Video Editing I
- Media Communications II to Filming and Video Editing II
- Media Communications III to Filming and Video Editing III
- Media Communications IV to Filming and Video Editing IV
- Video Production Seminar to Filming and Video Editing Seminar

The final program recommendation would be that the high school develop Makerspace Suite:

- Although a space has not been identified, it is recommended that the committee continue to explore the development of a Makerspace. The committee will activity seek the input of the high school Principal, the Business Administrator, Head of Buildings and Grounds as well as Central Office Administrators, prior to making a recommendation about the location of the space to the BOE.
- Technology needed for suite and new classes:
  - CNC Machines
  - Dust Collection
  - Laptop Cart
  - Epilog Laser Printer
  - 3D Printers

Course Title	Grades	Credits	Description
CNC production	9-12	2.5	This class provides extensive hands-on experience performing all tasks identified by industry experts and local employers using a Computer Numerical Control Machine (CNC). The course includes basic CNC operator skills and CNC set-up processes. Students gain real-world experience using actual CNC machining centers to perform real production runs and job set-ups.
Cost:	1 Teachers @ 4 Days ($300 per day)		Total Cost: $1,200
Drone Technology	9-12	5.0	This course is an introduction to the fundamentals of unmanned aircraft systems (UAS), including their history and developing role in the modern aviation industry. Topics include basic information regarding current and future uses of drones: airframe types, materials, and sizes: electric motors, propellers, and electronic speed controller matching. In addition, the course will cover camera use, crimes and crime fighting uses

			artificial intelligence in single drones and drone swarms.
Cost:	1 Teachers @ 5 Days ($300 per day)		Total Cost: $1,500
Robotics and 3D Printing	9-12	5.0	This course is a revolution and is all about personal fabrication that is happening now. 3D printing is poised to unlock the potential in every person to create, innovate and fabricate. It is already transforming manufacturing; soon it will change the world. In addition, the course will expose the students to basic programming as well as problem solving strategies. Students will work hands-on in teams to design, build, program and document their progress.
Cost:	1 Teachers @ 5 Days ($300 per day)		Total Cost: $1,500
Audio and Music Engineering	9-12	2.5	The course is intended to provide students a basic understanding of sound design, audio recording, and sound engineering. The curriculum is built on a foundation of music, audio content production, acoustics, fundamental engineering science, signal processing hardware and software, electronics, and software engineering
Cost:	1 Teachers @ 4 Days ($300 per day)		Total Cost: $1,200

In addition, to the above curricular changes it is being recommended that Filming and Video Editing Seminar be moved from an Academic status to an Honors status. This recommendation is the result of a review of curriculum as well as a partnership with Rider University. This partner Collaboration between Rider University (Rider) and Bridgewater-Raritan's Media Communications faculty has resulted in the opportunity for students to earn college credits. Students completing the necessary coursework can apply for three credits in Introduction to Television Production, which will appear on a regular Rider transcript. These credits will be good at both Rider and accepting universities. Although this partnership has existed for some time, it was determined through the curricular review process as well as examining the course rigor of instruction and student independence, that this Filming and Video Editing Seminar is an honors level course.

Finally, the IT department is recommending that an Academic Achievement Certification Program be developed. The Academic Achievement Certificate Program is designed to provide a list of the knowledge that a student has acquired in a certain area of study. Each certificate will list the area of concentration and the courses taken. The certificate will be signed by the Principal and the department supervisor and will be suitable for college and portfolios. By successful the necessary courses a student in the areas would demonstrate a sustained interest in the areas in which they focused. To receive a certificate the student must achieve a grade of "C" or better in the courses associated with the following areas:

- Woods Technology
- General Industrial Technology

Assessments
The assessments need to be align to demonstrate attainment and retention of the 2014 NJSLS. In addition, through department meetings and professional development, the teachers will continue to align to common assessments amongst classes taught by different teachers. This is an ongoing process and will be something that needs to be verified on a yearly basis to ensure that all assessments are meeting our targeted learning outcomes.

Not only do the assessments need to align to the current NJSLS, the department needs to develop common assessments that are utilized in all sections of a particular class. This practice will ensure that the students are prepared equally, no matter which teacher or section they are assigned. Through common assessments, we will ensure that all students have met the required course learning objectives.

Finally, the department is committed to moving all major assessments, whether it be exams or simulations, to a data management system. Data management programs that collect and analyze data will allow our department to identify and track trends within the assessment as well as across various classes. In addition, it will allow the department to identify trends over time.

Resources and Technology
Being that the IT is very dependent on equipment and facilities, the majority of the recommendations for the department will focus in this area.

Makerspace Suite – The following equipment would be necessary if the concept of the Makerspace is approved and moves forward.

Items	Rationale	Approximate cost
CNC Machine	Necessary for creating the CNC Course	3 @ $10,000 = $30,000
1 – 2 HP Dust Collection Machine	Dust collection is pivotal to ensure that there is a clean space	1 @ $1,000 = $1,000

Items	Rationale	Approximate cost
3D Printers	Necessary for creating the Robotics and 3D Printing Course	10 @ $2,000 = $20,000
Epilog laser printer/cutter	Necessary for creating the CNC Course	1 @ $10,000 = $10,000
Video Cameras	These would be used to discourage tampering with the equipment	3 @ $1,000 = $3,000
Robots	Necessary for creating the Robotics and 3D Printing class	25 @ $1,000 = $25,000
Drones	Necessary for creating the Drones Course	25 @ $500 = $12,500
Flight Simulators	Necessary for creating the Drones Course	25 @ $250 = $6,500

Upgrades to current program in the Wood Design and Fabrication Courses (room 222)

Items	Rationale	Approximate cost
PC Based Laptop Cart	The current laptop in the woodshop (room 222) are in excess of tens year and cannot handle the current software. They do not have sufficient processing power.	22 @ $1,200 = $28,000
Air Conditioning	The woodshop (room 222) is the only classroom space at the high school that is not air-conditioned.	$40,000
Upgrade to Dust Collection System	The Dust Collection System in the woodshop (room 222) is more than 20 years old and needs to upgraded and repaired.	$2,000
Ambient Air Cleaner	These units to filter fine dust from the air in woodshop (room 222). Fine airborne dust is the most damaging to the lungs and most woodworking facilities now have these units	$3,500
Replace Obsolete Woodshop (Room 222) Equipment:	The equipment is in excess of fifty years old and need to be	$70,000

1 Planer, 3 Band saws, 1 Drum Sander, 3 Lathes plus tooling, 1 Jointer, 2 Disc Sanders, 20 Vices, Replace Hand Tool Sets, And Cordless Tools	replaced with newer and more modern equipment with updated safety features.	
Video Cameras	These cameras will be install in the woodshop (room 222) would be used to discourage tampering with the equipment	3 @ $1,000 = $3,000

Technology

The following upgrades to the Television studio, which is part of the IT area. It should be noted that the television is in excess of 15 years and has not been completely updated since it was originally installed. The following recommendation are necessary in order to have maintain the high level of expectation and programing as well as to ensure that students are learning the most current industry standards.

Upgrades to current program in the Bridgewater-Raritan television Studio Suite

Items	Rationale	Approximate cost
Additional LED light	LED is utilized in all of the television studios that we visited during our site visits. In addition, there is a substantial electrical savings.	$10,000
High Definition Cameras	High Definition Cameras were utilized in all of the television studios that we visited during our site visits. This is currently the industry standard.	3 @ $30,000 = $90,000
High Definition Switcher and support equipment	High Definition switcher is necessary to support High Definition Cameras. In addition, they were utilized in all of the television studios that we visited during our site visits. This is currently the industry standard.	$25,000
Upgrades to other outdated equipment.	The equipment either no longer works or is not	$10,000

	compatible with each other (e.g., VCRs, CRTs)	
Repair or replace back drop curtains	The curtains are used to create neutral backdrops that allow graphics to be imposed in the background.	$10,000
Video Cameras	These cameras will be install in the television studio would be used to discourage tampering with the equipment	3 @ $1,000 = $3,000

Staffing

No anticipated change in current staffing levels are anticipated at this time. However, staffing will continually evaluated on a year-by-year basis and adjusted accordingly.

Professional Development

Effective professional development enables educators to develop the knowledge and skills they need to address students' learning challenges. Sound professional development will help teachers with teacher retention, deeper subject matter knowledge, and develops a collaborative environment, which ultimately leads to better student achievement. As a result, a plan will be developed that will:

- Provide ongoing, targeted professional development for staff
  - Drone Technology
  - Robotics and 3D Printing
  - CNC Technology

- Develop knowledge and skills teachers need to address students' learning challenges
  - Special Education
  - Students with special needs

- Improve education efficiency
  - Developing the program
  - Raising awareness

- Build confidence in staff
  - Improving and expanding teachers skills and abilities
  - Diverse learning strategies

- Encourage, inspire, and reenergize staff
  - Improve morale of staff

Proposed Program Plan Timeline

	2018-19	2019-20	2020-21	2021-22	2022-23
	Program Review	Pilot and Resources	Implementation	Implementation	Implementation and Review
Programs / Courses	Assess current program	Create and propose new courses to the Board of Education	Provide Professional Development	Provide Professional Development	Review and assess
Curriculum	Assess current curriculum in all courses	Writing and revision of courses	Provide Professional Development in curriculum and instruction	Examine assessment and student learning. Make updates based on feedback	Examine assessment and student learning. Make updates based on feedback
Resource / Technology	Assess current resources / technology and develop a list of recommended resources and purchase for pilots	Purchase recommended materials and pilot their integration	Implement the resources in all classes	Assess current and ongoing use of resources / technology	Assess current and ongoing use of resources / technology
Staffing	Assess current staffing numbers with course	Assess current staffing numbers with course Assess current numbers to make determination about staffing needs			

APPENDIX A

Course Offerings

Course Titles	Grade Level(s)	Week/ Semester/ Full Year	Curriculum Approved
Technology Cycle – Innovation and Design	7	7 Weeks	September 2017
Technology Cycle – 3D Modeling	8	7 Weeks	September 2017
Computer Aided Design Technology I	9-12	Full Year	January 2007
Computer Aided Design Technology II	10-12	Full Year	January 2007
Electronics	10-12	Full Year	January 2007
Engineering Computer Graphics I	10-12	Full Year	January 2007
Engineering Computer Graphics II	11-12	Full Year	January 2007
Fundamentals of Automated Design	9-12	Semester	January 2007
Home Improvement	9-12	Full Year	September 2007
Introduction to Electronics	9-12	Full Year	January 2007
Media Communications I	9-12	Semester	January 2007
Media Communications II	9-12	Semester	January 2007
Media Communications III	10-12	Semester	January 2007
Media Communications IV	11-12	Semester	January 2007
Video Production Seminar	11-12	Semester	September 2007
Wood Design and Fabrication I	9-12	Full Year	January 2007
Wood Design and Fabrication II	10-12	Full Year	January 2007
Wood Design and Fabrication III	11-12	Full Year	January 2007
Special Education - IT	9-12	Semester	January 2007

APPENDIX B

Three Year: Course Enrollment Trends

Course	School	2015-2016		2016-2017		2017-2018	
		Total Students	**Avg. Class Size**	**Total Students**	**Avg. Class Size**	**Total Students**	**Avg. Class Size**
Innovation and Design	BRMS	143	23.83	141	23.5	131	21.83
3D Modeling	BRMS	141	23.5	139	23.17	143	23.83
Computer Aided Design Technology I A	BRHS	56	18.67	54	18	48	16
Engineering Computer Graphics I A	BRHS	38	19	32	16	36	18
Home Improvement A	BRHS	56	18.67	56	18.67	59	19.67
Introduction to Electronics A	BRHS	60	20	56	18.67	56	18.67
Media Communications I A	BRHS	57	19	77	19.25	76	20
Media Communications II A	BRHS	27	13.5	33	16.5	38	19
Media Communications III A	BRHS	20	20	15	15	18	9
Media Communications IVA	BRHS	16	16	15	15	12	12
Video Seminar A	BRHS	19	19	7	7	7	7

Course	School	2015-2016		2016-2017		2017-2018	
		Total Students	Avg. Class Size	Total Students	Avg. Class Size	Total Students	Avg. Class Size
Wood Design and Fabrication I A	BRHS	87	17.4	92	18.4	95	19
Wood Design and Fabrication II A	BRHS	47	15.67	29	9.67	50	16.67
Wood Design and Fabrication III A	BRHS	18	18	13	13	12	12

Three Year: Grading Trends

Course	School	2015-2016	2016-2017	2017-2018
Innovation and Design	BRMS	N/A	92.08%	91.43%
3D Modeling	BRMS	N/A	94.25%	93.07%
Computer Aided Design Technology I A	BRHS	84.16%	86.26%	85.31%
Engineering Computer Graphics I A	BRHS	79.79%	85.98%	85.10%
Introduction to Electronics A	BRHS	87.54%	92.72%	92.08%
Media Communications I A	BRHS	90.43%	91.92%	95.75%
Media Communications II A	BRHS	93.73%	93.73%	95.83%
Media Communications III A	BRHS	95.25%	95.88%	96.97%
Media Communications IV A	BRHS	97.46%	90.33%	97.67%
Video Seminar A	BRHS	87.10%	96.79%	98.00%
Wood Design and Fabrication I A	BRHS	90.52%	93.03%	92.60%
Wood Design and Fabrication II A	BRHS	88.06%	91.35%	88.74%
Wood Design and Fabrication III A	BRHS	91.53%	89.90%	90.83%

N/A – Indicates that the course did not run during that particular school year.

Three Year: Enrollment Trends by Gender

Course Name	School	Total Enrollment	Males	Females
Innovation and Design	BRMS	381	183	195
3D Modeling	BRMS	411	189	222
Computer Aided Design Technology I A	BRHS	336	308	28
Engineering Computer Graphics I A	BRHS	252	189	63
Home Improvement A	BRHS	413	378	35
Introduction to Electronics A	BRHS	392	364	28
Media Communications I A	BRHS	80	56	24
Media Communications II A	BRHS	152	108	44
Media Communications IIIA	BRHS	72	44	28
Media Communications IVA	BRHS	48	28	20
Video Seminar A	BRHS	28	8	20
Wood Design and Fabrication I A	BRHS	665	602	63
Wood Design and Fabrication II A	BRHS	350	329	21
Wood Design and Fabrication III A	BRHS	84	77	7

APPENDIX E

Program Evaluation - Guiding Questions

- What is our vision for the Industrial Technology program?
- How does/could our program support improving student achievement?
- What standards can we compare our program with to determine effectiveness?
- How has our program been impacted by technology?
- How effective is our current model of the required middle school program and elective high school program? How can it be made more effective?
- How does our program compare to programs in other schools?
- What is practical application in home of the skills and knowledge learned in our program?

APPENDIX F

Complete list of courses that meet 21st Century Life and Careers, or Career-Technical Education Graduation Requirements:

Academic Intern Program	Fashion Design I, II, III
Accounting I, II	Financial Planning
Advanced Photo Editing for Business	Fundamentals of Automated Design
Advanced Programming for Business	Home Improvement
AP Computer Science A	Introduction to Culinary Arts
AP Computer Science Principles	International Business
Applied Culinary Arts I, II	Introduction to Computer Science
The Art of Applied Nutrition	Introduction to Electronics
Business Law	Introduction to Marketing
Business: An Introduction	Keyboarding
Career Exploration and Awareness	AP Microeconomics
College Preparatory Accounting	AP Macroeconomics
Computer Aided Design Technology I, II	Media Communications I, II, III, IV
Computer Applications	Multimedia Technology and Business Presentations
Computer Repair and Technology Support I, II	Notetaking and Study Skills
Desktop Publishing	Photo Editing and Web Design
Electronics	Programming for Business
Engineering Computer Graphic I, II	Space and Design
Family and Child I, II	Today's Living
FCS	Wood Design and Fabrication I, II, III
All Programs of Study at Somerset County Vocational Technical School	

District Comparison Charts

Comparison Data	Total number of students in grades 9-12	District Factor Grouping (DFG)	Student / Teacher Ratio	District Spending per Pupil	Free and Reduced Lunch Percentage	Percentage continuing Post-Secondary Education	Graduation percentage
BRRHS	**2,882**	**I**	**12:1**	**$17,080**	**7%**	**94%**	**95%**
Bernards	843	J	13:1	$19,611	8%	93%	100%
East Brunswick (Grades 10-12)	2,188	I	13:1	$18,897	4%	96%	100%
Edison Township	1,908	GH	12:1	$15,737	34%	87%	95%
Hillsborough	2,290	I	12:1	$15,829	7%	95%	98%
Hunterdon Central	3,043	I	13:1	$21,700	6%	90%	95%
Montgomery	1,714	J	14:1	$16,431	3%	96%	100%
Randolph	1,611	I	12:1	$17,164	5%	94.4%	97%
South Brunswick	2,921	I	15:1	$16,135	10%	95%	96%
Watchung Hills	2,205	I	13:1	$18,321	1%	95%	98%
West Windsor – Plainsboro	1,497	J	12:1	$16,507	4%	97%	99%

Information obtained through Public School Review and Self-Reported School District Profiles

APPENDIX H

District Comparison SAT Information

SAT Comparison Data	Math	ERB Reading and Writing	SAT Total
BRRHS	**603**	**592**	**1,195**
Bernards	597	613	1,210
East Brunswick	627	611	1,238
Edison Township	546	543	1,089
Hillsborough	618	601	1,219
Hunterdon Central	661	648	1,309
Montgomery	674	657	1,331
South Brunswick	611	602	1,213
Watchung Hills	604	608	1,212
West Windsor – Plainsboro	672	657	1,331

In formation obtained through "NJ.com: The 50 N.J. High Schools with the Best SAT Scores"

Comparison Chart: Course offerings in BRRSD compared to like districts

IT courses offered at BRRHS compared to other districts. Some courses are identical, while others are similar in nature. **KEY** X = identical or similar offering .5 = semester course C = indicates cycle program	Bernards	Hillsborough	Edison Township	West Windsor - Plainsboro	Montgomery	East Brunswick (Grades 10-12)	Hunterdon Central	Watchung Hills	South Brunswick	Randolph
7th Grade Technology Cycle – Innovation and Design			X							
8th Grade Technology Cycle – 3-D Modeling										
Advanced Electronics			X			X				X
Computer Aided Design Technology I	X	X	X	X	X	X	X	X	X	S
Computer Aided Design Technology II	X	X	X		X	X	X	X	X	S
Electronics			X			X				X
Engineering Computer Graphics I	X	X	X	X	X	X	X		X	X
Engineering Computer Graphics II	X	X	X		X	X	X		X	X
Fundamentals of Automated Design	X					X				X
Introduction to Electronics			X			X		X	X	X
Media Communications I	X			X	X	X		X	X	X
Media Communications II	X			X	X	X		X	X	X
Media Communications III	X				X	X			X	X
Media Communications IV	X				X	X			X	X
Video Production Seminar									X	X
Home Improvement						X			X	X
Wood Design and Fabrication I	S	X	X			X		X		S
Wood Design and Fabrication II	S	X	X			X		X		S
Wood Design and Fabrication III	S	X	X					X		

Comparison Chart: Course offerings in like districts, but not offered in BRRSD

Electives offered at other districts but not in BRRSD.	Bernards	Hillsborough	Edison Township	West Windsor - Plainsboro	Montgomery	East Brunswick (Grades 10-12)	Hunterdon Central	Watchung Hills	South Brunswick	Randolph
Honors Engineering				X			X			
Principles of Engineering							X			
Architecture							X			
Alternative Design							X			
Materials and Processes							X			
Introduction to Technology							X			
Invention and Innovation							X			
Introduction to Technology Engineering and Design							X			
Stem I		X				X			X	X
Stem II						X				
Game Design				X	X	X			X	
Screen Printing						X				

Electives offered at other districts but not in BRRSD.	Bernards	Hillsborough	Edison Township	West Windsor - Plainsboro	Montgomery	East Brunswick (Grades 10-12)	Hunterdon Central	Watchung Hills	South Brunswick	Randolph
Robotics				X					X	X
Automotive (10 Credits)				X						
Photography				X						
Construction Technology				X						
Applied Engineering				X	X					
Photography – Media Arts		X	X							
Photography II – Media Arts		X								
Photography III – Media Arts		X								
Digital Photography		X								
Energy, Power, and Transportation		X	X			X				X
Aerospace Engineering								X		
Music Technology						X				
Engineering (General, Mechanical)						X		X	X	
Advanced Electronics			X							
Automotive			X						X	