Dover School District – SAU #11
Instructional Technology Program Evaluation Report
October 20, 2015

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Introduction

On August 25, 2015 Dover's district-wide Technology Audit and Planning committee met to develop a slate of performance indicators for the district's instructional technology effort. Ultimately, the work on the 25th resulted in indicators in three indicator categories:

- Student Learning and Skills
- Teacher Skills and Pedagogy
- District Supports for Instructional Technology

Within each of these categories, individual indicators target specific desired outcomes of Dover's instructional technology efforts.

The data collection by Sun Associates between 9/24/15 and 10/9/15 included:

- Teacher online surveys – 210 Total
    - 64 – HS
    - 48 – MS
    - 28 – Garrison
    - 31 – Horne
    - 39 – Woodman Park
- Parent online surveys – 171 Total
    - 59 – HS
    - 35 – MS
    - 27 – Garrison
    - 30 – Horne
    - 20 – Woodman Park
- Teacher focus groups – 28 Teachers Total, Elementary, Middle and High School
- Student focus groups – 14 Students Total, Middle and High School
- Classroom-level observations (walk-throughs) of all classrooms in all 5 schools
    - Teacher interviews/discussions in 62 classrooms
- Principal interviews in all 5 schools

This data has been analyzed by the evaluators and is summarized as it relates to the indicators below.

Student Learning and Skills Indicator

The Student Learning And Skills indicator states:

In daily practice, students in the Dover School District demonstrate and develop information fluency and media literacy skills through curriculum-based experiences that emphasize planning, organizing, designing, constructing, collaborating, preparing publications, and independently producing creative and original works. Within the framework of state and national standards as well as local curriculum, Dover teachers guide their students to become flexible critical thinkers, problem solvers, innovators and to choose and employ a variety of learning resources that best fit their needs.

As noted in the introduction to this report, the evaluators surveyed teachers and parents throughout the district. While the specific wording of survey questions differed slightly between populations, the questions themselves were designed to:

1. Gauge the importance and prevalence of the kinds of learning experiences described in Dover's indicators (Figures 1 and 2)
2. Determine the degree to which technology currently supports these activities and 21st c learning in general (Figures 3 and 4)

Findings related to classroom learning experiences

- **Teachers place a high priority on student learning experiences such as critical thinking, collaboration, and problem solving**

  As shown in the figures below, teachers self-report that they routinely engage students in activities that develop critical thinking, collaboration, and problem-solving. Parents share the belief – at very similar rates/levels -- that these activities occur regularly at school.

  Teachers in focus groups talked about working to incorporate more "pods" (groups) and wanting to move toward a more student-centered model that leverages collaboration. Others talked about helping students critically evaluate television commercials, while others cited the Next Generation Science Standards as motivation to move to a more problem-based teaching approach.

  During classroom observations, the evaluators saw several critical thinking, collaborative, problem solving activities taking place. In one class, high school students were observed working in groups to conduct science experiments, graph data and explain their findings. Middle school students were observed collaborating with peers on math estimation challenges. Elementary students in a number of classrooms were observed working in "centers" that supported/demonstrated small group learning.

  In focus groups, middle school students described their "Day 6" tradition of homeroom-based team challenges that provide opportunities for collaborative problem solving. Likewise, at the elementary level, all students participate in a weekly STEM class, which is inquiry-based, and engages students in hands-on learning and scientific investigation.

- **Teachers value differentiation and experiences that support creative expression**

  Particularly at the elementary level, teachers place a high priority on differentiation and providing opportunities for students to explore concepts and demonstrate understanding in creative ways.

  The elementary STEM classes again provide a good example of differentiation and creativity. Students are allowed the flexibility to design "solutions" to the open-ended STEM challenges posed, and can draw upon their individual strengths to innovate and create using a variety of materials.

- **Teachers place a high priority on real world problem solving**

  Teachers, particularly those at the High School, tend to feel that their classroom activities reflect a connection to topics in the real world. Figure 2 shows that parents seemed slightly less inclined to see connections between their students' work at school and real world problems.

  The evaluators saw a few examples where teachers tried to connect their work in the classroom to current issues. In one class, high school chemistry students were prompted to think about polar ice and global warming as a context for their phase change lab graphing the effects of heat on ice. In another example, the evaluators observed a middle school math class in which the study of volume connected to the concentration of sugar in soda, with students extrapolating about how much sugar would be in various sized drinks, and identifying the healthiest choices.

- **Teachers and parents state that independent work is highly prevalent**

  The evaluators observed many classes in which students were working individually on workbook activities, answering questions in a textbook, or reading silently. Even while researching for projects such as the middle school Fertile Crescent project, students all work individually to complete the same teacher-specified final product.
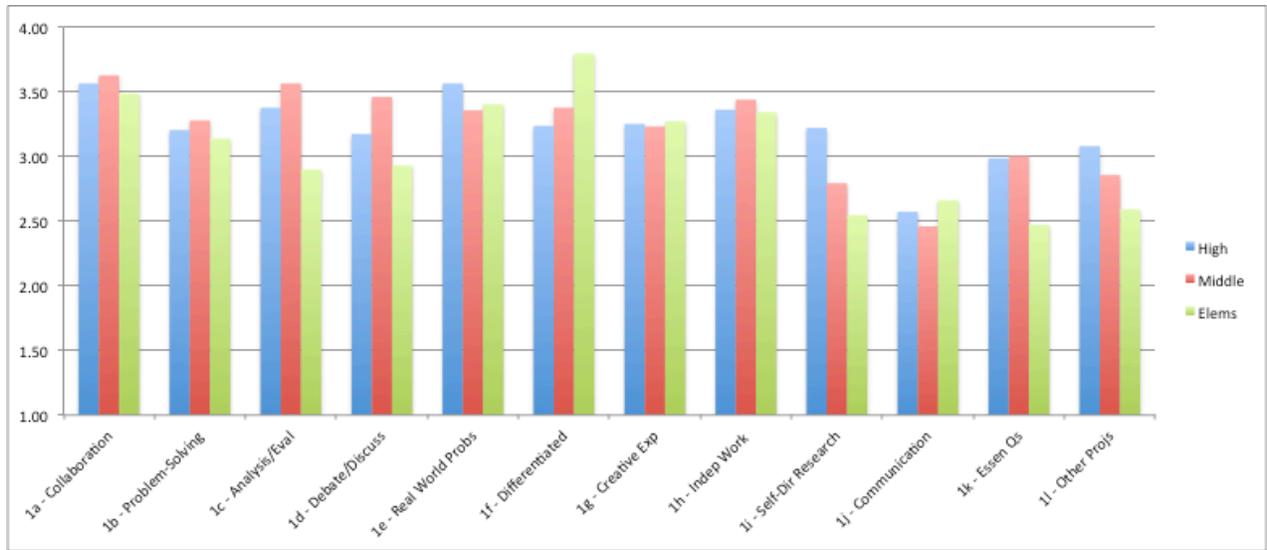
Figure 1: Teacher Survey Question 1 – What is the priority of this learning experience in your classroom? Average rating by level (high school, middle school, elementary school). Scale – 4 = Highly Priority/We Do This A Lot; 3 = Important/We Fit It In When We Can; 2 = We Do A Little of This; 1 = It's Not Relevant/Important In My Classroom
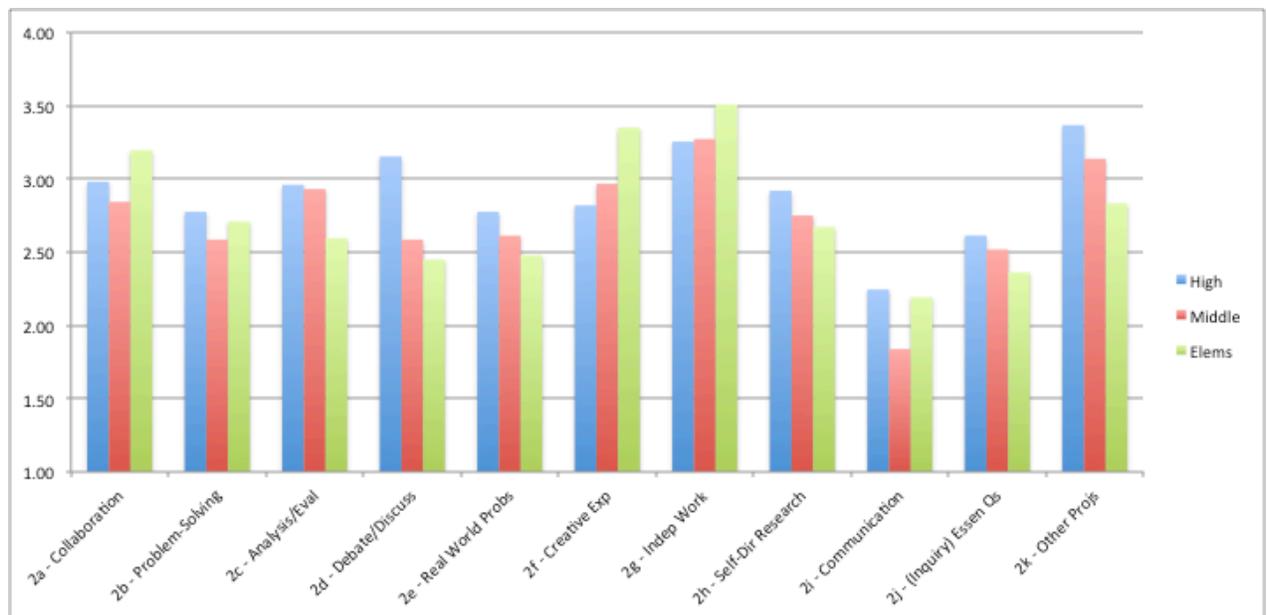

Figure 2: Parent Survey Question 2 – How typical is this learning activity in your student's classroom? Average rating by level (high school, middle school, elementary school). Scale – 4 = Very Typical; 3 = Somewhat Typical/Frequent; 2 = They Don't Seem to Do This Very Much; 1 = I Don't Think They Do This At All.[1]

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[1] The Parent survey contained an option for choosing "I Do Not Know" for each of these questions. The averaged responses in this graph are averages of all respondents who <u>did not</u> choose "I Do Not Know".

Findings related to student technology use

Figures 3 and 4, below, show the degree to which teachers and parents feel that technology supports the learning activities listed.

When looking at those high priority/high frequency activities discussed above (i.e., problem solving, critical thinking, and creativity), parent responses (Figure 4) indicate disagreement that technology supports these activities for elementary students. Likewise, teacher responses (Figure 3) tended toward disagreement, particularly at the elementary level. Teachers tend to feel somewhat more positive about technology's role at the secondary levels, yet still don't "agree" that technology supports these 21st century activities.

- **Student technology use is largely non-collaborative and focused on individual work**

  The prevalence of individual work discussed above is echoed in the data for technology-supported learning. Teachers – and even more strongly, parents -- at the elementary level tend toward disagreement that technology supports collaborative learning.

  The evaluators' observations very clearly underscore this point. Where students were observed using chrome books or laptops, the work was almost exclusively independent. In many cases, students were using computers to research the same topics. Rather than working cooperatively, students were each engaged in producing their own version of the teacher-assigned project, paper, or assignment, with little interaction or discussion between students.

  Likewise, students in elementary and middle school computer labs were observed working alone on programs such as *Type to Learn, Bookflix, and Microsoft 365*. High School students were observed in computer labs using a credit recovery program. In elementary classrooms, teachers explained that workstations there are used to practice math facts on *IXL* or *Study Island* or to access early reader programs. Additionally, the evaluators observed classrooms at all levels in which classroom computers, connected to a projector, were used to display writing prompts, math problems, or textbook pages on the Smartboard so that students could work individually at their desks.

- **Development of information fluency and media literacy is inconsistent and infrequent**

  Parents and teachers concur that students do not use technology to develop information fluency and media literacy skills at the elementary and middle school levels. The data is somewhat more positive for the High School, but not to the level that parents or teachers actually "agree" that technology plays a supporting role in the development of these skills.

  Information obtained from students supports this basic idea. Some students indicated that they had received instruction through the Middle School "study skills" class in how to identify credible websites for the purposes of conducting research. Others contend that the only discussion around Internet resources relates to appropriate use of citation and MLA formatting.

  This situation is perhaps explained by the fact that Dover currently has no district-wide technology scope and sequence to guide the development of student media literacy skills

throughout the grades. Teachers thus address the use of technology resources in a highly individual manner, according to their own interest, skill, or available time.

High School students are required to complete a computer credit requirement prior to graduation, but it is unclear whether information fluency and media literacy play a role in these courses. It is unlikely that these skills are uniformly addressed across the various types of courses/experiences that students can use to complete the High School requirement. High School teachers in focus groups, survey comments and interviews often cite their concern that students are not media literate/savvy.

Students at the High School were able to cite a very small number of examples in which select teachers have used Google Classroom and other web-based applications to engage students in discussions and group presentations. Google Classroom is just being rolled out in Dover, and these limited attempts at electronic collaboration are described as being difficult in an environment where access to computers is sometimes difficult due to library and lab scheduling. It is still common for Dover students to share files via flash drive rather than in a collaborative cloud environment.

Also at the High School. the engineering courses at the CTC provide an example of technology being used to support collaboration, problem solving, and critical thinking. True to the STEM model of learning, these classes integrate technology with math, science, and engineering within a student-centered, inquiry-driven curriculum. Unfortunately, the engineering program is a highly specialized set of courses open to only a select number of students (less than 4% of the student body).
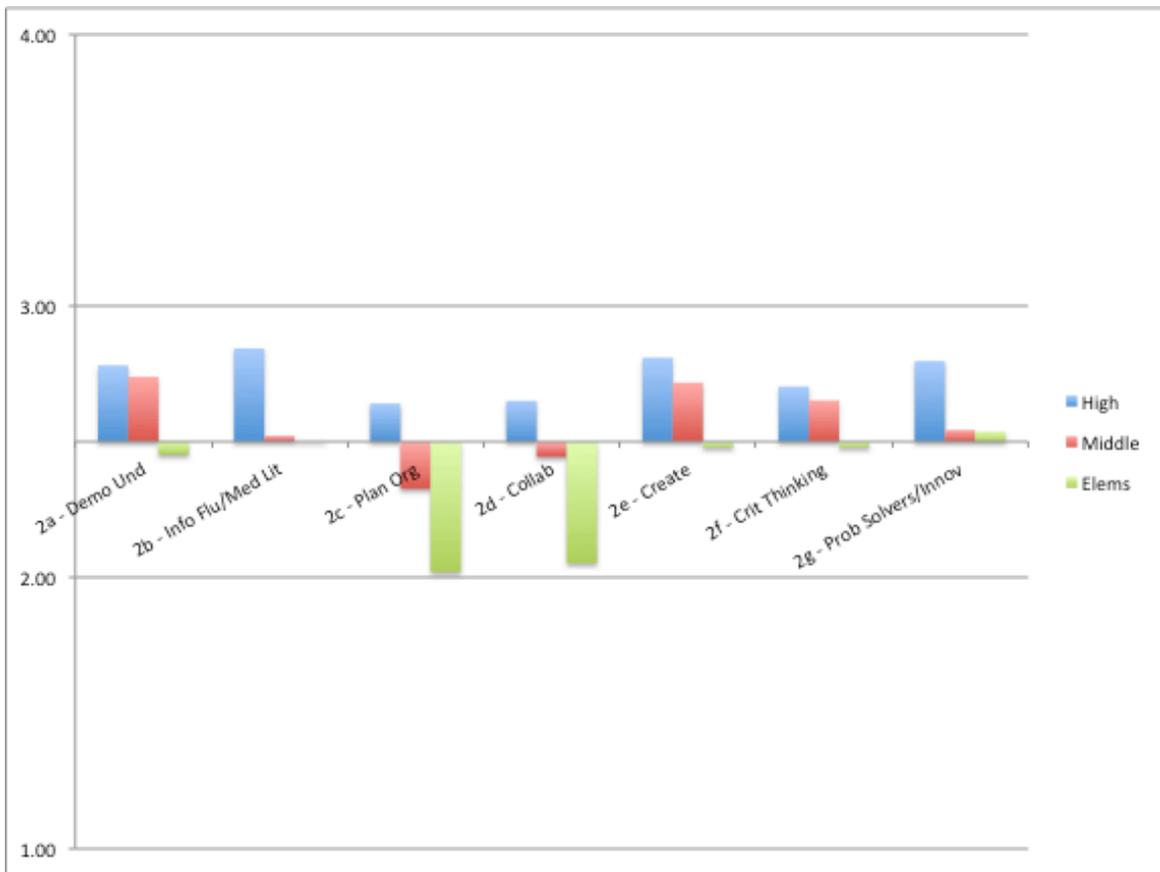
Figure 3: Teacher Survey Question 2 – Degree to which teachers agree that their students are using technology to accomplish various tasks. Scale – 4 = Strongly Agree to 1 = Strongly Disagree

Figure 4: Parent Survey Question 3 – Degree to which teachers agree that their students are using technology to accomplish various tasks. Scale – 4 = Strongly Agree to 1 = Strongly Disagree
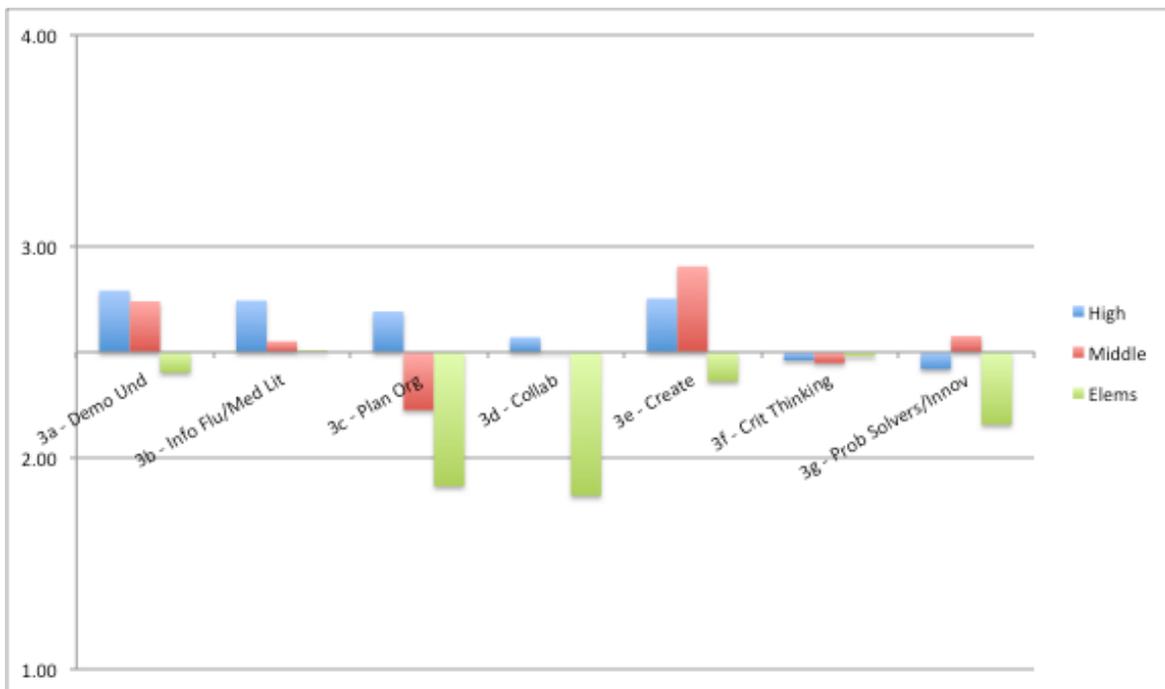
- **Most teachers feel that their students do not have adequate technology skills.**

    As has been discussed earlier in this section, and will be discussed further in relation to the next two indicators, student and teacher technology use in Dover is inconsistent and is driven largely by the skills and interests of the individual teacher. While there are required technology (computer) courses in the Middle and High schools, there are no such requirements in the elementary schools to provide a uniform foundation of student technology skills. Therefore, many teachers – particularly elementary and Middle School teachers - feel that their students do not have adequate technology skills to support their learning. This is shown in Figure 5, below.
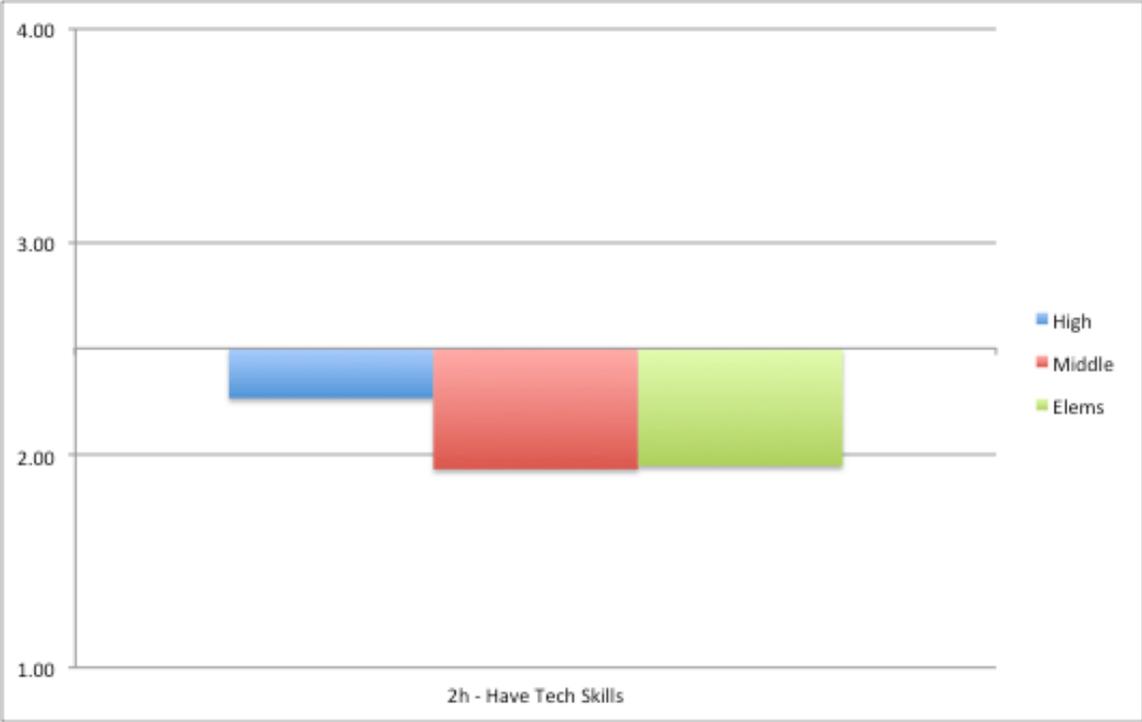

Figure 5 -- Teacher Survey Question 2 – Degree to which teachers agree that their students "Arrive in my classroom each fall with the technology skills necessary to successfully use technology for learning". Scale – 4 = Strongly Agree to 1 = Strongly Disagree

Teacher Skills and Pedagogy Indicator

The first part of Dover's Teacher Skills and Pedagogy states:

Dover's teachers work to model and thereby support the development of 21st century mindsets within their students. To do this, teachers develop project-based learning, communication skills activities, collaboration opportunities, differentiation in lesson planning, and numerous opportunities for students to express their creativity. Teachers guide their students in the process of learning how to properly use technology as a tool for independent, innovative, problem solving.

Findings related to 21st century pedagogy and the development of 21st century mindsets

Critical thinking, collaboration, creativity, communication, real-world problem-solving as well as information and media literacy are all part of the "21st century mindsets" referenced in Dover's indicator. As discussed in the Student Skills indicator in the previous report section, Dover's teachers place a high priority on the teaching of many of these skills in their classrooms and activities. Media and information literacy are an exception to this trend in that these skills are dependent to a large extent on use of and access to technology; and Dover teachers for the most part do not address these skills consistently in their classes or across the grades/subjects.

Evaluator observation and in-person discussion with teachers reveals that in day to day practice, actual instruction tends to focus more on a pedagogical model that emphasizes traditional teacher-directed instruction. In particular, students (particularly those in the Middle and High schools) produce individual teacher-specified work products and work in parallel on most learning tasks. The evaluators find that a distinct gap exists between teacher perception of their instructional model and how student learning occurs in the majority of Dover classrooms.

- **There is little evidence that technology supports 21st century learning activities on a regular basis.**

  Teacher-provided data as well as observations provide very little evidence that teachers use technology to model and develop the skills that are parts of a 21st century mindset. When asked, teachers consistently state that a lack of access to technology and a lack of training and support represent the major barriers to use of technology by them and their students.

  The evaluators found some teachers making very initial use of cloud-based technologies (Google Classroom, and in a few cases the file-sharing aspects of Microsoft *Office 365*) to support student collaboration. The evaluators also observed one High School teacher thoroughly integrating the use of online communication tools (blogs) in his classes.

  Across the district, the majority of teachers utilize technologies such as Internet resources, projection systems (including Smartboards), and workstations for production of teacher and student work. Most of this technology use is highly teacher-driven and supports whole class and individual (versus small group collaborative) instruction. In short, while there is currently use of technology by Dover teachers, little of this models or supports the development of 21st century student skills and dispositions (mindsets).

- **Teachers do not consistently guide students in their use of technology**

  There is considerable inconsistency across the district and within individual schools as to the extent that students utilize technology for even the most basic, teacher-directed, tasks. This finding is rooted in teacher survey, interview and focus group data. At the elementary level the evaluators were told that there is considerable variation in the frequency with which students go to the computer lab, and once in the lab different classes seem to do different things. Student technology use is very much at the instigation and discretion of the individual teacher. Consequently, teachers and students note that student technology experience varies according to what teacher they had in previous years. Middle School teachers note that students from different elementary schools have different degrees of technology skill owing to the different experiences in different buildings.

  Some teachers readily acknowledge that they do not have sufficient knowledge to guide their students' use of technology and hence are reluctant to create many expectations regarding student technology use. This problem is compounded by the fact that the majority of Dover teachers visualize student technology solely in relation to a "one student, one computer" model. The majority of Dover teachers therefore cite a lack of available computers as the main reason why they cannot expect their students to utilize technology at school (see Figure 7 and the related discussion in the District Supports section below). Several teachers told the evaluators that they were unsure what technology was available to them and their students in school. Furthermore, a number of teachers noted that they also could not expect students to utilize technology in relation to school work at home (i.e., homework) as some of their students did not home access to computers or the Internet.

Findings related to teacher resources and professional development

The second part of Dover's Teacher Skills and Pedagogy states:

Dover's teachers are well equipped with the skills and resources necessary to support their work. These resources include access to technology, time, as well as consistent and thorough professional development. Teachers practice and continue learning new skills in order to model lifelong learning to students.

- **Dover teachers do not feel that they have the technology skills and resources necessary to support their work.**

  Teachers' perceptions as to the lack of technology devices and network infrastructure issues are discussed elsewhere in this report. As shown in Figure 6 below, teachers also feel that they do not have adequate professional development related to using and integrating technology to support student-centered learning. Likewise, teachers generally do not feel that they have the skills to utilize technology to address their students' learning needs, as shown in Figure 6, below.

  Opportunities for professional development related specifically to technology are reported to be rare in Dover Schools. For example, only a few teachers per school participated in Google Hero training during the later portion of the 2014/15 school year. This limited pilot has been expanded in the current school year with training offered in October 2015. Reports from

teachers indicated that this October's Google training was a small part of a very tightly packed professional day and was compromised by problems with Google logins and other technical issues. Reportedly, similar issues (lack of time, technical problems) have impacted most other technology trainings over the years.

Teachers note that a significant problem related to technology training is a "lack of differentiation" in that training is often offered in a "one size fits all" mode. Teachers say that they would benefit from a professional development approach that offers different levels of training for teachers of different skill levels. The October 2015 Google training is again offered as an example. Here teachers note that it would have been beneficial for the Google Heroes to have received "advanced training" that built upon their existing Google Classroom skills while teachers new to Google could have had more basic training.

Finally, it is noted by the evaluators that the District's existing Collaborative Inquiry model seems to rely strongly on teacher initiative to determine the particular focus of an individual teacher's professional development. Such a model seems reasonably unlikely to guide teachers to explore topics and areas of focus that "push the envelope" in terms of interest and ability. Given the overall scarcity of technology resources and technology awareness in Dover schools, self-selected professional development topics may perpetuate a situation where teachers remain unaware of and unskilled in new applications of technology to student learning. It is noted by Dover teachers and administrators that the Collaborative Inquiry work occupies 50% or more of the available time for teacher professional development.
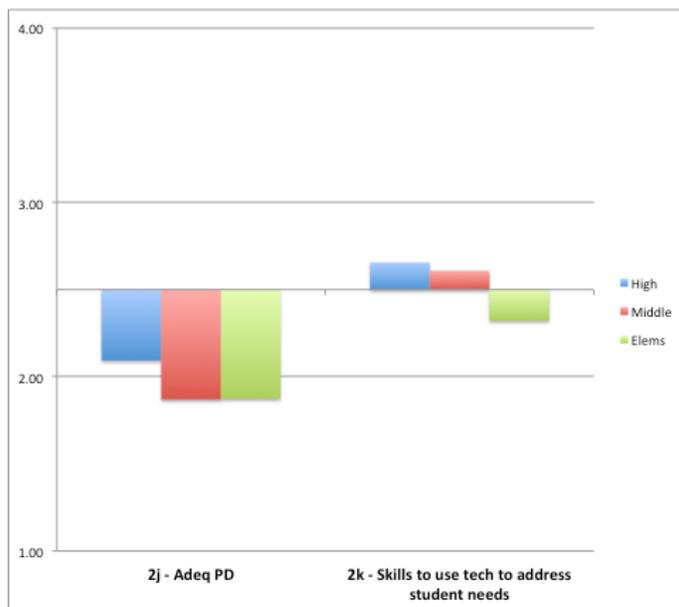

Figure 6 - Teacher Survey Questions 2j and 2k – Degree to which teachers agree that they have adequate PD and that they have the skills to use technology to address student needs. Scale – 4 = Strongly Agree to 1 = Strongly Disagree

- **Teachers at all levels note that there is very little opportunity for teacher collaboration between grades**.

  Although grade-level, team, and department meetings take place, teachers don't connect with one another to coordinate across grade levels. Teachers are vocal in their dissatisfaction with this situation and seem to desire more collaboration, but all note that there "is not time" for such work. Teachers cite a lack of time as one of the main reasons why they are unable to collaboratively share ideas, tips, and resources related to technology integration.

- **Teachers consistently note a lack of access to technology resources**.

  See the next section on technology infrastructure for more information on this finding. The evaluators' main take-away on this point is that while there are indeed places where infrastructure could be improved (particularly around issues of standardization and upgrade of devices), teachers actually have basic access to resources. What is missing is the training, technical support, instructional support, and overall communication necessary to catalyze and support the use of the district's technology resources.

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District Supports Indicator

Findings related to policies and curriculum

The first part of Dover's District Supports indicator states:

The Dover School District makes technology-supported student learning a priority by developing policies and curriculum that provide guidance/boundaries/expectations to staff and students that align with state and national standards and adapt to a perpetually changing environment. Dover actively engages all members of the district community to insure ongoing input and data-informed decision-making and on how technology is being used to support student learning and teacher work.

- **There is no evidence that "all" teachers are aligning their curriculum with state or national technology standards.**

  Individual teachers work to address the technology skills of their students, but this happens on a teacher by teacher basis.

- **The Middle and High schools provide courses that address computer skills.**

  In the Middle School, there is a stand alone "study skills" course that addresses basic computer applications. In the High School, students can satisfy their computer credit with a variety of courses, some of which address basic skills and some of which are more oriented to students with specific interests in technology.

- **In elementary schools, there is no uniform process for addressing the development of student technology skills**.

  As noted in the Teacher Skills indicator, there is considerable variation among teachers as to their own technology skills/interests. This means that student technology skills are not uniformly addressed throughout the grades, and are highly teacher-dependent. Most teachers report taking their students to the lab on some regular basis, although the evaluators find that "regular" seems to vary from school to school and teacher to teacher. In the lab, student activities vary also, in that there is no defined curriculum (as described in the indicator) for the development of student technology skills. As shown in Figure 5 (above), the end result is that most teachers do not feel that their students have the technology skills necessary to use technology for learning.

- **The district has a technology committee that meets somewhat regularly**.

  The evaluators found various teachers throughout the district who are on this committee, although the overall purpose of this group is not clear. What is clear is that there is currently no technology plan and (as has been discussed earlier in this report) there seems to be no clear set of expectations related to how technology should be utilized or deployed. It does not appear to the evaluators that the district has engaged "all members" of the community around issues of how "technology is being used to support student learning and teacher work."

Findings related to staffing, support and availability of technology at school

The second part of Dover's District Supports indicator states:

The district provides staffing at the building and district levels to support teachers in the integration of technology, engage students in varied learning opportunities and to provide professional development. The district builds sustainability by establishing the necessary and consistent allocation of resources for instructional technology, infrastructure, staffing and training.

- **Technology staffing is a major concern among Dover teachers and administrators**

  At present, the district is reorganizing its staffing and is in the process of hiring a District Technology Coordinator. There are also a number of vacancies on the technology staff as of the current school year.

- **Teachers frequently note the lack of staff who can address their technology needs**.

  Dover teachers frequently state that they do not have adequate levels of technical support. While the existing technical support staff is generally credited with being helpful, recent changes in technical staffing have generated significant concerns as to the ready availability of technicians. Teaches note problems with how the "help desk" has historically operated – particularly around the completion of technical work and the repair and removal of devices. The current process for addressing technical support issues is in flux and this has caused significant concern from teachers across the district. Mainly, teachers at the elementary level are concerned that they will no longer have technicians resident in their building and that they will have to depend on (what they perceive to be) uncertain district-level/shared technician resources.

  Likewise, most teachers note that they have never had assistance in developing and supporting instructional uses of technology. Teachers repeatedly emphasize that the only way to get instructional support is to find another teacher who knows how to do something and to try to learn from that individual. Many elementary teachers roll this concern into one of "we need a computer teacher", which they envision both as a support person for teachers and as someone to work directly with students.

- **Teachers and parents have concerns related to the availability of technology resources for teachers and students** (see Figures 7 and 8, below and the section on Infrastructure).

  As is shown in Figure 8 and discussed in the section on Infrastructure, the majority of teachers and parents feel that students do not have sufficient access to technology at school. The main problem cited is a "lack of computers" and in particular, dependable computers. Further, as has been discussed earlier, teachers do not feel that they have adequate professional development or sufficient technology staffing to meet their needs.
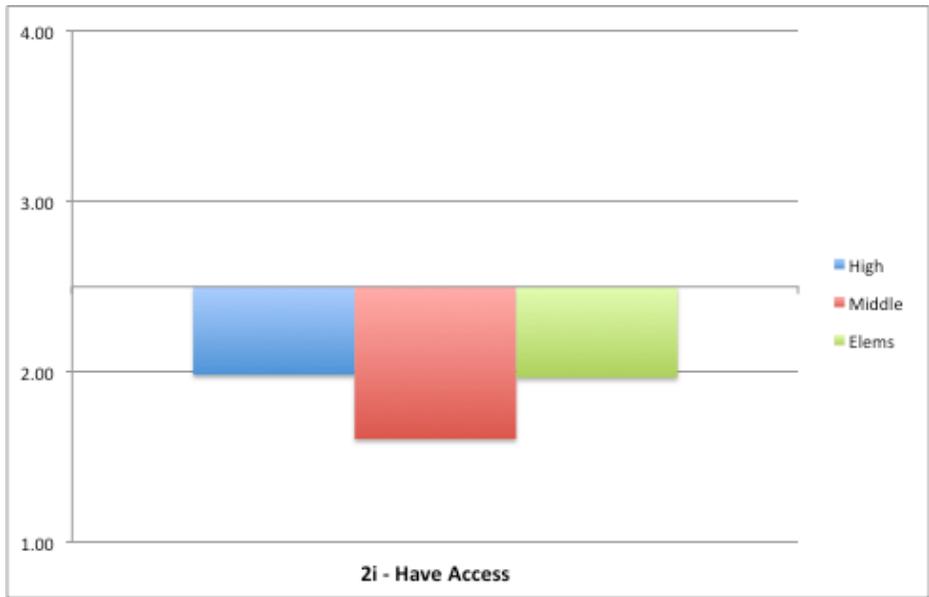
Figure 7 -- Teacher Survey Question 2i – Degree to which teachers agree that their students have access at school to the technology they need to learn. Scale – 4 = Strongly Agree to 1 = Strongly Disagree
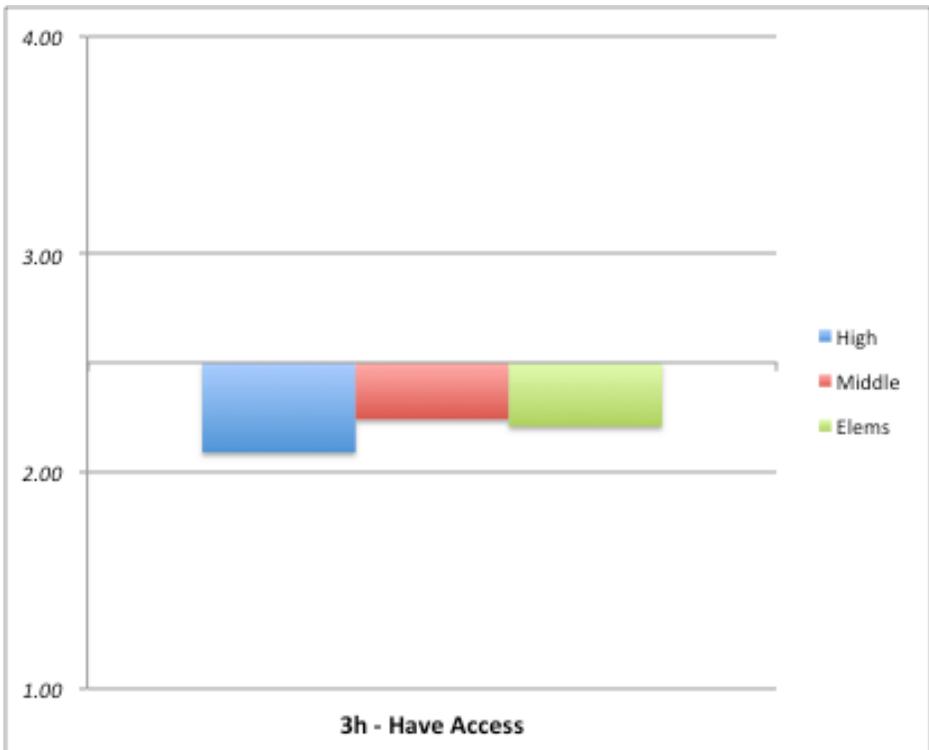

Figure 8 -- Parent Survey Question 3h – Degree to which parents agree that their students have access at school to the technology they need to learn. Scale – 4 = Strongly Agree to 1 = Strongly Disagree[2]

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[2] The evaluators note that 17% of high school parents, 26% of middle school parents, and 26% of elementary parents indicated that they "do not know" enough about their student's access to technology at school to be able to answer this question. As is the case with all graphs of parent survey data in this report, this graph only calculates responses from parents who chose something other than "do not know" for this question.

Dover's Technology Infrastructure

Throughout the course of data collection, Dover's teachers and administrators began many evaluator interviews with a statement related to infrastructure problems. Likewise, comments about infrastructure are pervasive throughout the online survey data (in the open responses). Since teachers, administrators and parents were aware that the evaluator's data collection efforts were in relation to a technology audit (and technology plan) it was only natural for many respondents to contextualize their responses with a discussion of the state of the actual technology (devices, network, etc.) available to them. Teachers and administrators generally expressed concerns about the quantity, reliability, and overall function of the technology infrastructure. Parents expressed similar concerns, although a number of parents also noted that they did not know enough about the actual availability of technology in schools to have an accurate opinion on the matter.

The evaluators emphasize that teacher/staff/parent comments on infrastructure are based on individual perceptions and experiences (in the case of teachers). In very few cases were the evaluators in a position to independently verify the technical "reality" of these perceptions. In a number of key areas, particularly those related to network infrastructure, the district's work with Neoscope should be able to sort out perception from reality. Nevertheless, the urgency with which users voiced their opinions related to infrastructure argues for discussion of these concerns. Broadly, user comments related to infrastructure cluster around a few key points. These are:

- **Availability of devices** – This is by far the most frequently heard complaint from teachers and it is usually vocalized as a problem with having an insufficient number of computer workstations, Chromebooks, or stationary lab space to provide every student in a class with access to a device.
- **General problems with technology "reliability"** – Many teachers simply state that "technology is unreliable" without providing any more detail as to the source of the unreliability.
- **Problems with the network** – Many teachers believe that the district's network – wireless and wired (although there seem to be more comments about the wireless network) – is "slow", unstable (e.g., problems with logging in, problems accessing sites, and the existence of "crashes") and is therefore unreliable.

Perceptions related to these three main points seem to be the primary reasons why the majority of Dover's teachers say that they cannot/do not make as much use of technology as they seem to imply that they would otherwise. In addition, other issues discussed in the body of this report – namely, factors related to technology support, standards/expectations/curriculum guidance, and training/professional development – appear to conspire with the various perceptions related to infrastructure to create an overall environment where student and teacher use of technology face significant barriers.

The Neoscope report of 8/18/15 addresses a number of areas of "deficiency" within Dover's network infrastructure. These deficiencies mostly relate to problems with server and network configuration as well as network management. While the evaluators defer to Neoscope's expertise in terms of the identification of these issues, it is noted that Neoscope did not focus on the aspect of the infrastructure that users most readily identify and perceive – namely, device availability and connectivity. In this regard, the evaluators' independent perception as to the availability of technology for Dover's users shows that there is generally some amount of technology available to Dover's teachers and students. All schools have computer labs (multiple labs in the secondary schools) and a variety of wireless devices (on carts and individually) are available in all schools. Most elementary classrooms have at least 3 working student workstations as well as a teacher workstation. Some teachers have wireless devices

(either district-owned or personal). There are many interactive white boards available throughout all schools (in classrooms and other instructional areas), though several teachers who would like to be able to use the Smartboards do not have them in their rooms. Many classrooms have printers. Where applicable, computers have various data logging and probeware interfaces. It is clear that there is technology for students to use, although not necessarily in the quantity that many teachers desire.

Despite this general availability of technology devices, the evaluators note several problems that seem to create the teacher perception of there being a lack of technology. These are:

- There is significant inconsistency in terms of type and quality of devices across buildings and (most significantly) within schools. Some workstations are quite old and are reaching the end of their useful life. Some peripheral devices (e.g., Smartboards) are in a poor state of repair and/or simply do not exist in some classrooms.
- Users (as one might expect) are often unable to differentiate between problems with devices and problems with device connectivity (networking). Thus even though a user might have a device, if that device is experiencing connectivity problems the end assessment by the user will be that they "don't have technology", and this is what is reported to the evaluators.
- At present – and this seems to be at some level a persistent problem over time – users have no clear or consistent communication with technical or district staff who can explain problems, policies, or provide productive guidance on how to use technology. The end result, once again, is that many users find it easier to simply say that they "don't have technology" than to sort through the various complexities and frustrations related to using technology.

In short, it is not possible for the evaluators to simply say that Dover's teachers and students do not have sufficient access to technology. There is certainly room to improve access by upgrading and repairing devices and augmenting the number of devices -- and there is clearly the need to address the various networking issues identified by Neoscope. Addressing these issues may well improve network performance and thereby alleviate user concerns about an "unreliable" network.