UPSD School Board Directors STEM Walkthrough Observations

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Background

A Stem walkthrough was held on 3/10/17. Board attendees were Joan Smith, John Gehman, Will Pike, Raeann Hofkin and Mike Elliot (Mike was unable to attend the HS portion of the tour). Administration Attendees were Dr. Alexis McGloin - Superintendent, Laurie Smith- Middle School Principal, Rob Carpenter-High School Principal, and John. Sheeran - Director of Facilities & Operations.

The tour was initiated following an email sent to parents in the district (but not to Board members) pointing out deficiencies of the Middle school for STEM that might be fixed upon building of the new middle school. Upon receipt of their email, a suggestion for some short term actions was sent to the Superintendent who suggested a walkthrough to show deficiencies of the program first hand. Ms. Hofkin suggested we include the High school as well (Note: The STEM teacher interview that was the impetus for this tour is in the attached Appendix).

14 rooms were scheduled for the Middle School tour, but unfortunately only 4 of those were science classrooms (28% of the overall tour). It is not known if we toured all science instruction rooms or not. Family and Consumer Science, Library, auditorium. Art, Guidance, and Special Education areas were also included on the list. We were informed Art is now grouped in STEM and Called “STEAM”. Following that logic, 6 of the 14 rooms would be STEAM related (42% of the planned tour). We were unable to tour the

Physics Classrooms in the High School. Also, it turned out that we were unable to tour the special education rooms as we ran out of time, so a separate request was made to tour district wide special education facilities on a future date.

Executive Summary of findings

Common Themes

Teacher dedication

- All teachers we spoke to clearly had a passion for their profession, and wanted to do best by their students
- Most appeared to go above and beyond by spending their time outside the classroom to bring in new ideas or obtain classroom materials.
  If this dedication is commonly shown by other teachers as well, this is a strength for the district

Staffing

Based on the observation and discussions that occurred during the walkthrough, Staffing levels may not be adequate in the technology areas (or possibly in other areas observed as well).

a) Technology Education:
   - It was pointed out in the Technology Education classroom that the layout didn't allow good supervision in both classrooms, and the original STEM email stated most districts have 2 instructors in this area, not 1.
   - We were told that the number of students in the classroom seemed to prohibit sufficient individualized attention to teach some of the expected hands on skills one would learn in a technology area (not PC related skills but skills such as using power tools, etc.). A 2nd teacher as suggested in the teacher interview (Appendix), or a skilled teacher's assistant (perhaps a retired craftsman, etc.) might help alleviate the situation.
   - One of the deficiencies pointed out was that the technology teacher couldn't monitor the hall because his rooms were so large and away from the hall. If there was a 2nd person in the classroom, or even a hall monitor, this problem could be easily solved.

b) Library:
   - It was pointed out during the tour that the library was poorly utilized. We observed the librarian teaching a class behind a blackboard-type divider. We were informed that the librarian taught six periods a day, so couldn't fulfill typical library supervision duties in addition to her teaching duties. Note this appears to require more of a staffing solution rather than a facilities solution. If a facility cannot be used because there is inadequate staffing, it is not due to the quality of the facility, it is due to the allocation/utilization of the staff.

Maintenance

Many of the items needing repair were fixed in the past, with" duct tape and band aid" type of approach, or perhaps never fixed properly at all. This raises the question: What is the process in place to review completed projects to validate projects are completed appropriately?

Examples include:

- Lockers partially detached and falling out of the walls (2-4 inches of travel). According to John Gehman, $36 million was budgeted for previous renovations, and $6 million was left after completion, yet all lockers were still not fixed at that time. We were told one of the reasons that the repair wasn't done was "that would have required *change requests* for the contractor". Since we were well under budget, it is unclear why this would not be added for repair under the renovation program mentioned by Mr. Gehman.
- In the shop class, where metalworking equipment was removed, an electrical conduit was left sticking out of the floor and a garbage can was placed over it! **This is a safety hazard and should be fixed immediately.**
- Hoods not working properly in the HS science area, and extra ventilation was installed rather than replacing the hoods.
- HS Storage room had a strong chemical smell; either the room needed special ventilation or special cabinets with ventilation for solvent storage. **This is a safety hazard and should be fixed immediately.**

Question: What is the process of reviewing the facilities? Do our teachers review their classroom and how often do Facilities Director and/or Building Administrators evaluate the rooms?

Based on the observations during our tour, here were some items identified as" Quick Fix items".

- Construction paper taped over windows rather than purchasing shades
- Electrical outlets not in optimal areas-easy to fix by running new wires.
- Tables damaged in floods and removed-consider buy a new table
- "Permanent tables" that don't allow for rearrangement of class space- buy or upgrade the tables
- An anecdote was shared of using former library shelves being used make steps in the auditorium

Support of Teachers with appropriate resources/tools:

A common phrase when speaking with staff was "we make do". Examples:

- When asked the general question, "what do you need?" one thing that came up BEFORE space was better training/career development, including training for special education aids for inclusion activities to improve the "quality" of the inclusion.
- For Family and consumer science, we were told that cooking was the area which students enjoyed the most, an important life skill. Yet the budget for food over the last

20 or so years had only increased from $3,000 per year to $3,600 per year, even though the number of students had roughly doubled (and of course inflation would mean you need $4,400 dollars of today's dollars to buy what you could purchase for $3,000 in 1997)

Question: how are these classroom budgets set and who sets them?

- The family and consumer science teacher did her own shopping to buy items" on sale".
- Teachers in the HS were preparing distilled water with a still that they use to generate purified water for experiments. When I asked why I was told "distilled water is expensive".

Comment: Teachers are highly trained as educators; their time should be focused on the instruction, not in buying or worse yet making supplies for their classes. **For reference, in industry ensuring that there is a proper supply chain in place for supplies, and an adequate budget for supplies is the role of first or 2nd line management, not necessarily the individual contributors.**

Facilities planning and facilities organization

There was a general theme based on the observation of a lack of emphasis on overall facilities organization and sub-optimal space management in the middle school. Some of that is likely due to layout/planning of the previous middle school additions, but some is also due to not looking at the space as a whole and optimizing layouts. It seems that teachers are given "a box" (room) and they have to think about how to organize and fix deficiencies themselves. This should not fall only on the individual teachers; this is a facilities/management issue working in partnership with the teachers.

Questions to help facilitate better optimization of facilities:

- What is list and order of priorities from an educational perspective?
- What areas NEED the most space no vs what was important 20 years ago?
- What areas need to be co-located?
- Moving of classrooms that are mainly PCs or desks is a lot easier than moving heavy equipment (routers, etc.), but the impression I got makes it seem as if classrooms are fixed and immovable.
- Even in the case of routers, saws, etc. In the Technology room, these pieces of equipment can be moved as well, it only requires movement of electrical lines and air ducts that are already in place.
- What is the process in place to review completed projects to validate projects are completed appropriately?

Examples:

- The first art class we saw was cavernous and huge and had the "best storage of the building". Then we saw the 6th grade science class that was small and over cramped.

- We were told people couldn't collaborate in the library because Mrs. Wietecha had to teach a class and the class would be disturbed by noise, yet the "class" walls were blackboards, etc. But <u>not an actual room partition</u>.
- We were also told the space she wasn't using for teaching (the rest of the library) couldn't be properly used because it disturbed her students, yet no one on the walkthrough (facilities director, building administration) considered adding floor to ceiling partitions as are commonly used in most office building auditoriums to isolate portions of the working space. What was used in this space was a blackboard-type divider, which did not fulfill any room isolation or sound isolation as one would expect from typical floor to ceiling accordion type dividers.
- The family and consumer science room was not laid out properly due to the fact half the space was taken out in years past for a separate classroom (a facilities decision made in years past).
    i. Deficiencies of current space pointed out were:
        1. poor supervision capability due to recessed kitchens and blind spots depending on where the teacher might be positioned relative to the kitchen areas
        2. No smart board
            a. We were told it was "the only class at the middle school with no smart board".
            b. When asked, it seems no one from facilities/administration had even considered changing the layout of the room to make it an open kitchen concept, or to move some storage cabinets to install a smart board.

    *** **This is a facilities** <u>management</u> **issue**
- We are using prime technology space in the former metal shop to house a computer lab. This is underutilization of the wide open high bay ceiling space typically used for hands on activities or fabrication equipment. Perhaps a swap out of this area with the science classrooms would allow for greater space in science demonstrations and more efficient use of space for computer instruction for technology, which doesn't need a high bay area.
- The auditorium, which was part of the tour, was listed as a main issue/deficiency of the middle school. When asked why it only has half with full open ceilings we were told it was modified in the past to make classrooms which are not really used as such anymore (another legacy facilities decision).
- When asked why we don't fix things now, I was told repeatedly we don't want to invest in the current facility since we are buying a new facility. This is a cost effective option, unfortunately this means that current students' needs may not be met for the next 3 years until the new middle school is built. There is likely some appropriate middle ground.
- Guidance Areas in former closets, next to teacher restrooms. I'm sure there must have been some other options

i. Example: Why couldn't we have used the secure entrance area instead and have built an actual secure entry, not a hole cut in the wall with a sliding window to look out at the door?
ii. Why not remove the teacher restrooms and open that space for a full guidance area?

K-12, 6-12 curriculum integration

A common theme heard from STEM instructors we spoke with in the HS was a lack of integration or alignment of core concepts, etc. from Middle School to High School.

- HS Technology (X-lab) instructors mentioned that there was good alignment in what was taught at the elementary level to HS, but middle school was not.
- When asked directly, a HS science teacher mentioned incoming students were not well prepared for the rigors of HS, and it has "gotten worse". It was suggested that this might be more of a methodology issue rather than a facilities issue, as facilities were the same for years but preparation was now "worse".
- It was also mentioned the 9th grade academy was set up by Dr. Carpenter to help in this area, but what might help as well is clear alignment of curriculum and expectations so the required skills are begun to be taught in MS, and catch up is not needed.
- Interestingly it was pointed out that the middle school math curriculum included graphing of equivalence points, which is an advanced skill, but there appeared to be other areas of deficiency, so alignment again might help in this area.
- We were told there were some type of K-12 meetings of subject matter experts, but there was not a lot of feedback as to how well it is working (and Dr. Arney who recently left the district was responsible in this area).

STEM Recommendations, based on feedback from teachers and observations:

1. Emphasize teacher training at conferences to see how other districts might deal with similar STEM educational issues. They could bring back good ideas on how to better use what we have or point out what we need to invest in (district wide, not just MS)
2. Prioritize STEM curriculum alignment, facilitate K-12 teacher meetings for subject matter experts, as well as integration of different related disciplines (math and science, art), to align on what foundational skills need to be taught when to ensure students are prepared as they progress through grades.
3. Identify and prioritize short, medium and long term STEM facilities and equipment upgrades for current and proposed future facilities. I believe AJ Juliani had started down this path, not sure if or how it is being continued with our new Technology Director.
4. It also seems as if there is a middle area for technology education which is not emphasized. If students desire pure hands on work, they are directed towards the Vo-Tech, while high

level engineering is taught in STEM classes. As someone who worked in the STEM field in this area for the last 20 years, I know there are students in the middle who will not go to VoTech, nor become engineers or scientists, but may work in a high-tech field. Some thought should be given to what is best to prepare these students.

General Recommendations:

1. Encourage tours of surrounding districts by Facilities Directors and building administrators and lead teachers to see how others solve similar problems. Conferences might also be a resource for networking on these areas.
   *** One effective way to capture these learnings is to require summary reports to capture the learnings for sharing with others (future administrators, board members, etc.)
2. Hire a facilities management consultant with experience in educational workspaces to objectively look at the organization of our buildings and help us **optimize it.** Based on the conversations during the walkthrough, it appears we may need some external help understanding how to do this or what options might be possible. A starting point might be visits to see how things are done in other districts.
3. Address repairs in a manner where they are repaired properly, not just functionally. For example, it would not be acceptable in an administrator's office or in one's home to use construction paper as shades, or have electrical conduits sticking out of the floor or ceiling tiles hanging open with receptacles in them. It should not be acceptable in our classrooms either.
4. A periodic walkthrough of buildings and classrooms to identify any facilities issues by building administrators or Facilities Directors would be useful to identify some of these minor "quick" fix items. See: https://en.wikipedia.org/wiki/Gemba for some information on these types of walkthroughs.
5. Identify a 3rd party who focuses on workspace organization to look at some of the individual classrooms. This may or may not be part of #2, depending on the consultants we find.
6. Broaden the curriculum alignment to cover non-STEM areas as well.

Conclusion/Summary

I would like to thank the administrators and teachers for hosting us, and the other board members for attending as well. It was an informative tour and discussion. I was encouraged by the passion and dedication of the staff, and their openness to discuss issues, as well as the openness of Dr. McGloin and the Building principals in discussing some of the shortcomings and how they are trying to improve the situation.

- There appear to be significant opportunities to optimize use of our current Middle School workspace in the short term, which would pay off for the current students who would be using this facility up until the proposed middle school construction is completed.

- Taking an overall facilities optimization approach would be helpful for the other 3 buildings as well,
- In addition, further solidifying the K-12 communication and curriculum across fields of study would be useful for curriculum alignment in STEM as well as for other areas of study (English, Family and Consumer Science, etc.)

Appendix: STEM Teacher Interview, sent to parents.

On Fri, Feb 10, 2017 at 4:06 PM, UPSD <broadcasts@schoolmessengermail.com>

An Interview with Middle School Instructors on STEM Education

One of the many reasons the school district has decided to build a new middle school centers on STEM education: **science, technology, engineering and math**. We spoke to two of our middle school instructors. Mr. Christian Fowkes and Mr. Phillip Grigonis, about STEM education, its importance and how the proper facilities are essential to providing it.

Q: Why is STEM education so important?

Christian Fowkes: According to U.S. Department of Commerce, STEM occupations are growing at a rate of 17%, versus just 9.8% for other occupations. Our students – and our nation – need quality STEM education to keep pace. Even beyond those occupations, STEM activities provide hands-on and minds-on lessons for the student. Making math and science both fun and interesting helps the student to do much more than just learn.

Phillip Grigonis: STEM subjects areas require our children to think at a highly analytical level. This level of thought leads to the growth of a nation and the economy within it. Jobs relating to STEM areas produce higher individual income levels. STEM education is not just a growing movement in the United States. Many governments around the world realize that these areas are vital to a nation's growth in the 21st century.

Q: What are the priorities in terms of STEM education at the middle school level to prepare our students for high school and beyond?

Christian Fowkes: STEM education teaches problem-solving skills, and kids gain confidence as they work through problems. According to US News & World Report, research shows that by the time students reach fourth grade, a third of boys and girls have lost an interest in science. By eighth grade, almost 50 percent have lost interest or deemed it irrelevant to their education or future plans -- the STEM pipeline has narrowed to half! That means millions of students have tuned out or lack the confidence to believe they can do science.

Phillip Grigonis: The main focus at the middle school level is trying to get the students to "gain interest" in these areas and also to create "positive memories" of their encounters with these subject areas. In technology and engineering classes, it is important to give students exposure to problem solving that pushes them to be independent problem solvers. It's also important to give students the time to develop their dexterity with tools and materials through building and designing activities. In science, it is important for students to develop inquisitive behaviors about the natural world and the universe. In math, students should be able to apply reasoning for decision making, and be capable of seeing relationships between math and other real-world applications.

How has the curriculum changed over the last 5-10 years to address the redoubled focus on STEM?

Christian Fowkes: We've increased collaboration between math, science, and engineering educators to tailor content to more closely relate to student interests. STEM has also allowed us to focus on skills in addition to facts.

Phillip Grigonis: Typically the curriculum has changed to provide students with more hands-on related activities that better allow students to convert book knowledge to practical knowledge. Learning through multiple senses (hearing, touching, seeing, and smelling) allows the students to retain knowledge better. Having more hands-on related activities is more expensive because this entails purchasing new equipment and more materials for the students to interact with.

Q: How have the curriculum and teaching methods changed the facility needs?

Christian Fowkes: STEM education has compelled us to rethink how we deliver education. It requires integrated technology in classrooms and labs, the flexibility to move the physical space to fit the content, flipping the classroom—school at work

and homework at school, blending in-person and online experiences, and smaller group work so that students can learn from each other.

Phillip Grigonis: Technology and engineering is a subject area typically taught by individuals certified in technology education. The classroom typically provided to these teachers is the same classroom that was previously used for industrial arts. While technology and engineering teachers still use the industrial art environment for hands-on building related activities, technology and engineering labs today need clean areas for 21st century technology related activities like computer-aided design (CAD), robotics, computer programing, 3-D printing, and lessons on technology.

How are we managing to meet these needs in the current middle school facility?

Christian Fowkes: We aren't. STEM is not being done in our science classrooms because the facilities do not meet the needs of the program. At this time I teach science in a classroom, but don't teach in "*science classroom.*" Due to the current layout of my classroom I am unable to move tables to allow for kinesthetic activities or set up for hands-on labs. There is no preparation space for the limited labs I am able to perform. In essence, my course has become more of a "history of natural science" class than a "life and environmental science" class.

Phillip Grigonis: At the Upper Perkiomen Middle School, we are meeting these needs by putting temporary "Band-Aids" in place everywhere. The room for technology and engineering was designed in the 1970s and needs a complete renovation. There are too many things to list about how and why this room needs to change. The ITTEA (International Technology and Engineering Educators Association) has published the "Facilities Planning Guide" for STEM Labs. This should be referenced and compared to the current lab that the students are learning in.

What things are adequate?

Christian Fowkes: The addition of the one-to-one Chromebook initiative has enabled us to incorporate more online experiences for students.

What things are deficient?

Christian Fowkes: We struggle with providing the necessary physical space to incorporate some key aspects of STEM. Lab space consists of the top of a student's desk or table. Due to the confines of the small classrooms, desk/table configurations

are limited. We don't even have the basic, legally required, safety equipment to do simple labs – things such as an eye-wash station, decontamination shower or fume hood. So we can't do them. Additionally, with rooms for subjects being located far from each other, typically on the other side of the building, collaboration between different subjects is limited. We have an inability to implement STEM curriculum properly.

How will the new middle school help us meet the demands of STEM education?

Christian Fowkes: It will provide the missing elements that I mentioned above from integrated technology to space for smaller groups.

How will we compare to other schools -- lacking, equal or better?

Christian Fowkes: A new facility will allow us to be better than or equal to those districts that have upgraded science labs, classrooms and campuses in last five years.

Phillip Grigonis: A new middle school will allow us to design an environment that can give students more modern learning opportunities. In addition to a building, we would need to budget for continually supporting a STEM initiative within the classroom, including equipment purchases, training and disposable materials. Digital technology changes at rapid rate; some equipment may be outdated within 5-10 years.

With the architectural limitations of a new building, our technology and engineering program would be equal to other schools, not better. Room size, for example, in the proposed technology and engineering lab of the new proposed middle school is smaller than the current lab and the Pennsylvania State recommendations. We'll have to watch class sizes to make sure there is no safety concern. In addition, it looks like adding another technology education teacher is not feasible. Some districts in Montgomery County have two technology education teachers. We only have one.

Christian Fowkes has been teaching science at our Middle School since 2008. Currently, he is a 7th grade science teacher. Christian was presented the "Exemplary Teacher of Middle School Science Award" from the Montgomery County Science Teachers Association in 2007 for his work with the Environmental Science Club while at Pottstown Middle School. He received his Bachelor's Degree from the Pennsylvania State University in Agricultural and Environmental Science and his Master's Degree in Curriculum and Instruction from Kutztown University. Christian holds teaching

certifications in mid-level citizenship, agriculture, general science, and environmental science as well as a principal certification.

Philip Grigonis is in his second school year as the Technology Education Teacher at our Middle School. He spent a year teaching Technology Education in the West Chester Area School District prior to joining Upper Perk. Phil received his Bachelor's Degree from Shippensburg University in Business Administration and his Master's Degree in Education from Millersville University. He holds teaching certifications in business education and technology education.