WAYNE STATE UNIVERSITY

FY2018: Capital Outlay Project Request

Submitted to the Office of the State Budget
October 31, 2016

Attachment B

Fiscal Year 2018
Capital Outlay Project Request
STEM Innovation Learning Center

Institution Name: Wayne State University

Project Title: STEM Innovation Learning Center

Project Focus: Academic

Type of Project: Renovation

Program Focus of Occupants: Dedicated to the training and education of undergraduate students in science, technology, engineering, and mathematics (STEM) programs.

Approximate Square Footage: Approximately 82,000 net square feet, 100,000 gross square feet
Total Estimated Cost: $29.5 million

Estimated Start/Completion Dates: Construction start April 2018, use and occupancy August 2019

Is the Five-Year Plan posted on the institution's public internet site? Yes

Is the requested project the top priority in the Five-Year Capital Outlay Plan? Yes

Is the requested project focused on a single, stand-alone facility? Yes

Wayne State University requests $14.75 million in State Capital Outlay support to renovate and repurpose the Science and Engineering Library as a new STEM Innovation Learning Center. The total project budget is $29.5 million, and the University plans to fund its 50 percent match with philanthropic gifts or through debt financing.

The Science and Engineering Library (SEL) was closed three years ago as part of the continuing necessity to reduce operating costs. The collection is in the process of being relocated to the Undergraduate Library, and SEL is available for a new use. When concepts were initially developed for our STEM Innovation Learning Center it was envisioned as a smaller, new construction project. When the SEL became available, plans for the project were modified to renovation scope instead. Over new construction, this approach has several significant advantages that are discussed in detail in our *5-Year Capital Outlay Plan* and in the following pages of this Project Request.

Because Wayne State has experienced such unprecedented growth in STEM student enrollment and graduation rates since 2010, we submit this project as an outstanding investment opportunity to create an enhanced instructional environment for our undergraduate STEM students. Planned space components for the building include:

- Flexible and flippable general-purpose classrooms and instructional laboratories that are rich with technology to permit the transformation of traditional lecture driven instruction to collaborative, hands-on, real life, team, and project-based learning.

- Maker hacker labs that will give students interdisciplinary exposure to skill set development that are not possible in most instructional settings.

- Livingroom spaces in what would otherwise be corridors where students can gather before and after class, to study, continue interdisciplinary discussion, or have a conversation with their faculty instructor.

- Dedicated classroom and office space to a specific department to oversee building maintenance and operation

This project represents exciting value to Wayne State University and the State of Michigan by partnering in the creation of additional human capital that will further drive positive economic performance. For our STEM students, we respectfully request State support.

Please provide detailed, yet appropriately concise responses to the following questions that will enhance our understanding of the requested project:

1. **How does the project enhance Michigan's job creation, talent enhancement and economic growth initiatives on a local, regional and/or statewide basis?**

Renovating and repurposing the University's Science and Engineering Library as the STEM Innovation Learning Center will provide us with contemporary instructional laboratory resources and capacity to address the continuing increase in STEM program enrollment and graduation rates which lead to job creation and economic growth. The 2012 Report to the President, "Engage to Excel: Producing One Million Additional College Graduates with Degrees in Science, Technology, Engineering, and Technology," from the President's Council of Advisors on Science and Technology (PCAST) states that if the nation is to remain competitive in science, technology, engineering, and mathematics (STEM), American universities collectively will need to increase graduates in these areas by one-third, or one million additional STEM degrees over the next decade. The PCAST report goes on to note that merely increasing the retention of STEM majors from 40 to 50 percent, nationally, will provide approximately three-quarters of the targeted one million graduates. This is our goal in actualizing a STEM Innovation Learning Center.

For the period from 2012 to 2022, the U.S. Bureau of Labor Statistics forecasts employment in science and engineering occupations to grow by 13 percent, while growth in all occupations is forecasted at 11 percent. It further advises that approximately 59 percent of the projected increase in science and engineering jobs is in computer and mathematical science occupations. These occupations also have the largest growth rate at 23 percent. Biological, agricultural, and environmental life science job opportunities are expected to increase by 20 percent, and social scientists and psychologists have the next highest projected growth rate at 19 percent. Supporting the validity of these projections, the U.S. Department of Commerce reported in 2011 that the actual growth rate in STEM jobs was 8 percent from the period 2000 through 2010, while non-STEM jobs only grew by less than 3 percent nationally. They too project future STEM job growth rates that approximate those of the Bureau of Labor Statistics. Wayne State University students appear to clearly understanding these statistics as evidenced by enrollment and corresponding graduation rate increases in STEM fields.

The past six years has yielded exceptional growth in Wayne State University students majoring in STEM programs that lead to related bachelor degrees upon graduation. Within the College of Liberal Arts and Science, students that have declared a major in STEM fields has risen from 2,639 to 5,884 for an increase of 47 percent. The College of Engineering, which now includes the Department of Computer Science, has experienced similar enrollment increases. Across the entire College student enrollment has increased from 1,022 to 1,981 for an increase of 94 percent. The number of Wayne State students that have been granted STEM degrees has also increased significantly during this time frame. For the College of Liberal Arts and Science the increase has gone from 766 to 940, or 22 percent. For Engineering the increase has gone from 496 to 657, or 32 percent!

The U.S. Bureau of Labor Statistics also reports that the average annual salary of STEM employees was $76,000 in 2013, compared to the average annual salary of all U.S. employees of $35,080. STEM jobs are paying nearly 116 percent more than the average U.S. worker earns annually! Because the vast majority of Wayne State graduates remain and accept jobs in the tri-county metropolitan area following graduation, this statistic is particularly exciting because these graduates offer the opportunity to contribute to the revitalization of Detroit and further strengthen the local economy. Along with this, 86 percent of Wayne State graduates remain in the state of Michigan, which provides Michigan with a stronger, educated workforce. In our College of Liberal Arts and Sciences, 67 percent of our 2014-2015 STEM graduates remained in Michigan and 66 percent were placed in jobs before or soon after graduation with 56 percent of those jobs related to the students' field of study. Our College of Engineering 2014-2015 graduates provide even more optimistic numbers, with 86 percent remaining in Michigan,94 percent finding job placement within six months of graduation, and 90 percent finding employment in positions related to their field of study! Our STEM graduates are finding jobs, and more importantly, they are finding jobs here in Michigan to contribute to our economic growth.

A large percentage of our STEM graduates will certainly be placed in positions that replace those entering retirement, but many others will secure jobs that do not exist today; these are positions evolving from an expanding economy and from the commercialization of products and services developed by our STEM-entrepreneurs who create business start-ups and, in turn, more new jobs. The University's intellectual portfolio currently contains over 500 technologies, of which over 100 are licensed. In increasing STEM enrollment, certainly this portfolio will continue to grow, further fueling the tri-county and State economy. In addition, The *New York Times* article, "Where the Good Jobs Are – and Why," reported that for each STEM-related job produced in a city, five non-STEM jobs are created, further fueling a local economy. Wayne State University STEM graduates are making these impacts possible.

In summary, by implementing the STEM Innovation Learning Center, Wayne State will significantly improve its facilities dedicated to STEM teaching and learning environments. These are resources that are critical in preparing students to excel in an increasingly advanced and interconnected global society. In addition to the significant advantage that the facility will provide to our students, the University and the State will both benefit from increasing the number of STEM graduates who are well prepared to meet a rising need and to contribute to the State's economic progress.

2. How does the project enhance the core academic and/or research mission of the institution?

Wayne State University is one of the nation's top and Michigan's only urban, public, research university, offering more than 380 academic programs to nearly 28,000 students through 13

schools and colleges. Along with the University of Michigan and Michigan State University, Wayne State is designated as a university with very high research activity, recognized for research and educational strengths in health and life sciences, physical sciences, engineering, and mathematics. The University awarded a total of 3,072 bachelor's degrees in fiscal year 2016 with 1,069 , or approximately one-third of the total undergraduate degrees, being awarded in STEM fields of study. Relative to 2011, the University's STEM degrees granted has increased by 33 percent.

As stated in the Distinctively Wayne State University Strategic Plan 2016-2021, our mission is to create and advance knowledge by preparing a diverse student body to thrive and positively impact local and global communities. To enable the achievement of our mission, strategic objectives and tactical action plans have been created and center around seven strategic focus areas; student success, teaching excellence, research, diversity and inclusion, entrepreneurship, financial sustainability and operational excellence, and community engagement.

Academic programs and course offerings in science, technology, engineering, and mathematics are at the core of our instructional responsibility. STEM programs and course offerings are foundational to every degree granted at Wayne State, and they are fundamental in preparing our graduates to be effective critical thinkers and major contributors to an increasingly diverse local, state, and global economy. Tactical action plans involving STEM initiatives permeate every focus area of our Strategic Plan. In the case of student success and teaching excellence, the National Science Foundation (NSF) has awarded us two grants which are aimed at improving our STEM education achievements. The WIDER grant (Widening Implementation and Demonstration of Evidence-Based Reforms),SSTEP grant (Student Success Through Evidence-based Pedagogies), among many others support the University's commitment to increase evidence-based teaching methods in foundational STEM courses. The PCAST report specifies evidence-based teaching methods as imperative practices in retaining STEM students.

Among our strategic plan initiatives is the necessity to advance implementation of the STEM Innovation Learning Center which is Wayne State University's top Capital Outlay Project Request for fiscal year 2018. The project will be located in the center of our non-medical research buildings, providing our undergraduate STEM students with many opportunities to engage in active research projects with principal investigators and research faculty. Undergraduate student involvement in active research is another effort that is central to the student success focus area of the University's mission and strategic plan.

These STEM program enhancements will be transformative, resulting in improved student retention, time to degree, and corresponding increases in STEM graduation rates. When coupled with the unprecedented increases in STEM program enrollment experienced in recent years, STEM graduation rate performance is expected to surpass all other programs offered by the University. Because upwards of 75 percent of Wayne State graduates stay in southeast Michigan for their entire career following graduation, these outcomes will serve as major drivers to

spurring entrepreneurship and business start-ups, and provide additional fuel to well established industries that benefit job creation in Detroit and southeast Michigan.

3. How does the project support investment in or adaptive re-purposing of existing facilities and infrastructure?

When initially planned in FY14 as the Science and Engineering Laboratory Classroom Building, the project was envisioned as new construction to provide instructional laboratories and support facilities for various STEM programs and course offerings, for a cost of $20.0 million. The closure of the University's Science and Engineering Library (SEL) provided the opportunity to modify plans for new construction, and alternatively propose SEL's renovation and repurposing as a STEM Innovation Learning Center. Renovating and repurposing the Science and Engineering Library for STEM instruction is a financially and environmentally responsible solution by comparison to new construction due to the avoidance of constructing the foundation, frame, and building enclosure systems. The SEL building also shares mechanical infrastructure with the adjacent, recently renovated A. Paul Schaap Chemistry Building, eliminating the need to purchase new heating and cooling plants. These cost avoidances enable the University to minimize the project cost per square foot.

In comparison to the original Project Request for new construction, these cost avoidances will enable the University to reduce the project cost per square foot by 33 percent from $440 per gross square foot to $295 per gross square foot and realize a substantial increase in usable net square feet. Additionally, the site previously planned for new construction will still be available for future development if needed.

4. Does the project address or mitigate any current life/safety deficiencies relative to existing facilities? If yes, please explain.

Yes, the project will mitigate life safety deficiencies relative to current facilities. Courses that will be taught in the proposed project are presently offered in four buildings including Science Hall, Shapero Hall, Physics, and Engineering. Science Hall was constructed in 1949, Shapero Hall and Physics in 1965, and the laboratory wing of Engineering in 1951. Each building has pipe stands for fire suppression in stair towers, but, with the exception of Engineering which offers fairly broad but not complete coverage, horizontal distribution to occupied spaces is quite limited. Engineering's fire alarm system was recently upgraded. The other three buildings, however, do not satisfy current code requirements.

The renovation of the Science and Engineering Library and its conversion to a STEM Innovation Learning Center will include scope to make it fully compliant with all National Fire Protection Agency and American Society of Heating, Refrigeration and Air Conditioning Engineers life safety

codes. The building's fire alarm system will be replaced from its command center to every detection device, and alarm devices will be both visual and audible. The Wayne State Police Department will be able to deliver voice instructions to occupants through the public address features of the system in the event of an emergency situation. In addition, the system will be integrated with new elevators in order to direct cabs away from floors in alarm. Because fire suppression coverage is presently limited to the basement and first floor student computer labs, the fire suppression system will be expanded to cover the entire building. The fire and jockey pumps will also be replaced. In the fume hood intensive chemistry and biology laboratories on the first floor, supply and exhaust air will be significantly improved over existing conditions by providing once-through air that is properly balanced through the new building automation system. Accomplishing these improvements and relocating STEM courses from the buildings noted above will eliminate the current life safety exposures students and faculty now face. Subsequent planned renovations of the existing class labs will address the life safety deficiencies of those buildings following the completion of the STEM Innovation Learning Center project.

5. How does the institution measure utilization of its existing facilities, and how does it compare relative to established benchmarks? How does the project help to improve the utilization of existing space and infrastructure, or support the need for additional space and infrastructure?

To measure utilization of Wayne State University's existing facilities, the university utilizes Ad Astra Information Systems, which is a data software that more than 1,000 higher education institutions use. In conjunction with this software, the University of North Dakota's 2013 utilization report, *University of North Dakota: Space Utilization and Planning*, is used as an established benchmark to compare Wayne State University's space utilization efficiencies.

Since Fall 2014, Wayne State University has used Ad Astra more intensely to manage the 192 general purpose classroom spaces. Recently, WSU began using the software to auto assign rooms based off of departmental preferences and to set maximum capacities. This, along with working to move to a new scheduling matrix, will help remove potential barriers from students who need to graduate, and bring WSU to obtain higher classroom utilization.

Beginning Winter 2017, the Registrar's Office will shift focus from inputting data to reporting. A new scheduling matrix will allow the office to run utilization reports to determine how much improvement has been made in scheduling general purpose classrooms at WSU. The data will allow the Registrar's Office to offer suggestions to departments on increasing room utilization, thereby improving their programs. These reports will help departments better understand how to spread class offerings out over the entire scheduling week, reduce unused seats in rooms by scheduling classes into appropriately sized rooms, minimize class offerings that use non-standard meeting patterns, and reduce the offering of unnecessary sections.

The Registrar has pioneered the use of Ad Astra for general purpose classrooms, and other WSU schools, colleges, and divisions have begun migration of their departmentally assigned spaces to Ad Astra. Those schools, colleges, and divisions include the College of Engineering, School of Business, and University Libraries. The College of Pharmacy is scheduled to go live in Winter of 2017.

In 2013, the University of North Dakota (UND) comprehensively analyzed their utilization rates in their *University of North Dakota: Space Utilization Analysis and Planning* report. Similar to UND, Wayne State University offers courses from 8:00am through 10:00pm, Monday through Saturday. Known for being a university that caters to the nontraditional student, the majority take advantage of this schedule flexibility to allow them to have full-time or part-time jobs, to participate in internships, or to take care of family members and other personal commitments. Although the university does teach courses on Saturdays, these were not analyzed in order to keep some consistency with the UND benchmark, which analyzed course offerings Monday through Friday, from 8:00am to 4:00pm.

In applying the hourly and daily parameters of 8:00am to 10:00pm, Monday through Friday, a total of 75 hours per week in which general purpose classrooms, auditoriums, lecture halls, and seminar rooms could be scheduled for classroom use were analyzed. On average, actual classroom time is scheduled for about 31 hours of the 75 available, or 38 percent of the week. When an average 30 minutes of classroom prep time was added to this utilization, the rooms were used an average of 61 percent of the time available. In comparison, the University of North Dakota only analyzed their classroom data for a core 40 hours. Their utilization rates totaled 80 percent of the 40 hours available during the week, but the report notes that many institutions use a target of 40 percent and that reaching 80 percent is extremely difficult. In using the target of 40 percent, WSU is using their current classroom spaces well. Further, the wide timeframe allows the university to continue to cater to the nontraditional student, but additional attention can now be provided to understand how this impacts the university's support services, such as audio-visual assistance, custodial maintenance, etc.

In addition, the rooms that are loaded into Ad Astra were also analyzed for their average seat fill rate. Wayne State's average seat fill in general purpose classrooms for a 75 hour week is 67 percent. In comparison, the University of North Dakota only had an average seat fill of 65 percent for their 40 hour week. This shows that WSU students are taking advantage of the courses that are offered across campus, to the point that each class, on average, is at 67 percent capacity.

As stated previously, WSU continues to optimize Ad Astra in order to provide better data, create better efficiencies, and deliver the courses that students need. WSU is expected to increase utilization percentages as this technology is further taken advantage of, which will also allow support services to tailor their availability.

The STEM Innovation Learning Center is not anticipated to affect utilization rates but will provide renovated labs with improved technology and services as compared to existing facilities. The spaces that will be vacated due to the renovation are planned to be renovated in subsequent projects. At the time of these subsequent projects, the best and highest use of the vacant spaces will be analyzed. Since WSU is continuing to improve the information produced from Ad Astra, the university will have an excellent tool to make decisions on how to use these spaces. Further, the increase of STEM students is certain to increase the utilization of the renovated Science and Engineering library. This project will provide the necessary space type that is essential to providing instructional space to STEM students.

6. How does the institution intend to integrate sustainable design principles to enhance the efficiency and operations of the facility?

All Wayne State University new construction and major renovation projects built in recent years have minimally achieved Leadership in Energy and Environmental Design (LEED) silver certification. Earlier this year, the United State Green Building Council (USGBC) awarded our recently constructed Advanced Technology Education Center our first gold ranking. The State supported IBio building is expected to earn gold certification, and the STEM Innovation Learning Center will be designed and constructed to achieve gold as well.

Because this project is exclusively focused on the education and training of STEM students, many of whom have high interest in LEED and sustainable initiatives, we will be inviting student participation in all phases of the project to advance their knowledge of sustainable design, construction, and building operation practices. Through the University's Office of Sustainability, several students have recently participated in a LEED training initiative that led to becoming certified LEED Green Associates. This project and the LEED training initiative will be used as an additional opportunity to develop students who are USGBC certified upon graduation.

The STEM Innovation Learning Center provides many features that will improve the University's sustainability footprint; these are attributes that will reduce our environmental impact and reduce operating costs. The Science and Engineering Library (SEL) already benefits from substantial efficiencies because it receives steam and chilled water from the adjacent, recently renovated A. Paul Schaap Chemistry Building. Prior to the renovation of Chemistry, there were three chiller plants in its sub-basement serving adjacent buildings. Now there is one integrated plant of three chillers, which are staged and sequenced into production only when cooling demands increase, serving the same buildings. Before, all three plants would run even when demand was low. Chemistry's four steam boilers are staged similarly, to sequence into production only when steam demand increases. Therefore, the production of heating and cooling BTU's is as efficient as possible. The renovation and repurposing of SEL will focus significantly on minimizing the consumption of BTU's through the use of occupancy and CO2 sensors, and the use of variable air volume technology that is integrated with the building

automation system to reduce unnecessary HVAC system operation. Modulating air valves on laboratory fume hoods will be used to safely minimize conditioned exhaust air rates from the building, and energy recovery technology will be included on the exhaust air systems to capture and recycle heating and cooling BTU's to the supply air of the building. Also of interest is the use of dimmable LED lighting, daylight harvesting, and replacement of single pane glazing with double or triple pane units. Special consideration will also be given to creating a facility that has its LEED solutions on display as complimentary instructional tools for our faculty and students.

7. Are match resources currently available for this project? If yes, what is the source of the match resources? If no, identify the intended source and the estimated timeline for securing said resources?

No, matching funds are not presently available. Wayne State University is currently evaluating funding options for this and the other projects presented in our 5-Year Capital Outlay Plan. We are now completing the implementation of all projects funded by our 2013 issue of general revenue bonds and finalizing the list of projects to be funded from the next issuance of long-term debt. While philanthropic gifts will be requested to support this project, any unsupported balance will be covered through debt financing which is planned for 2017.

8. If authorized for construction, the state typically provides a maximum of 75 percent of the total cost for university projects and 50 percent of the total cost for community college projects. Does the institution intend to commit additional resources that would reduce the state share from the amounts indicated? If so, by what amount?

The total project cost to design and construct the STEM Innovation Learning Center is $29.5 million. Wayne State is requesting State Capital Outlay funding support in the amount of $14.75 million or 50 percent of the project cost. We expect to fund the balance by philanthropic gifts or debt financing.

9. Will the completed project increase operating costs to the institution? If yes, please provide an estimated cost (annually, and over a five-year period) and indicate whether the institution had identified available funds to support the additional cost.

Since the Science and Engineering Building is currently empty, the operational costs are expected to increase with the increase in building use. It is estimated that operational costs would increase by $529,979 per year or about $2.6 million over five years. Current operating costs compared to future operating costs is outlined in the table below. Since the project is intended to meet at least LEED Silver expectations many of the utility increases will be offset with the cost savings

realized by these design standards. Further, the increase in STEM courses will provide the necessary student base to further offset costs.

Operational Cost Type	Current Cost (S) / GSF	Current Costs ($)	Future Cost (S) / GSF	Future Costs ($)
Custodial Cleaning	0.14	13,760	0.68	68,351
Grounds Maintenance	0.13	12,821	0.13	12,821
Plant Maintenance	0.86	86,201	1.03	103,442
Utilities	1.75	175,000	5.25	525,000
Security	0.00	0	0.72	72,000
Communications	0.02	1,933	0.28	28,998
Insurance	0.09	8,547	0.16	16,188
Service Contracts	0.07	6,677	0.08	8,118
Total Costs	**3.05**	**304,939**	**8.34**	**834,918**

10. What impact, if any, will the project have on tuition costs?

This project will not have any direct impact on tuition costs.

11. If this project is not authorized, what are the impacts to the institution and its students?

While great improvements will be achieved by way of the STEM pedagogical transformations described in response to question 2 above, the full benefits to our students and State will not be fully realized if this project is not authorized. Students' learning in these key fields will be challenged in sub-optimal and functionally obsolete lab classroom facilities. Wayne State is dedicated to educational excellence by mission and strategic vision and can only enact the very best practices if contemporary facilities exist to support pedagogical innovation and need. Currently, our campus is equipped primarily with traditional classrooms. A few active and experiential learning classrooms are available, but none exist to enhance STEM laboratory instruction. Construction of the STEM Innovation Learning Center will provide our students with up-to-date, flexible classrooms that are equipped with enabling active learning technologies. If this project is not authorized and advanced, Wayne State students risk falling behind their peers both regionally and nationally, simply due to obsolete and deficient facilities.

Additionally, without this facility the University will be significantly disadvantaged by its limiting physical capacity. With the unprecedented increase in STEM enrollment during the past several years we have addressed the demand by adding sections to most courses, thereby increasing

instructional space utilization. We have also increased the number of students assigned to take course sections which, generally, is an undesirable approach to satisfying enrollment demand due to the negative impact on teacher to student ratios. Clearly, Wayne State University will be graduating more STEM students by virtue of initiatives that go beyond the proposed project. However, the proposed project will provide capacity and resources needed to attract, retain, and graduate more students in STEM fields.

12. What alternatives to this project were considered? Why is the requested project preferable to those alternatives?

For several years through to fiscal year 2012, Wayne State's 5-Year Capital Outlay Plan included a $110.0 million project to design and construct a 250,000 square foot Interdisciplinary Science Research Building on the site of the current Life Sciences Building. Although this alternative would have met all of the University's science and technology research and teaching facility needs for years to come, it was simply too expensive. Given numerous competing facility needs, even with substantial State support, the University cannot afford to proceed with a project of that magnitude. During the 2012 Campus Master Plan update, the plan to construct a much smaller building and subsequently renovate vacated instructional labs was developed as an alternative. As noted, the original concept for this project has evolved to where Wayne State now requests State Capital Outlay support to renovate the existing Science and Engineering Library and convert its use to a STEM Innovation Learning Center.

Renovating labs in the various buildings in which STEM instruction is currently taught is another alternative we considered to address the significant need to upgrade existing teaching labs. While this would be a lower cost alternative, the requested project is preferable because it renews and returns an existing and mostly vacant building to effective use; it facilitates interdisciplinary teaching opportunities by consolidating departmentally focused programs offered in different buildings; it enables continued growth in STEM fields, and it provides additional instructional capacity when existing labs are renovated in a subsequent project.