1. **Project Title:** Growing Science: An interdisciplinary project to develop urban agriculture research, education, campus nutrition, and urban renewal

2. **Primary Applicant:**
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3. **Secondary Applicant:**
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   Birdie Cunningham: 2-6125; cunn5603@stthomas.edu
   Todd Empanger: 2-6066; tdempanger@stthomas.edu

4. **Other proposal support:**
   UST Dining Services
   Biology Department
   St. Paul Youth Jobs Program - proposed
   URCS Young Scholars - proposed

5. **Overview and purpose of the project:**
   **Overview**
   We propose to develop a new UST initiative, the Growing Science Project, that combines urban agriculture research with educational and community development activities in low-income neighborhoods. We will establish urban agriculture “farms” on vacant lots in St. Paul; we will model these farms after the UST Stewardship Garden. We will conduct UST student-led research on these farms to determine how crop yield, farm profitability, and environmental impacts from coffee compost compare to those from synthetic fertilizer. All of the produce from these plots will be purchased by UST Dining Services. The work will include significant broader outreach components: UST undergraduates will mentor local high school students, the work will incorporate more local produce into Dining Services, and it will support events that raise awareness about food security and nutrition. Here we ask for funds to support lot leases, infrastructure development, supplies for crop nutritional analyses, and funds to support cooking classes.

   **Background**
   Rising food demand is placing unprecedented stresses on agricultural and natural systems (Tilman et al. 2011). Approaches are needed to increase production on existing lands while reducing impacts on natural systems, and to encourage shifts toward more vegetarian diets and local food consumption (Foley et al. 2011). Given the global rise in urbanization, urban agriculture will make important contributions toward these goals (Tracey 2011). However, research is urgently needed to improve production efficiency in urban environments and to engage citizens in urban agricultural efforts.

   We propose a new UST initiative, the Growing Science Project, that combines urban agriculture research with educational and community development activities in
low-income neighborhoods. It is a collaborative project among Biology Department faculty (Adam Kay and Chip Small), the Wellness Center (Birdie Cunningham), Dining Services (Todd Empanger), and the City of St. Paul.

The model for the Growing Science project is the UST Stewardship Garden, which we established on the UST St. Paul campus in 2010 (Figure 1). This project has successfully integrated research, educational, and service activities. It has been the basis of multiple student-led research projects, national presentations, and grant proposals, it has been the setting for classes from multiple UST departments, and, since 2010, and it has yielded over 4000 lbs. of produce donations to food shelf partners. The SG was generously awarded UST CSF funds for 2012-13; these funds were used to build raised beds and landscaping features.

The Growing Science project expands on the Stewardship Garden work in several ways. First, we propose to develop comparable “farms” on vacant lots in St. Paul. The City has a Garden Lease Program to lease Housing and Redevelopment Authority vacant land to non-profit entities for urban gardens. Basic rent is $1/month with a $250 deposit per site. Leases are granted on a six-month basis. We are in discussions with the St. Paul Planning and Economic Development and Parks and Recreation Departments to identify two sites for the 2013-2014 growing season.

At each site, we will construct 32 2m x 2m plots with raised beds and imported soil (as in the Stewardship Garden). Soil imports will ensure that soil quality is suitable for vegetable production; raised beds will add to the site’s aesthetics (e.g., Figure 1). Our request for Campus Sustainability Funds is primarily for the materials for raised beds and soil imports at our two sites.

One main goal of the Growing Science project is to conduct publishable research on urban agriculture. Our initial research work will seek to determine how the yield, profitability, and environmental impacts from coffee compost compare to those from
synthetic fertilizer. Coffee is an important agricultural product with substantial environmental impact; ~1.5 million metric tons of coffee waste is generated in the U.S. each year. Coffee waste is very abundant on the UST campus. One approach for reducing coffee ground waste has been to transform it to fertilizer via composting. Composting using earthworms increases concentrations of nitrogen (N) and other minerals in coffee, while reducing carbon content (Liu and Price 2011). However, it is not yet clear how effectively vermicomposted coffee increases crop growth relative to other common fertilizers.

For Growing Science, we will use coffee compost generated on the UST campus using red wriggler worms (Eisenia fetida). We will assign plots to either pure coffee compost (n=4), full synthetic fertilizer (20-20-20 NPK blend, n=4), or compost plus 25%, 37%, 50%, 62%, 75%, or 87% of the synthetic fertilizer used in the full treatment. We will then measure yield (vegetable production by weight), profitability (income generated/input costs), and environmental impacts (nutrient runoff). This design will allow us to determine the extent to which coffee compost can be substituted for synthetic fertilizer while still maintaining yields and minimizing run-off. Our two Growing Science farms will apply the same experimental design, but we will plant different crops at each site to allow each student group to produce a unique data set. All results will be combined into a single publication.

A second goal of Growing Science is to generate educational opportunities. Two UST students from Biology or Environmental Science will lead and manage the research at the sites. These students will collaborate with Leann Luecke (student leader of the Stewardship Garden) other UST students participating in the Kay and Small labs on “Stewardship Science” (www.uststewardshipgarden.wordpress.com). These students have already been recruited for the 2013-2014 season; they will receive UST course credits for their contributions. These students will receive integrative training that combines agriculture field research and technical training in soil and agriculture product analysis. They will also receive mentoring experience, as we will help them work with youths recruited from the St. Paul Parks and Recreation Youth Jobs Corps, a program designed for economically disadvantaged Saint Paul city youths interested in summer work and career training (we have already had several conversations with the organizers of this program, see below).

A third goal of Growing Science is to contribute to campus nutrition and raise awareness about food issues. All produce from the Growing Science sites will be sold to UST Dining Services. Todd Empanger will work with Drs. Kay and Small to determine which crops we should grow as part of the Growing Science project; a main consideration will be the extent to which crops meet the needs of Dining Services. Funds from these sales will be used to expand the project in 2014-2015. Birdie Cunningham will develop promotional materials and events (including cooking classes) sponsored by the Wellness Center. These materials and events will highlight the availability of produce on campus, the investment of UST in urban agriculture, and the general educational and outreach activities of the project.

One final goal of the program is to contribute to urban renewal. The Growing Science farms will be established on vacant lots in St. Paul neighborhoods in need of
economic activity. Farms will provide income and scientific training to local youths. They will also serve as community gathering centers beautified with flowers and hand-made furniture (see Figure 1). We will hold regular gatherings at each farm site to increase community involvement and raise awareness about food security and urban development. We will also seek to attract visitors to each farm to increase economic activities in focal neighborhoods.

These project goals are complementary and mutually reinforcing. Although the research, educational, and outreach activities are each sufficiently robust to justify the project on their own, they also provide significant opportunities for synergy. Research results that will impact the scientific community will also be food to support dining services and campus nutrition programs. Educational experiences will produce relevant and timely scientific results and will double as community service activities. Community investment activities such as youth employment will increase research productivity and provide mentorship training for undergraduate students.

6. How the project will be implemented:

We will spend the funds requested from the CSF for this project in March-May 2014. We will work with UST students recruited into Growing Science, the SG coordinator (Leann Luecke), other members of the Kay and Small labs, and volunteers from the UST Biology club, Green Team, and other campus groups. We will build raised beds at our two sites as soon as the ground thaws (likely mid-late April). We successfully completed a nearly identical project on the UST campus in 2013.

Some of the logistics for the project are still being worked out. We have discussed site locations with the City of St. Paul (Planning and Economic Development, Parks and Recreation); one likely site will be the Oxford Community Center on Lexington Avenue near Highway 94. There are 100s of available locations, so our current lack of certainty about locations does not threaten our project at all. We have discussed incorporating the St. Paul Youth Jobs Program into the project; grants for that are due in January. Connection to the Youth Jobs Program is not essential for us to launch the project, so this uncertainty also does not threaten the feasibility of our project.

7. Budget:

We request $21,450 for this project. Most of the funds will be to build raised beds and import soil to our sites (as was done at the Stewardship Garden in 2013)

We will build 64 raised beds 32 plots at each of the two sites. Material requirements per plot:

1. Cedar planks (two boards 2” x 12” x 12 = $114) – Menards
2. Corner posts (4 posts 2” x 2” x 36 = $8.44) – Menards
3. Wooden stakes (8 stakes $2.75) – Menards
4. Galvanized wood screws (56 3” screws $3.60) – Menards
Total material requirements per plot are ~ $130. Total for 64 plots ~ $8,250.

We request soil for all plots. We’ll need ~90 cubic yards of soil for the two sites ~$5,000 from Linder’s (including delivery).

We request $500 for lot lease deposits ($250/site).

We request $1,500 for 3 drip irrigation systems.

We request $500 for seeds, starter pots, and potting soil.

We request $1,500 for tools (drills with extra battery packs, shovels, lawnmowers, weed whackers, pitch forks, clippers, rakes, wheelbarrows).

We request $1,000 for tomato cages (~$3.50/cage, 128/site).

We request $1,200 for 3 storage sheds (~$400/shed, one shed is for the Stewardship Garden).

We request $300 for boxes and bags for transporting produce to Dining Services.

We request $1,500 for consumable supplies for soil nutrient analyses, soil leachate analyses, and crop nutrient analyses (including crop carbon, nitrogen, phosphorus, and lignin analyses. All of these are done regularly in Dr. Kay’s lab).

We request $200 for the Wellness Center to support 2 cooking classes during fall 2014.

We request $500 for website development and video work to promote the project.

8. Include defined metrics for a clearly measurable outcome and a schedule of appropriate progress reports to the CSF through the duration of the project:

We will inform CSF when the work has been completed. We will provide CSF with blog posts written about the project (which will be posted on the campus sustainability blog (www.ustsustainblog.com), conference proceedings, and any publications and press that come out of the project.

We will keep track of the amount of produce that is harvested and sold to Dining Services.

We will also quantify the number of students that are impacted by the project. We will also quantify the number of credit hours generated by the work.
9. If your project will offset greenhouse gases and reduce the campus carbon footprint, describe thoroughly how this will happen:

The project is not specifically designed to offset greenhouse gas emissions. Instead, it aims to increase awareness of sustainability issues and to provide training for students interested in sustainability science careers. The SG project has already extended awareness of nutrition, food security, and other sustainability issues across campus and in the surrounding community. Growing Science should substantially increase this impact.

As a result of this project providing locally grown produce to Dining Services, there will be a modest decrease in the amount of food miles required to feed UST students. The impact of local produce purchases on the UST carbon footprint is unclear. We hope that others will be interested in working on quantifying this impact. The larger benefit from this project will be in raising student awareness about the environmental and social impacts of our food choices.

10. Describe if and how students will be involved and/or the educational value to our community:

Students will be involved in all aspects of this project, as described above. The Stewardship Science project employed 6 students in 2013 (4 full time). We have already had more than 10 students express strong interest in working on Growing Science in summer 2014.

In collaboration with the Wellness Center, we will create activities and displays that promote nutrition and the value of local produce. This work should significantly enhance food appreciation on the UST campus.

11. Highlight innovations and the potential for the project to be scalable across our campuses:

This project is an innovative integration of research, education, and service. Very few projects provide students the opportunity to engage in discovery science while also making a tangible contribution to their community.

This project has a lot of potential to be scaled up. We hope to use the initial development of Growing Science to attract external funding. We hope to expand the project to 6-10 sites in 2015.

12. If applicable, include lifecycle costs, possible investment payback schedules and potential long-term savings:

The funding we are requesting through the Campus Sustainability Fund is seed money that will allow us to launch a multi-year urban agriculture project. The produce purchased by Dining Services will largely offset the costs of the project in future years, and our students doing research for credit provide the labor, along with students from
the St. Paul Youth Jobs Program. We will use the results of the initial year of this project to support applications for external grants, which, if successful, will provide additional support for the project and revenue for the university.

13. If necessary, include additional supplemental materials as an appendix to the main application. Please limit the application plus appendix to no more than 10 total pages.

References


