**Pat Tellinghuisen, Program Director and Faculty Advisor**

**I. Introduction**

Science outreach activities with middle school students are fully consistent with the increased emphasis on attracting students into the STEM (Science, Technology, Engineering, and Math) disciplines. Vanderbilt Student Volunteers for Science (VSVS) has been active in science outreach to Nashville middle schools since 1994. Objectives of VSVS are to (a) provide middle-school students enriched science instruction through hands-on experiments, (b) offer Vanderbilt students a chance to “make a difference” through community service, (c) provide role models for school children, and (d) stimulate interest in teaching as a profession.

In VSVS we focus on middle school students (4th- 8th grade), because (1) students in middle school are beginning to form their attitudes about science, and (2) teachers in middle school often find it difficult to design substantive hands-on science activities for their students.

Since 1994, VSVS has reached over **97,000 children in 1,850 Metro Nashville school classrooms. This year (2017-2018) marks the third year that there have been over 850 VSVS volunteers.** Fall 2017 and Spring 2018 semesters each had over 580 volunteers.

**VSVS members spend about 15 hours each semester** presenting four different science lessons to Metro students. These lessons include hands-on experiments and are designed to correlate with Tennessee state curriculum standards and end-of-year exams.

An important part of our science outreach program is the partnerships we form with the middle school teachers. These partnerships not only promote a collaborative effort toward enhanced science instruction through inquiry-based activities, they also provide other benefits. For example, the college students serve as role models to the school children, showing the importance of academic achievement and the role of a college education. The college students find their lives enriched by their contact with school children, and they appreciate how their efforts affect the academic lives of the school children. We believe these experiences will foster future involvement of Vanderbilt students as parents and community leaders and will help them recognize the importance of teachers and public schools.

Our website, <http://studentorgs.vanderbilt.edu/vsvs/>, is accessible to the public at large. The website includes **complete text and training tips for our more than 130 lessons. YouTube videos have been added for the lessons that are regularly used in the classrooms.**

During the 2017-18 school year **VSVS employed 22 student undergraduate workers to refurbish the experiment kits.**

The **members of the VSVS student board** each committed 1 hour per week helping in the lab and training teams on the lessons. Board members hold titled positions with specific duties allocated to ensure that VSVS runs smoothly. Board Interns (22) were selected (from an applicant pool of 46) in November 2017 and became full Board members in April, 2018 after completing a semester of working with senior board members. This is the third year we have used this process to select new board members.

**II. Highlights for 2017-18 Academic Year.**

1. **856 VSVS members** brought hands-on science instruction to **over 4800 middle-school** **students.** Over 10% of Vanderbilt undergraduates participated in VSVS during the 2017-18 academic year.
2. VSVS teams taught in 160 classrooms with 53 Metro teachers in 11 schools. Bellevue , Margaret Allen Middle and Sylvan Park Elementary schools were added this year in the Fall semester.
3. VSVS **continues its collaborations** with other Vanderbilt programs such as **ViNSE, Vanderbilt Children’s Hospital,** **Next Steps, and Diabetes Day.**
	1. VSVS has continued with its program at the **Vanderbilt Children’s Hospital (started in August, 2010):** teams of Vanderbilt undergraduates do VSVS experiments with patients in their hospital rooms. **Live videotaping of lessons from the VCH Seacrest studio continued in both semesters.**
	2. The first-year Next Steps students participated in monthly VSVS science lessons. **A new initiative** was started to involve two 2nd year Next Steps students as members of regular VSVS teams.
	3. VSVS has continued its collaboration with **ViNSE** and helped prepare 263 lessons for 47 teachers and 4351 students in grades 6-8, in **5 rural counties** (218 classrooms) Training was held in July 2017 for some new teachers. Since the beginning, the program has collaborated with 131 teachers in seven counties, preparing 1,484 kits that have been used by 27,600 students.
4. Lessons are constantly being updated to fit the Metro curriculum and requests from teachers. **The new lessons** introduced this year include Balancing Nails, Ionic and Covalent Compounds, WeDo and Ozobot Robotics and coding lessons. Several undergraduate board members helped writeand test these new lessons. Board members also gave valuable input for updating current lessons, including adding a demonstration of the iodine clock reaction to illustrate Rates of Chemical Reactions and the addition of a transparent generator to the Electromagnetism lesson.
5. VSVS **collaborations** with other Vanderbilt **student** outreach organizations included **Vanderbilt Fall Service Day, MLK Service Day, MRS, American Chemical Society Affiliates, Code Ignite, Robotics Club, ASB teams, Dance Marathon, APO, EmbrACE, The Brain Institute, and VI4.**
6. In **other outreach activities**, VSVS members helped judge science fair projects at Head Magnet and at the Middle TN Science Fair at Belmont University.
7. Two new events that more than 50 VSVS volunteers participated in were held on Saturdays at the Martin Center. The first was MegaMicrobe, run by VI4 (**Vanderbilt Institute for Infection, Immunology and Inflammation)** whereVSVS helped with several booths as well as running a “Shrinky Dinks” experiment. The second one was Brain Blast run by **The Brain Institute**, where VSVS ran an experiment called “Why is an Apple Red” as well as helping out with other booths.
8. VSVS provided science activities and assisted at several events at the Adventure Science Center – Polymer Day, NanoDay, Robotics Day, Chemistry week.
9. VSVS continues to provide kits to **Metro teachers who do not have VSVS teams**, and who can access our lessons through our web site, and to Vanderbilt faculty members. Several **Williamson, Roberson, and Wilson County** teachers also use VSVS kits.

**III. VSVS Membership during the 2017-18 School Year.**

In the 2017-18 academic year, 856 students participated in VSVS, many of them (39%) for both semesters. These volunteers represented all classes from freshmen through graduate, included engineering, science, and non-science majors. Figure 1 shows the growth of VSVS since its inception in 1994 and Figures 2 and 3 show the distribution of students. Figure 4 shows the number of students who participated in one or both semesters. Graduate school volunteers have increased in numbers. Both semesters each had over 580 volunteers, enabling VSVS to send out over 145 teams each semester.

**Figure 1**

**Figure 2**

**Figure 3**

**Figure 4**

**IV. Volunteers in the Classroom**

1. **Classroom visits reach over 4800 students**

Teams of three to five volunteers brought hands-on, inquiry-based science activities to over 4800 middle school students during the school year. These activities were specifically designed to correlate with the Metro science curriculum.

VSVS teams went into:

 12 different schools

 160 different classrooms during their regular class time and partnered with

 47 different teachers

The middle schools included East Literature Magnet, H.G. Hill, Head Magnet, JT Moore, Margaret Allen, Meigs Magnet, Nashville International School (Islamic), Rose Park, and West End. One Metro Special Education class and Sylvan Park also received teams, and the Next Steps class at Vanderbilt met once a month.

**B. After-School Program visits reached about 150 students**

Teams also went to after-school programs at Rose Park, Head Magnet (2), Safe Haven, and Sylvan Park.

**The table below shows the diversity in the schools visited by VSVS teams.**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Middle Schools** | **# classrooms visited by VSVS teams** | **% Economically Disadvantaged** | **%ELL** | **% Disabilities** | **% Black, Hispanic or Native American** |  |
| Bellevue | 13 | 50.1 | 4.7 | 13.9 | 32 |  |
| East Literature Magnet School | 16 | 71.3 | 1.3 | 6.6 | 71 |  |
| Head Middle Magnet | 25 | 49 | 2.5 | 5.6 | 62 |  |
| H. G. Hill Middle | 15 | 75.2 | 13.1 | 14.9 | 43.4 |  |
| JT Moore | 24 | 43.9 | 2.3 | 16.3 | 38 |  |
| Margaret Alln | 12 | 90.8 | 29.5 | 10.7 | 64.1 |  |
| Meigs | 14 | 28.4 | 0.1 | 4.2 | 31 |  |
| Nashville International School  | 4 |  |  |  |  |  |
| Rose Park Math Science Magnet  | 19 | 64.7 | 3.4 | 4.8 | 69.3 |  |
| Special Ed | 1 |  |  | 100 |  |  |
| Sylvan Park | 2 | 42.9 | 3.0 | 13.7 | 38.2 |  |
| West End Middle | 15 | 51.9 | 3.1 | 18 | 45.6 |  |

ELL = English language learners

**V. Collaborative Programs at Vanderbilt.**

1. **Next Steps Program.**

A team of 4 VSVS members taught science lessons to 12 Next Step’s first-year students once a month during the academic year. The Next Steps program is for academically challenged students who have graduated from high school, and who want a college experience. A new initiative was to include 2 2nd-year Next Steps students on regular VSVS teams, as part of their service component.

**B. Vanderbilt Children’s Hospital Program** <http://childrenshospital.vanderbilt.org/interior.php?mid=8375>

In 2010 VSVS students began working with the Vanderbilt Children’s Hospital School Program, in which patients are tutored to help them keep up with their schoolwork while they are in the hospital. A total of 12 VSVS members go into patients’ rooms or clinics and teach relevant science experiments. VSVS lessons and kits were modified to meet the needs of the hospital setting. The VCH/VSVS team is selected by an interview and written application and is limited to experienced VSVSers.

The videotaping of VSVS lessons in the Seacrest studio at the hospital means that more patients and their families are exposed to STEM topics. The lessons can be viewed (live) in all patient’s rooms, and patients can also attend the lesson in the studio, as well as ask questions from their rooms.

**C. Vanderbilt Diabetes Day**

25 VSVS members ran 2 booths with experiments on Instant Snow for both

elementary and middle school children attending the Middle Tennessee Diabetes Day.

**D. Collaborations with Other Vanderbilt Student Outreach Organizations**

* **Vanderbilt Fall service day:** 45 students volunteered 2 hours on a Saturday morning to help build We-Do Robots and fill dropper bottles and containers with chemicals to be used by the rural schools served by VSVS and VINSE.
* **ASB***:* 4Teamstook VSVS kits to ASB sites.
* **ACS Affiliates** used several VSVS kits during Chemistry week.

**VI. Other VSVS Activities in the Community.**

* 51 volunteers signed up for an afternoon of 12 different science activities with over 120 **Head Magnet** students at their **Science Festival**.
* 25 volunteers presented 4 different activities to over 100 students and parents at the **Rose Park Pi (science and math) night**.
* Helped judge middle **school science fair projects at Head Magnet** school and at the Middle Tn Science Fair at Belmont University.
* VSVS members volunteered at the **Adventure Science Museum** at their Chemistry week (VSVS volunteers with Vanderbilt ACS affiliates), Nano day, Robotics Day and Polymer Day.
* 46 volunteers helped build NXT robots and First Lego Challenge buildings at **Ensworth school.** Ensworth then generously donated the materials so that VSVS could start First Lego teams in 2 schools. We anticipate having these schools participate fully in the First Lego League challenge in the Fall semester.
* VSVS materials and lessons were provided to Vanderbilt faculty for use in their children’s schools and for students in the Nashville community.

**VIII. VSVS is Recognized Both Within and Outside the Vanderbilt Community.**

* In April, 2018, VSVS won the Vale Award for Best Collaborative Organization.
* In Sept, 2017, Pat Tellinghuisen was the recipient of the [Vanderbilt Institute of Nanoscale Science and Engineering’s](https://www.vanderbilt.edu/vinse/) (VINSE) Distinguished Service Award.
* VSVS was awarded a **Predator’s grant** to fund the purchase and implementation of Lego WeDo’s curriculum in elementary afterschool programs in the 2017-18 year.
* The entry to the **2011 NIH K-12 LAB Challenge, “Protecting Skin from Ultraviolet Light,”** won an award and is posted on web site  [http://science.education.nih.gov/NIHLabChallenge.nsf/](https://email.vanderbilt.edu/owa/redir.aspx?C=4c1431b9d5e44a14a0c672e97f161b03&URL=http%3a%2f%2fscience.education.nih.gov%2fNIHLabChallenge.nsf%2findex.xsp%3fpage%3dHome)   Comments from Cindy Allen, on behalf of the LAB Challenge Working Group, included “Yours was the only entry team composed of a faculty member, an emeritus professor, and an undergraduate out of our pool of 110 entries, which was such a treat for us. Also, raising awareness about UV light is so timely! Thanks so much for taking the time to enter and for your creativity.”
* In October 2010, Dr. Mel Joesten, co-founder of VSVS and Vanderbilt University Emeritus Professor of Chemistry, received the American Chemical Society Salute to Excellence Awardfor his contributions to science education. His award lecture was *“Vanderbilt Student Volunteers for Science – A Dream Come True.”*
* The VSVS website reached science educators world-wide. Our “Reebops” lesson was published in the*European Journal for Science Teachers*, [http://www.scienceinschool.org](https://email.vanderbilt.edu/owa/redir.aspx?C=3a040dd93682498a98d0f75f62ba87c5&URL=http%3a%2f%2fwww.scienceinschool.org).
* Other universities continue to enquire about starting VSVS-type organizations, in response to our web document, “Starting a(n) SVS” link. Davidson College is the latest, with their DSVS group. TN*-*SCORE administrators from Knoxville met with Pat Tellinghuisen to discuss why VSVS is so successful.
* VSVS lessons have been presented at National Science Teacher’s Association’s meeting in Nashville in November 2005 and in Houston in November 2007, TSTA conference in November 2007, and the NMSA conference at Indianapolis in November 2009.
* Pat Tellinghuisen has presented workshops on VSVS lessons at MNPS and Williamson Co. in-service days for middle school teachers and for summer workshops for Center for Science Outreach.
* Pat Tellinghuisen trains over 50 teachers from rural schools on the lessons they use in their classrooms during the year.

**IX. Funding**

We gratefully acknowledge support for VSVS programs by Vanderbilt University, Vanderbilt Chemistry Department, and the Tennessee Space Grant Consortium.