

Maryland's
Results from
the 2020
National T&E
Education
Safety
Survey



*How Does Maryland Compare to the
National Averages?*

*What are the Implications for School
Systems?*

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Love, T. S., & Roy, K. R. (2020). K-12 technology and engineering education safety and facilities survey. [Data set]. National Safety Consultants, LLC.
<https://sites.google.com/view/2020-te-safety-study/>

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Presenter: Tyler Love

CURRENTLY

- Assistant Professor of Elementary/Middle STEM Education at PSU Harrisburg
- Safety Editor for ITEEA
- NSTA Safety Advisory Board Member
- OSHA 511 General Industry Certificate
- 2018 CareerSafe® Safety Educator of the Year

PREVIOUS EXPERIENCES

- Coordinator and Associate Professor of T&E Ed at UMES
 - Technology and Engineering teacher in Howard and Queen Anne's
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Presenter: Melvin Gill

CURRENTLY

- PLTW teacher in Anne Arundel
- Adjunct Instructor for UMES
- Author of Safety Articles for ITEEA
- Reviewer of Safety articles/books

PREVIOUS EXPERIENCES

- Safety Workshop Instructor for MCCTES

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Background Info

- Last national survey on T&E safety is unknown
- Large focus on safety in T&E education due to:
 - Liability
 - Alternative certification
 - STEM/Makerspaces
 - After school clubs

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Previous Research - CTE

- Recent studies on safety in various CTE areas by Threeton and Evanski (2014, 2015, 2019)
 - 57 CTE teachers from 30 counties in PA
 - 93% had safety plan in place
- Top 5 obstacles to implementing safety in CTE classes
 1. Chronic student absences
 2. SPED modifications/accommodations
 3. Lack of funding
 4. High class enrollment
 5. Small classroom/lab space

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Previous Research - Science Ed

-Stephenson, West, Westerlund, & Nelson (2003)

- 856 science teachers in TX
- 81 incident/accident report forms returned

-Incidents/Accidents increased:

1. 8% to 62% as **class size** increases from <14 to >24 students
2. 11% to 66% as **room size** decreased below 60 sq. ft per student
3. 11% to 47% as **room size** decreased below 800 sq. ft
4. 35% did not have adequate training
5. Only 69% had a written safety policy

-Study redone in 2014, similar findings

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T&E 2020 National Safety Survey

-Adapted from Stephenson et al. study, face validity

April 2020 - sent out to ITEEA/TEEAM members, county supervisors

- 744 national, 107 MD responses

-Questions on:

- Info and Demographics
- Experience and Certification
- Classroom Conditions
- T&E facilities
- Teacher and Student Safety Training
- Recent Incidents/Accidents

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Gender and Race

Maryland

Answer	%	Count
Male	71.96%	77
Female	28.04%	30
Total	100%	107
White	84.11%	90
Black	8.41%	9
Two or More Races	4.67%	5
Asian	1.87%	2
Hispanic or Latino	.93%	1

National - 74% male; 90% White, 5% Black (718 total responses)

Certification(s)

Maryland

Alternative or Emergency	1.76%	3
Elementary Education	5.29%	9
Technology Ed or T&E Education	48.24%	82
A Science Education area	8.82%	15
CTE area	14.12%	24
Other (please specify)	21.76%	37

National - Very similar

Total Years Teaching T&E/Tech Ed/Indust. Arts

Maryland

Answer	%	Count
0-3	12.15%	13
4-8	32.71%	35
9-15	20.56%	22
16-25	19.63%	21
26+	14.95%	16

National

0-3	10%	70
4-8	20%	142
9-15	20%	143
16-25	28%	201
26+	23%	162
Total	100%	718

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Course Preps

<u>Preps</u>	<u>Maryland</u>	<u>National</u>
1	6%	3%
2	31%	14%
3	41%	31%
4	11%	25%
5	6%	13%
>5	6%	14%

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Primary Focus of Your Courses

Maryland

1. Engineering Design, T&E Literacy
1. Tie - Electronics/Programming/Robotics, & Pre-engineering (ex. PLTW)
1. Tie - Materials Processing, CAD, Communications/Graphics

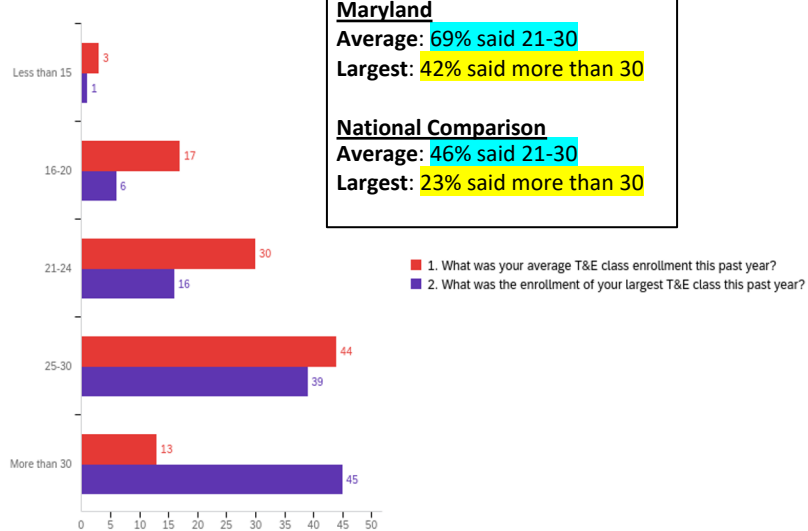
National

1. Engineering Design, T&E Literacy
1. Tie - Materials Processing, CAD, & Electronics/Programming/Robotics
1. Pre-engineering (ex. PLTW)

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Enrollment in your classes: Average and Largest Class sizes

Maryland



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Percentage of students in your classes this past year that had special needs?

Maryland

Answer	%	Count
0-5%	20.56%	22
6-15%	43.93%	47
16-25%	20.56%	22
26-50%	12.15%	13
More than 50%	2.80%	3

National

0-5%	20%	146
6-15%	41%	297
16-25%	27%	191
26-50%	10%	73
More than 50%	2%	11
Total	100%	718

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Administration's progressive disciplinary support?

Maryland

Answer	%	Count
Poor	15.89%	17
Fair	28.04%	30
Good	37.38%	40
Excellent	18.69%	20

National

Poor	12%	79
Fair	21%	152
Good	42%	302
Excellent	26%	184

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Have a sufficient budget to maintain safety

Maryland

Answer	%	Count
Yes	47.66%	51
No	52.34%	56

National

Answer	%	Count
Yes	53%	380
No	47%	338

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Does your district conduct annual safety audits of T&E facilities?

Answer	<u>Maryland</u>	<u>National</u>
Yes	44%	43%
No	28%	37%
Unsure	28%	21%

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Do the Following Have A Written Safety Policy?

Answer	<u>Maryland</u>	<u>National</u>
T&E Classes	92%	82%
T&E Department	75%	56%
School District	66%	44%

Recommendation

- Work with your district safety compliance officer, legal counsel, supervisor, and teachers to develop a safety policy
- Enforce consistently and fairly

Did you receive any form of safety training during the following?

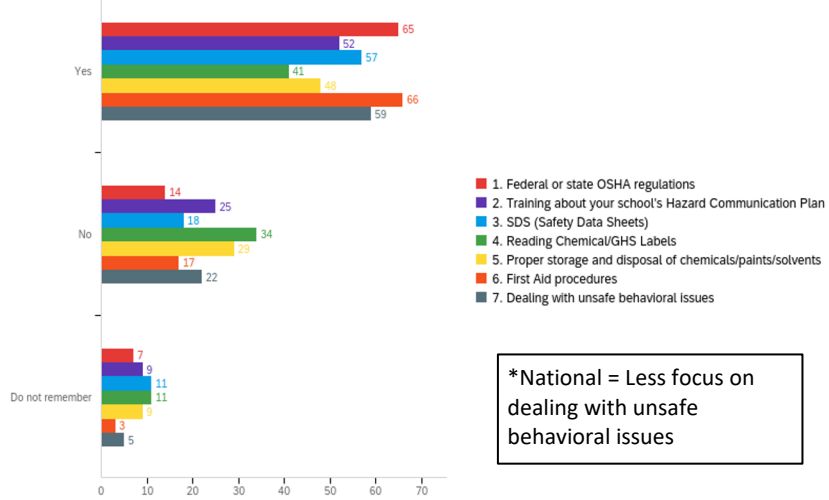
Answer	Maryland	National
UG tech/eng or lab courses	55%	62%
UG teaching methods courses	51%	54%
Grad tech/eng or lab courses	33%	28%
Grad teaching methods courses	38%	32%

How long has it been since your district last offered you safety training?

Answer	Maryland	National
<6 months	22%	15%
6 months -1 year	34%	21%
1-2 years	8%	7%
2-5 years	8%	5%
>5 years	8%	7%
Never received training from my district	20%	44%

Did the training mentioned in the previous question provide information on the following:

Maryland



*National = Less focus on dealing with unsafe behavioral issues

Have you participated in any T&E safety training provided by someone other than your district within the last 12 months?

Maryland

Answer	%	Count
Yes	10%	11
No	90%	96

*National = 18% said Yes

Who delivered the safety training you attended within the past 12 months?

MD Answer	MD %	MD Count	National %
Local training source (not my school district)	36%	4	26%
State teachers association	0%	0	12%
State department of education	0%	0	6%
National teachers association	0%	0	3%
A university	36%	4	11%
OSHA	0%	0	17%
Other (please describe)	27%	3	25%
Total	100%	11	

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Recommendation

According to OSHA (MOSHA in Maryland)

- Safety Training should be administered upon initial hire, and again any time a new hazard is introduced (chemical, equipment, etc.)
- Employer has a duty to provide these trainings
- Employee can request in writing to receive these trainings

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In what type of room did you primarily conduct your T&E activities this past year?

Answer	Maryland	National
Portable Classroom	0%	0.28%
Regular Classroom/computer room	27%	17%
T&E classroom/lab combo	62%	66%
T&E Lab	8%	13%
Makerspace	2%	2%
Varied due to floating	2%	3%

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Approximate size of the instructional area?

Answer (Fire Code Capacity)	Maryland	National
Less than 600 square feet (<12 students)	14%	8%
600-800 square feet (12-16 students)	30%	20%
800-1,000 square feet (16-20 students)	26%	22%
1,000-1,200 square feet (20-24 students)	21%	24%
Greater than 1,200 square feet (>24 students)	9%	26%

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Recommendation

Fire code NFPA 101 requires 50 sq. ft. per occupant (net square footage)

Research suggests at a minimum 60 sq ft. limits accident rates

Conduct safety inspections to make sure your facilities have proper safety controls and space (ITEEA website has a checklist)

Source: <https://www.iteea.org/102756.aspx>

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How often are students in your T&E class required to:

Question	Never	Rarely	Usually	Always
1. Sign a safety acknowledgement form?	14.95%	3.74%	13.08%	68.22%
2. Be tested for their knowledge of safety procedures prior to participating in new hazardous T&E activities/using new hazardous equipment?	8.41%	3.74%	12.15%	75.70%
3. Safely demonstrate a new procedure or use of a new tool/piece of equipment while directly supervised?	6.54%	1.87%	14.02%	77.57%

*Similar to national findings

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Safety tests and posters used with students?

Answer	Maryland	National
ITEEA's safety website	22%	10%
Virginia Tech's lab safety resource website	0%	1%
Power Tool Institute resources	1%	3%
School district/department developed resources	26%	15%
State developed resources	1%	4%
Student developed safety resources	3%	1%
Teacher (my own) developed resources	40%	58%
I do not use safety tests or posters	8%	8%

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Teachers Reported Having the Following:

	<u>Maryland</u>	<u>National</u>
Safety Zones on Floor	49%	48%
Non-skid strips near machines	14%	27%
Eyewash w/in 10 second access		
Plumbed	43%	47%
Portable	16%	22%
Adequate Ventilation	29%	45%
Workspace accessible to wheelchair bound students	41%	47%
Accessible master power shut offs	67%	61%
Sufficient number of outlets	62%	61%

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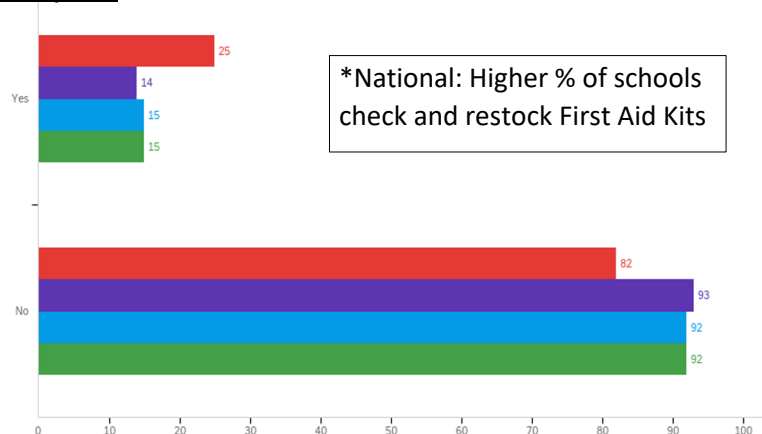
Teachers Reported Having the Following:

	<u>Maryland</u>	<u>National</u>
Lockable tool storage	81%	78%
Sufficient work space per student	55%	60%
Sufficient project storage	62%	61%
ANSI Z87.1 glasses for entire class	79%	83%
Cabinet to sanitize goggles	65%	50%
A sink in the facility	75%	76%
First Aid Kit	51%	61%
Lockable chemical storage cabinet	57%	67%
Finishing or chemical storage room	37%	46%
External exhaust paint booth	55%	83%

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Have any of the following occurred/do they occur?

Maryland



*National: Higher % of schools check and restock First Aid Kits

- 1. Within the last 12 months have circuit breakers or GFCI outlets tripped ...
- 2. Do you flush the eye wash every week for 2 or more minutes?
- 3. Does your school or district check your First Aid kit and restock missin...
- 4. Have you had to evacuate the lab or open the door because of fumes/poor ...

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Recommendation

Flush out eye wash sink/shower once a week for 2 minutes

Check first Aid kit each semester to restock, work with school nurse

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During your time of employment, has your school district been involved in litigation or a settlement because of a T&E laboratory accident?

Maryland

Answer	%	Count
Yes	3.74%	4
No	42.99%	46
Unsure	53.27%	57

National

Yes	7%	51
No	62%	444
Unsure	31%	223

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Within the last 12 months, how many T&E safety incidents (no injury) have occurred in your classes?

Maryland

Answer	%	Count
0	37.38%	40
1-10	59.81%	64
11-20	2.80%	3
21-30	0.00%	0
More than 30	0.00%	0

National

0	38%	274
1-10	60%	427
11-20	2%	15
21-30	0%	0
More than 30	0.3%	2

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If a T&E safety incident has occurred, did it involve any of the following?

Question	Involved	
1. Hot glue gun	56.07%	60
2. Broken glass	5.61%	6
3. Spills/splashes (of any kind)	10.28%	11
4. Student Operated Equipment/Machinery (ex. scroll saw, band saw, etc)	16.82%	18
5. Automated equipment (ex. CNC, laser cutter, 3D printer, robotics, etc.)	1.87%	2

Question	Involved	
6. Hand or portable power tools (ex. cordless drill, Dremel, etc.)	21.50%	23
7. Fumes	9.35%	10
8. Fires	0.93%	1
9. Projectiles	14.95%	16
10. Electrical Short	11.21%	12
11. Outdoor activities	1.87%	2

*Similar to national findings

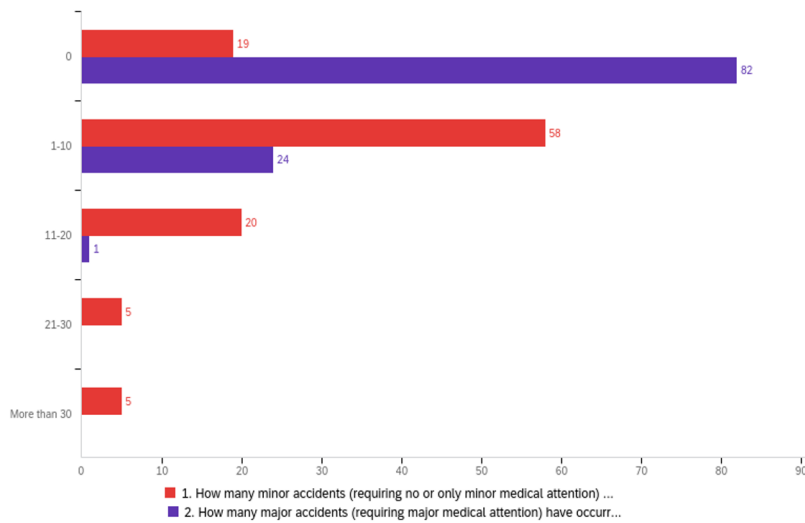
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How many T&E lab accidents occurred within the past year in your classes?

Question	0		1-5		6-10		11-15	
1. How many minor accidents in the past 12 months?	25.23 %	27	64.49%	69	9.35%	10	0.93%	1
2. How many major accidents (requiring major medical attention) occurred in your classes within the past 12 months?	89.72 %	96	10.28%	11	0.00%	0	0.00%	0

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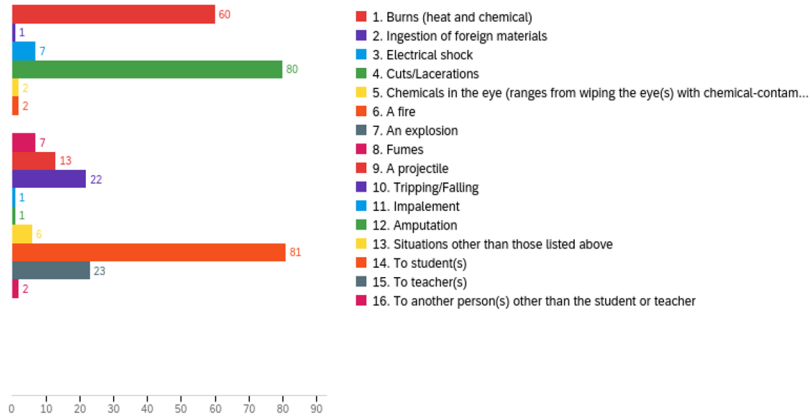
How many T&E lab accidents occurred within the past 5 years in your classes?



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If an accident (minor or major) has occurred in your classes within the past 5 years, did it involve any of the following:

Similar to national findings.
Mostly cuts/lacerations or burns to students



Maryland

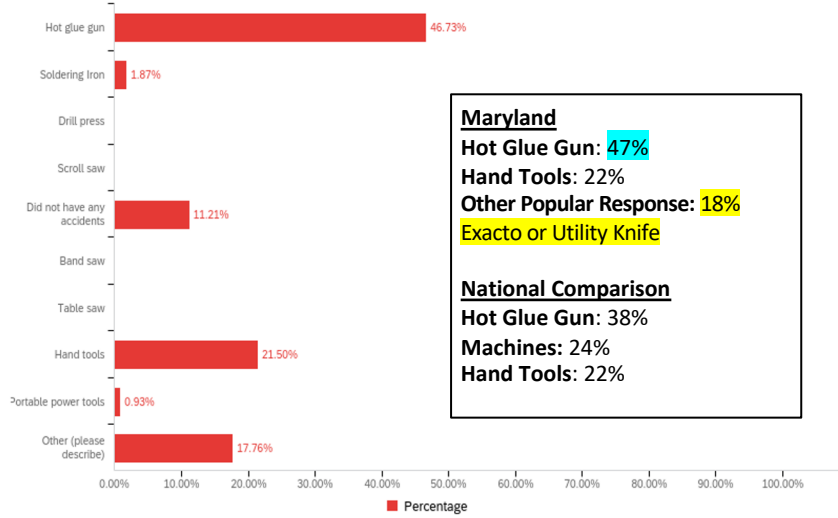
Most commonly injured body part?

Answer	%	Count
Did not have any accidents	10.28%	11
Fingers/hands	88.79%	95
Eyes/face	0.00%	0
Arms	0.00%	0
Legs	0.00%	0
Other body part	0.93%	1

National

Did not have any accidents	13%	93
Fingers/hands	86%	615
Eyes/face	0.4%	3
Arms	0.1%	1
Legs	0%	0
Other body part	0.8%	6

Of all accidents that have occurred during the past 5 years in your classes, what was the most common tool/equipment that caused injury?



Maryland
Hot Glue Gun: 47%
Hand Tools: 22%
Other Popular Response: 18%
Exacto or Utility Knife

National Comparison
Hot Glue Gun: 38%
Machines: 24%
Hand Tools: 22%

3D Printer Ventilation

	<u>Maryland</u>	<u>National</u>
Have 3D printer(s)	61%	75%
Built in filter (HEPA)	19%	17%
Used inside of a fume hood	3%	2%
Used near internal vent system (ex. electrostatic air filter)	3%	6%
No ventilation used	75%	75%

Soldering Ventilation

	<u>Maryland</u>	<u>National</u>
Do soldering activities	48%	52%
Under external vented fume hood	8%	15%
Under internal fume extractor	4%	12%

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Laser Engraver

	<u>Maryland</u>	<u>National</u>
Have a laser engraver	25%	44%
Internal Exhaust	41%	31%
External Exhaust	48%	64%
No ventilation	11%	5%

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Table Saws

	<u>Maryland</u>	<u>National</u>
Have a table saw	65%	65%
SawStop brand	28%	56%
Instructor only use	62%	34%
Student use with strict guidance	26%	31%
Student use with Teacher in Lab	12%	35%

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Top 3 Factors for Unsafe Conditions/Accidents in a T&E lab?

Maryland

1. Student Failure to follow safety protocols
2. Overcrowding
3. Classroom management/discipline

National

1. Student Failure to follow safety protocols
2. Overcrowding
3. Classroom management/discipline

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Questions?

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[https://sites.google.com/view/
2020-te-safety-study/](https://sites.google.com/view/2020-te-safety-study/)