

Candy Land: Engaging Students in Class

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Abstract

Social media, cell phones, Candy Crush, the crossword in the student newspaper, and worries about the exam in the next class are among the many distractors competing for students' attention in class. Teaching in this potentially distraction-filled environment can pose significant challenges for instructors. Use of active learning techniques such as in-class activities, problem solving exercises, discussions, and questioning draw students' attention to the task at hand and help keep them engaged. Effective use of humor and fun are important tools in this endeavor.

Numerous studies cite the importance of building positive rapport as a critical factor in promoting student learning. This study investigates the effectiveness of using candy in engineering classrooms and recommends methods of developing positive rapport using candy. Some faculty may be concerned about the use of candy in college classrooms as unprofessional or as a trick to curry student favor. Accordingly, students from four universities, both public and private, and from different geographical regions within the United States were asked for input about the use of candy in engineering courses. Results indicate that students feel that candy is an appropriate tool in college education and a majority agreed that candy use is not distracting or unprofessional. Similarly, students considered candy as a means for motivating them to pay attention and participate. The authors provide recommendations on how to incorporate use of candy in the classroom and list common pitfalls to avoid. This study demonstrates that, if used correctly, candy can aid student learning in college engineering classrooms.

No Sugarcoating: An Introduction to using candy in the classroom

Is 'having fun' relevant to learning engineering? Can use of humor or candy help promote fun? Will students perceive use of candy as unprofessional or distracting? Will students take a class or professor less seriously if candy is used? Will colleagues frown upon use of candy in the classroom?

These important questions, sometimes expressed as concerns by faculty, provided the motivation for this study. Each of the authors has made an intentional choice to use candy in support of student learning. However, each of us has also asked and been asked the questions presented above. Frequently, concerns are expressed by junior faculty who may not have been exposed to the concept of 'having fun' in a college classroom or who may be concerned about students' perceptions of their role as leader in the classroom. Some faculty have expressed concern that students may consider use of candy or humor as unprofessional or inappropriate in engineering classrooms.

Appropriate use of candy, as with any tool in the classroom, can help engage students, especially when coupled with appropriate use of humor. Numerous sources in engineering education literature describe the importance of engaging students as active participants to improve contextual understanding and retention of material^{1, 2, 3, 4, 5, 6}. Instructional strategies that focus on the learner enhance student learning, increase interest in engineering, and can even help retain engineering students by building connections with peers and with instructors^{2, 3, 7}. Lowman's "Two

Dimensional Model of Effective College Teaching”⁷ presents the importance of interpersonal rapport in maintaining an environment conducive to student learning. Lowman describes college classrooms as “*complex arenas in which a variety of emotional reactions can influence how much is learned and how the participants feel about it.*”⁷ Student motivation is likely increased in a classroom perceived by students to be a supportive learning environment, as established by the nature and content of communications among students and with the instructor⁸.

Bain⁹ describes “outstanding teachers” as professors who “*achieved remarkable success in helping their students learn in ways that made a sustained, substantial, and positive influence on how those students think, act, and feel.*” Trust and openness in a classroom can enable students to ask or answer questions without fear of reproach or embarrassment. Such an environment can be created in a classroom where students are acknowledged or rewarded for catching an error on the board, providing a particularly insightful answer, leaving the comfort zone of their seat to help with a demonstration or to post their answer on the board, or focusing on the task at hand in a group learning exercise. Fun, games, demonstrations, recognition, and rewards can be used effectively to connect with students as individuals, in addition to engaging the class as a whole^{10, 11}.

In addition to serving as rewards, candy-based demonstrations can be added to the pantheon of food-based teaching aids used in engineering classrooms^{12, 13} and at the K-12 level^{14, 15, 16}. Food-based demonstrations allow students to connect their learning to materials with which they are already familiar. These demonstrations have the added advantages of being readily available and relatively inexpensive.

Freeman and Wash¹⁷ identify humor as one of ten “brain-based” strategies to increase effectiveness of teaching and learning in the college environment. “*College professors should be able to bring humor to the classroom, laugh at their mistakes, and teach students that life is a joy, both inside and outside of the classroom. It is important not only to love the subject area, but also to remember it is being taught to real people with emotions and worries. Lightening the load with a bit of humor could mean all the difference for a student’s success in the course.*”¹⁷ Appropriate use of humor in the classroom can be used to reduce stress, liven up a classroom by varying the class structure, and even help develop a sense of community among students who are familiar with the line of humor.

In this paper, we present ways in which candy, sometimes combined with engineering “humor,” can be used in support of student learning. Students were surveyed on their perception of candy use in the classroom. The survey and results obtained from 96 students at four universities are presented and indicate support for, and appreciation of, candy use in engineering courses.

Chewing on the Idea: Methods

The survey was designed to quantify the effect of candy use on student attitude and engagement during class and to elicit student perspectives regarding the appropriateness of using candy in the college classroom. Students were asked to respond to four statements using a Likert scale ranging from “Strongly Agree”, to “Agree”, “Neutral”, “Disagree”, and “Strongly Disagree”. The statements assessed student views from both a positive perspective and a negative perspective to validate responses. The four statements were:

1. Candy is distracting.
2. Candy helps motivate students to pay attention and participate
3. Candy is appropriate for a college classroom
4. It is unprofessional to use candy in an engineering classroom.

The survey included demographic information to determine the university and course level in which candy was used. Ninety-six students at four universities, the Oregon Institute of Technology (OIT), the University of Minnesota Duluth (UMD), the University of the Pacific (UOP), and York College of Pennsylvania (YCP), located in different geographic regions across the United States completed the survey. Two private, UOP and YCP, and two public universities, OIT and UMD, were included and students' academic standing ranged from sophomore through senior years, as shown in Table 1.

Table 1: Summary of student survey respondent characteristics.

University	Public or Private	Geographical Area in US	Course Grade Level	Course Type	Number of Respondents
U1 – UMD	Public	Midwest	Senior	Elective	22
U1 – UMD	Public	Midwest	Junior	Required	28
U2 – YCP	Private	Eastern	Sophomore	Required	27
U3 – UOP	Private	West Coast	Junior	Required	14
U4 – OIT	Public	Northwest	Senior	Required	5

Short and sweet: Assessment results and discussion

Survey results were compiled numerically by assigning values to the Likert scale as follows: Strongly Agree = 5, Agree = 4, Neutral = 3, Disagree = 2, and Strongly Disagree = 1. Analysis of responses of all 96 students, shown in Figure 1, indicates that students overwhelmingly responded positively to the use of candy in the classroom. In fact, no student agreed or strongly agreed that candy is distracting and only one student responded that it is unprofessional to use candy in the classroom. Mean values of student responses for both statements were at or close to 1.5, as shown in Figure 1.

As shown in Figure 1, students agreed that use of candy was appropriate in the college classroom, as indicated by a mean score of 4.2. Only two students disagreed with this statement. Interestingly, these same two students disagreed that candy was unprofessional in the classroom, one agreed that it helped motivate students, and the other student's response was "neutral" regarding the effect of candy on motivation.

The largest variation in student responses was observed in regards to the question about whether candy helps motivate students to pay attention and participate. The mean response was 3.5, indicating a slightly positive view. The distribution of responses is shown in Figure 2. Although the majority of students agreed with, or were neutral about, the question of candy as a motivating factor, eight students disagreed and four strongly disagreed.

The four students who strongly disagreed were all from university “U1,” UMD in the Midwest. This led to a question as to whether responses varied by school type, location or course grade level. The average of student responses for each question by surveyed class is shown in Figure 3. As seen in Figure 3, there do not appear to be any clear trends in responses based on grade level, school type or class type. Students at university “U4,” OIT did express the lowest support for candy in the classroom among the four schools. However, only five students responded to the survey administered at university “U4,” OIT, which is not a statistically significant data set from which to draw conclusions.

Students were provided space to offer comments on each statement. Overall, the comments reflected the positive effect of candy on the classroom atmosphere and in providing incentives to participate, as follows:

“Main motivation is to learn, candy helps.”

“Provides incentive to answer questions.”

“Engineering classes are typically grueling and not fun experiences. Having candy lightens the mood and makes dealing with difficult material easier to bear.”

“People who do not usually answer questions in class began answering.” (This is a phenomenon personally observed by each of the authors in their own classrooms.)

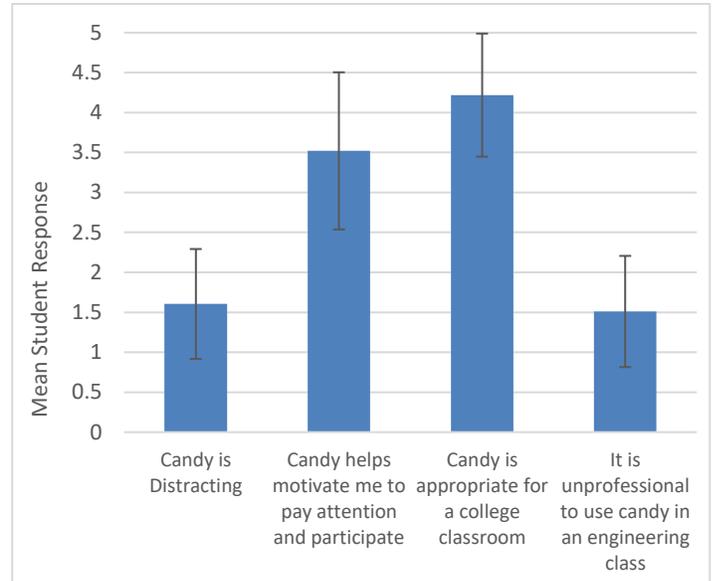


Figure 1: Mean student survey responses for all 96 students with shown standard deviation. Responses based on 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree and 5 = Strongly Agree

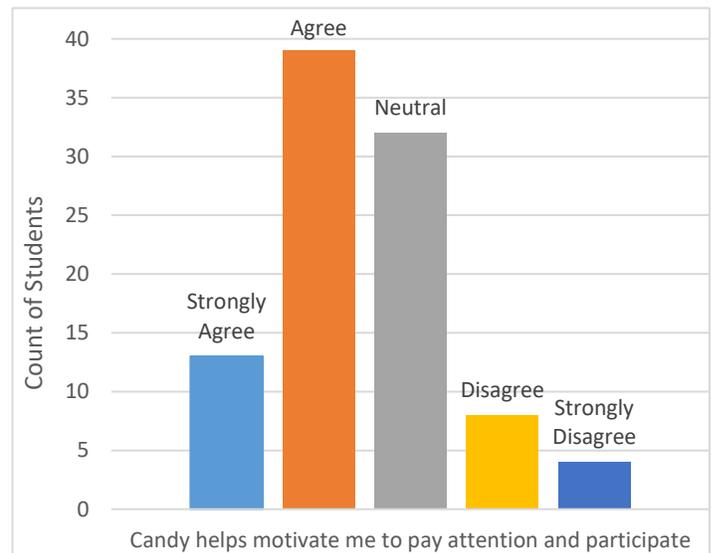


Figure 2: Count of student responses regarding the statement, “Candy helps motivate me to pay attention and participate”.

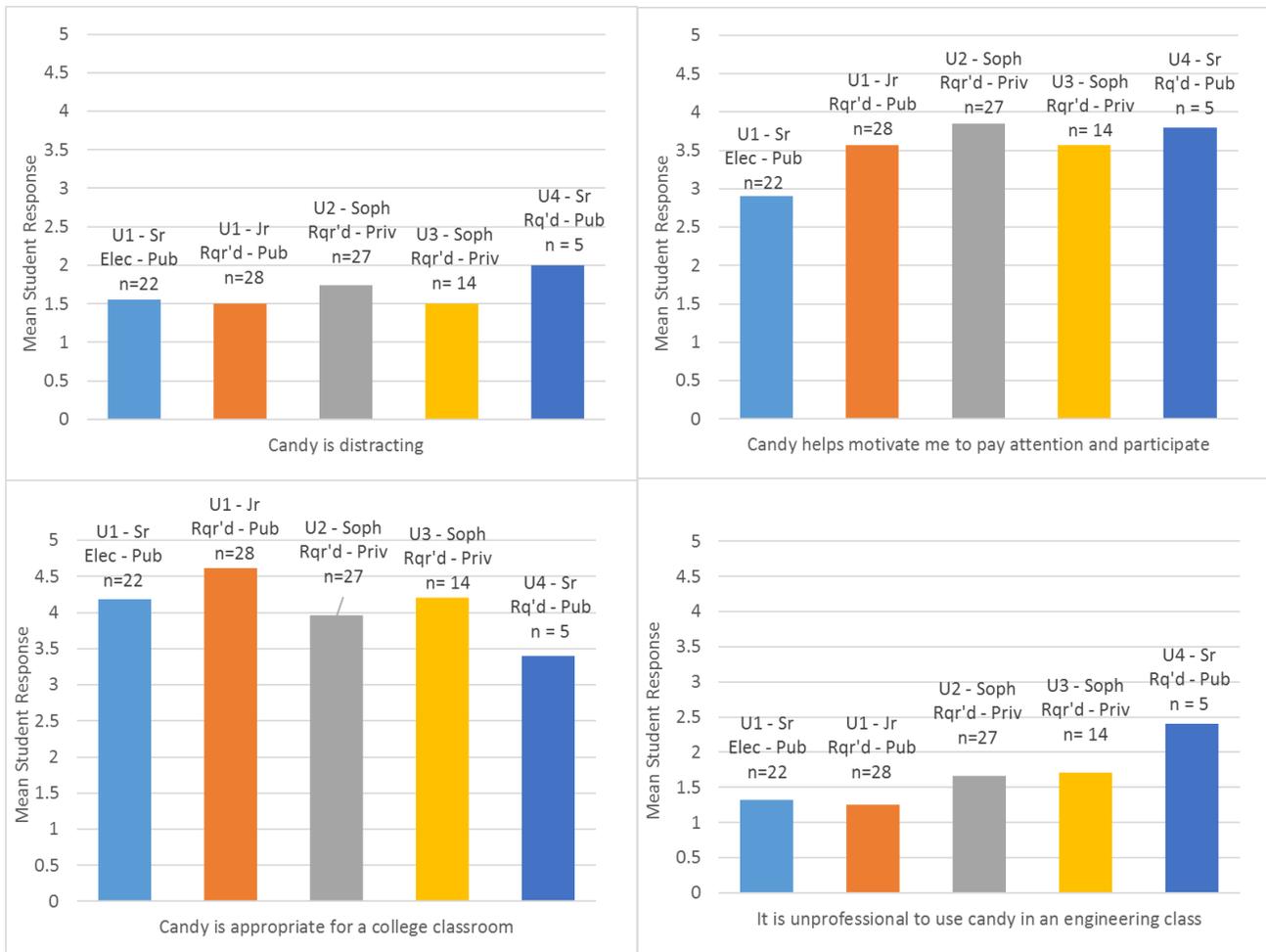


Figure 3: Mean student responses for each question with responses separated by class surveyed. Graphs indicate school, course grade level, if the course is required (Rqr'd) or an elective (Elec), if the university is public (Pub) or private (Priv) and the total count of students in the surveyed class. (1 = Strongly Disagree, 5 = Strongly Agree; U1 = UMD, U2 = YCP, U3 = UOP, U4 = OIT)

A number of students questioned the need for the survey with comments such as, “*Who doesn't like candy?*” and “*Who's bashing candy?*” It is unlikely that all students will respond positively to candy. In this survey, one student indicated not liking candy and two explained they liked candy but did not necessarily want to eat it. Students who were less inclined to find candy motivating or professional noted that the type of candy and how it was used is important. For example, a student recalled receiving a lollipop before an exam from their professor which helped to reduce stress but noted that candy thrown across the room was not professional. One insightful student noted that if the instructor brings a large bag of candy to class that is visible, the odds of everyone receiving candy is increased. This approach would limit incentives for participation as all knew they would get candy eventually.

Student comments and survey results indicate that the majority of students do find use of candy to be appropriate in the classroom. If used effectively, candy can help improve student engagement and create an atmosphere more conducive to learning. However, classroom dynamics can vary widely. If in doubt, the instructor should ask the students.

The Sweet Smell of Success: Implementing Candy in the Classroom

For faculty considering candy use in the classroom, we recommend some “do’s” and “don’ts” based on our own experiences, to successfully adopt this simple, low-overhead method of engaging students.

Do:

- Adopt use of candy as part of a larger effort to build rapport and enhance students’ learning.
- Demonstrate use of candy early on, e.g., by rewarding and recognizing students (promising ‘fame and fortune!’) who help handout syllabi and other paperwork during the first class meeting, or by making an intentional mistake on the board and rewarding the student who identifies the mistake.
- Recognize groups for shared effort (e.g., by giving one piece of candy per group member).
- Say the student’s name and ‘thank you’ or ‘well done’ if the candy is used in recognition for help or a job well done.
- Look for opportunities to ‘distribute the wealth,’ particularly to recognize typically quiet students.
- Use candy to build rapport strategically. For example, ask a typically non-compliant student for assistance, then recognize the student for their help.
- Use candy to highlight students’ involvement or achievements, e.g., Smarties or Starburst candy for a great answer.
- Periodically hand out candy in sets of two or three, which the student can share and become “the hero” among their peers. Starburst are especially effective for this option.
- Stick to the rules of “appropriate use of humor”: avoid jokes that are offensive, sexual, faith-based, or political in nature, or that may put students down.
- Be aware of possible food allergies and dietary restrictions. Examples include allergies to chocolate or nuts, or presence of animal-based gelatin in some candies that may be objectionable to vegetarians or people of some faiths.
- Use other types of treats e.g., raisins, stickers, rulers, discipline-specific giveaways from conferences, etc. if providing candy is likely to cause an uncomfortable environment.
- Keep the candy in an airtight container, preferably a recognizable one, and check the candy supply periodically – candy can get stale, melt, or otherwise become undesirable.
- Use packaged candy, i.e., individually wrapped, not loose.

- Ask students for their input using a mid-semester evaluation if you are concerned about their perception. If needed, explain why you use candy in the learning environment.

Don't:

- Overdo it. Students recognize candy as a reward, so giving candy for “easy answers” or trivial comments will lose its value.
- Fret that students won't like a particular type of candy. In our experience, the students who receive the candy are often just as excited about the recognition as about the candy itself. If the candy is not a favorite or not one they can eat, they will pass it to a friend. You can ask the student about it outside of class.
- Use jokes or candy that could potentially be taken as an insult, e.g, “Dum dums” are off limits, unless you turn it into a joke about yourself.
- Eat the candy yourself unless you also take up an exercise program!

Candy is also a valuable tool for use in a number of engineering demonstrations. Providing students with their own demonstration materials leads to individual experiential learning. Additionally, students' familiarity with candy versus an unfamiliar engineering material helps them form connections to prior knowledge. Examples of how candy can be used in demonstrations include:

- Licorice: tension/compression/torsion/column buckling based on length and column buckling shapes based on support conditions.
- Marshmallows: Poisson's Ratio.
- Snickers vs Hershey bar: homogeneity, isotropy of materials.
- M&Ms vs. Whoppers: demonstrate soil packing, pore spaces
- Caramels: anisotropic material – strong in compression, weak in tension.
- S'mores: used to demonstrate layering in soil strata, landfills.

If each student is given candy to use in a demonstration, the instructor should have extra candy on hand in case the student breaks or eats the candy before the demonstration takes place. Anticipating such behavior, for example, when asking students to model pinned-pinned and then fixed-fixed columns, each student should be given two pieces of licorice: one to eat and one with which to explore column buckling shapes. Edible demonstration materials are not limited to candy, as demonstrated by Fiegel and Derbridge¹² in their paper relating soil properties to food. Although beyond the scope of this paper, readers are encouraged to think broadly in terms of tools to use for class demonstrations.

A variety of candy can be taken to class in a re-sealable bag, lunchbox, or concrete testing container to avoid spillage. Rewarding students for correct answers with verbal acknowledgement and/or candy also offers a unique opportunity to bring humor into the classroom in a manner that easily avoids the common dangers of humor. In Table 2, the authors offer some sample jokes and puns that they have found useful, if silly. Of course, the person telling the joke or pun must find it amusing for it to be effective. Fortunately, students appreciate even a bad pun told with a smile.

Table 2. Examples of candy-related puns and their usage.

Candy	Pun	Example Usage
3 Musketeers	Musketeer award	Given for a great group answer.
100 Grand Bar	Most valuable assistance	For help on a demo, handing out papers, other help in class.
Almond Joy	We need some joy today	Effective for a particularly challenging topic, but avoid giving to student with nut allergies.
Chocolate bells	Be there with bells on	Used at Christmas/Winter Break for the final exam.
Grapeheads (or any grape candy)	Grape Answer!	Given for an insightful observation or answer
Gummy bears	Beary good job	Works for a variety of scenarios
Jolly ranchers	Jolly good effort	Unfortunately, the shape of these candies seems to make them an ideal choking hazard, but students do like them.
Lifesaver	Lifesaver award	Awarded for catching mistakes on the board. The individually wrapped 5-pack of gummy savers are the best, but hard to find other than at Halloween.
Mounds	Mounds of fun!	Random prize for a particularly challenging topic.
Nuggets (Hershey chocolate)	Nuggets of wisdom	A couple of Nuggets are placed at each student's seat before the start of an exam if the class is small.
Nuggets	Thank you for that nugget of knowledge	Used when a student answers a difficult question or provides a very insightful comment or question.
Raisins, Raisinettes	Raisin' the bar	Given for an insightful observation or early completion of work. (Word of caution: It does work a few times, but students seem to prefer chocolate to healthy snacks!)
Starburst	Startling burst of inspiration	Given for brilliant questions/observations. These can be handed out in stacks of 3 so the student can share with their neighbors and be the hero (with thanks to Prof. Steve Ressler).
Whoppers	A whopper of a prize	Announced as incentive for the first student to get to an answer on in-class work (with thanks to Profs. Al Estes and Ron Welch).
Chewing gum		Placed quietly on the desk of a student who is having trouble staying awake (without pun or commentary).

Conclusion

This paper presents the results of student surveys demonstrating effective use of candy as part of an instructor's efforts to build rapport, create a positive classroom environment, and help students learn. Motivation for this paper came from the authors' experience in facing resistance from peers when using candy in the classroom. Student attitudes show that candy is appropriate at the college level and is an effective tool for building rapport. Additionally, the authors provided methods of

incorporating candy into the classroom and offered suggestions for positive implementation, as well as pitfalls. Given the volume of research demonstrating the importance of rapport and positive emotions on student learning, proper use of candy is recommended in engineering education.

As a final recommendation, the authors advise making this technique your own. Candy can be used with individual style and humor to demonstrate commitment to students and excitement about content. Furthermore, do not bite off more than you can chew (that is our last food-related pun, we promise). Starting with a few candy-related components is more likely to lead to success than trying everything at once. After trying candy a few times, trusted students can be asked for informal feedback on how candy implementation worked. Their comments can help identify a path to success. Students will appreciate your efforts on their behalf.

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Bibliography

1. Felder, R.M., 1995. “A longitudinal study of engineering student performance and retention. IV. Instructional Methods,” *Journal of Engineering Education*, 84(4):361-367, 1995.
2. Felder, R.M., G. N. Felder, and E. J. Dietz, 1998. “A Longitudinal Study of Engineering Student Performance and Retention. V. Comparisons with Traditionally-Taught Students,” *Journal of Engineering Education*, 87(4), 469-480. Accessed on:
www4.ncsu.edu/unity/lockers/users/f/felder/public/Papers/Education_Papers.html
3. Felder, R. M., 2006. “Teaching Engineering in the 21st Century with a 12th-Century Teaching Model: How Bright is That?” *Chemical Engineering Education*, 40(2), 110-113.
4. Freeman, S., S.L. Eddy, M. McDonough, M.K. Smith, N. Okoroafor, H. Jordt, and M. Wenderoth, 2014. “Active learning increases student performance in science, engineering, and mathematics” *Proceedings of the National Academy of Sciences*, 111(23). <http://www.pnas.org/content/111/23/8410>.
5. Svinicki, M. and W. J. McKeachie, 2011. McKeachie’s Teaching Tips: Strategies, Research, and Theory for College and University Teachers, 13th ed., Wadsworth CENGAGE Learning, USA.
6. Wankat, P.C., and F.S. Oreovicz, 2015. *Teaching Engineering*, 2nd ed. Purdue University Press, West Lafayette, IN.
7. Lowman, J., 1995. Mastering the Techniques of Teaching, 2nd ed, Jossey-Bass, San Francisco, CA.
8. Ambrose, S.A., M.W. Bridges, M. DiPietro, M.C. Lovett, and M.K. Norman, 2010. How Learning Works. Seven Research based Principles for Smart Teaching. Jossey-Bass, San Francisco, CA
9. Bain, K., 2004. What the Best College Teachers Do, Harvard University Press, Cambridge, MA.
10. Desrochers, M., G. Hein, M. Raber, and D. Wright, 2003. “Fun and Games... In the Classroom?” *Proceedings of the 2003 American Society for Engineering Education Annual Conference & Exposition*.
11. Golder, K., D.G. Levis, and D.B. Webb, 2013. “Engaging and Motivating Students in Engineering Communication with Competition and Prizes” *Proceedings of the 2013 American Society for Engineering Education Annual Conference and Exposition*.
12. Fiegel, G., and N. Derbidge, 2015. “Introducing Soil Property Evaluation in Geotechnical Engineering – Some Food for Thought,” *Proceedings of the 2015 American Society for Engineering Education Annual Conference & Exposition*.

13. Durham, S., M. Hale, and S. Freyne, 2008. "Classroom Teaching Aids and Laboratory Experimentation to Engage Students in Materials Learning," *Proceedings of the 2003 American Society for Engineering Education Annual Conference & Exposition*.
14. Saliklis, E., 2008. "Arch Building for Kids. What did they learn? What did we learn?," *Proceedings of the 2008 American Society for Engineering Education Annual Conference and Exposition*.
15. Morse, J. L., 1998. "Bringing A Short Hands On Engineering Activity Into High School Classrooms," Paper presented at 1998 *American Society for Engineering Education Annual Conference*.
16. Birnkrant, M., M. Cathell, P. Blount, J. Robinson, A. Fontecchio, and E. Fromm, 2008. "Introducing Engineering Through Candy," *Proceedings of the 2008 American Society for Engineering Education Annual Conference and Exposition*.
17. Freeman, G. G., & Wash, P. D., 2013. "You can lead students to the classroom, and you can make them think: Ten brain-based strategies for college teaching and learning success." *Journal on Excellence in College Teaching*, 24(3), 99-120.