Humor in Technical Education, Communication & Innovation

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INTRODUCTION

Humor is a valuable tool in engaging audiences, and it is often applied in marketing and advertising. Here we describe the application of humor to improve technical education, innovation and communication in Science, Technology, Engineering, and Math (STEM) involving students at Georgia Tech. In education & communication, humor provides a relatable example that is also engaging. In innovation, humor provides divergent thinking that more broadly samples idea space when compared to traditional brain-storming techniques.

APPLICATION TO EDUCATION

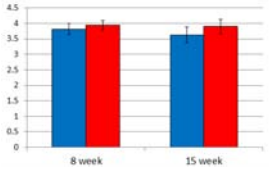

FIGURE 1. Average score for the "Uses humor in class" question on the instructor immediacy behavior survey in week 8 and 15 for a class with humor, and without humor. [1]

Figure 1 shows that students barely notice the difference when jokes are added to the classroom, even by an instructor who is also a professional comedian. Consistent with other studies, we hypothesize that temporally integrated humor is a distraction from learning because it increases the student's extraneous cognitive load. By integrating the humor into the lesson we get the benefits of humor without this undesirable effect as seen in Figure 2.

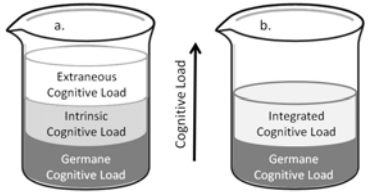

FIGURE 2. Integrated humor (b) avoids an increase in extraneous cognitive load (a). This allows more germane load which contributes to enhanced learning.

If the humor-integrated lesson is of the same structure as an actual technical example (isomorphic) then knowledge transfer from the humorous example to the relevant technical one is more likely.[2] Figure 3 illustrates such as example using the observed mixing of middle school students at a dance to teach liquid-liquid extraction in chemical engineering. Comparison of this humor-integrated approach with a control showed increased learning outcomes in a midterm exam. The only statistically significant ($p < 0.1$) correlation was between performance on the mixing part of a test question, and students who received the humor-integrated lesson as seen in Table I.[3]

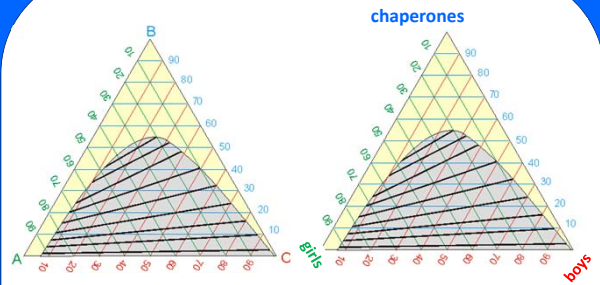

FIGURE 3. Ternary phase diagrams depicting the 2-phase region in gray of three generic liquid solvents and how a single phase is achieved by adding solvent B (left), and the analogous example of chaperones being used to get middle school boys and girls to mix at a school dance (right).

Cognitive Load	Mixing Question Sect. A	Mixing Question Sect. B
Intrinsic	r=-.1641 p=.3778	r= -.0379 p=.8574
Extraneous	r= -.2477 p=.1791	r= -.2927 p=.1557
Germane	r=.4155 p=.0224	r=.1472 p=.4826

TABLE I. Pearson Correlation (r), and the associated statistical significance (p) between Cognitive Load Components and Learning Outcomes measured by exam question o Liquid Liquid Extraction for humorous lesson (sect. A) and control (sect. B)

Use of similar examples in various classes showed an increase in the germane cognitive load for humorous examples.[3] This occurred except when the problem difficulty, characterized by the intrinsic cognitive load, was too high. At this point humor was not helpful as the problem should be broken into smaller problems.[3]

APPLICATION TO COMMUNICATION

The complexity of STEM concepts requires some level of learning, even when communication is the goal. We hypothesize the cognitive load theory of improved learning will also result in improved communication of STEM concepts. While we have carried out limited research, the application of the humor-integrated approach to communication received very positive feedback recently when utilized in a workshop at the 2018 ComSciCon event in Atlanta to teach scientists how to better communicate with the public.

APPLICATION TO INNOVATION

Recent work using stochastic fluctuations of thermal energy allowed molecular simulations to better sample conformation space. Analogously, we found better sampling of idea space by using humorous improvisation to produce divergent thought.[4,5] Humorous improvisation is used initially to produce divergent ideas, which inspire potential technical solutions (convergent step). These potential solutions are vetted to produce feasible solutions (emergent step) as seen in Figure 4.

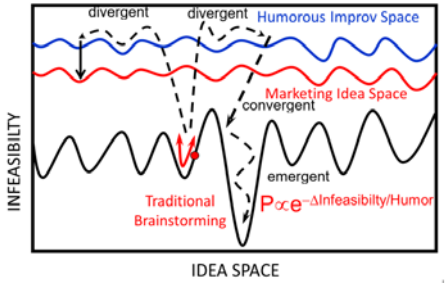

FIGURE 4. Three stages of our humorous innovation protocol: (i) divergent, (ii) convergent, and (iii) emergent.

CONCLUSIONS

Humor can improve both technical education and communication when integrated into the material to improve engagement without increase extraneous cognitive load. Humorous improvisation provides divergent thinking to broadly sample idea space. These initial ideas are improved via convergent and emergent steps.

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