

How to throw Chocolate at Students: A Survey of Extrinsic Means for Increased Audience Attention

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Abstract— This paper presents an overview of established and innovative means and teaching approaches that contribute to higher students' attention during lecture. The results are based on an international survey among lecturers from eleven universities. This survey was initiated by three lecturers from different countries who met at EDUCON 2016. The objective was to collect teaching experiences about playful means that motivate students to be attentive during a lecture. The proposed teaching approaches fall into three categories: *established teaching methods*, *unconventional extrinsic methods*, and *tools*. We focus on the extrinsic methods and discuss 14 illustrative examples of these approaches.

Keywords—*student attention; extrinsic motivation; didactic survey*

I. INTRODUCTION

Each new generation of students brings new educational challenges to teachers, but one which is quite consistent is to keep them attentive during a lecture. Already in the 1970s, pedagogic research indicated that student attention evolves in waves, with drops every 10-18 minutes[1]. Today, where students can always connect to the Internet through their mobile phone, they are easily distracted by social media, online games and other notifications. This results in significant changes in student behavior: A recent study has shown that the average human attention span has dropped from 12 to 8 seconds since 2000[2].

How can teachers deal with these effects? Would students be more attentive if pedagogical approaches were more student-centered, like peer-to-peer learning, flipped classroom or problem based educational approaches? Or are there other extrinsic means to increase students' attention? Students are

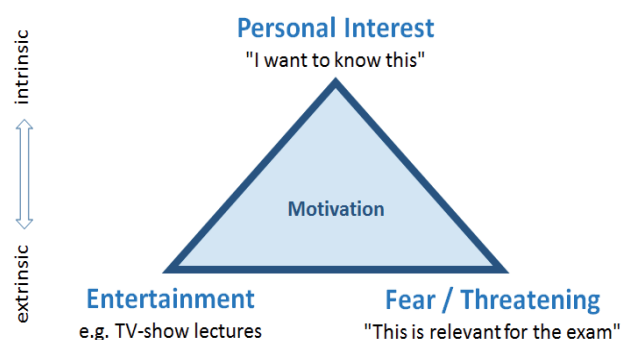


Fig. 1. Motivational factors for student attention

motivated in three different ways: personal interest, entertainment, and motivated by fear of an event happening, as is shown in Figure 1. Personal interest is an intrinsic type of motivation where the student is motivated from within, whether it stems from curiosity or other factors. Students can also be motivated by what can be called “entertainment”, in which there is someone or something else that causes the motivation. Examples of these could range from a video or TV-show to a lecturer that appeals to the student. Finally, fear can be a great motivating factor. In the student case, fear of failing a class can serve as a motivator to learn materials and achieve a high grade.

This paper presents an overview of ideas and best-practice teaching approaches that contribute to higher students' attention during lecture. It is a first result of Project

SmartTeaching, an international research project that aims at collecting, analyzing, and disseminating innovative, inspiring teaching methods.

Project SmartTeaching was brought into life when three lecturers met at the EDUCON conference in Abu Dhabi in April 2016 and shared their teaching experiences and tips to increase students' concentration during lecture. Some of these ideas were related to their field of teaching (engineering education), while others were rather general, like offering chocolate to students whenever they ask or answer a question. As a result of the discussion, the idea for this project emerged, and the authors decided to start with a study of methods that might improve students' attention. The results of this study, which are reported here, are based on literature research and on a survey that was sent to lecturers in several countries, and that collected innovative ideas for increasing students' attention.

II. RELATED WORK

Keeping the attention of students in class has long been an ever developing concept within the field of education. In order to counter this issue in classrooms, educators have developed various methods of teaching to ensure that students are not only paying attention during class time, but also learning the course materials.

First note that measuring students' attention is a non-trivial task: it requires a protocol or methodology to provide an objective evaluation. Existing approaches are either based on students' self-report [3] or on trained observers attending lessons[4], both assessing students' engagement (motivation, behavior, cognitive) based on predefined criteria. The main drawback of students' self report methodology is the influence of the student-teacher relationship, while the second type of measurement requires additional resources (the observers) to be implemented.

We now report existing approaches to increase students' attention. The University of Iowa has converted an "Introduction to Environmental Science" course from a normal traditional lecture to an interactive classroom with tasks assigned to small groups of students, online quizzes, and reducing the amount of time the professor gave a lecture by $\frac{1}{3}$. This led to increased student participation and higher engagement with the course materials. In addition, students reported they are more likely to take more courses in environmental science[5].

After attending a course on "Teaching Strategies for Millennial Generation Students", two faculties at Ohio State University decided in 2013 to change the way their course is structured for Doctor of Pharmacy students. Instead of a traditional lecture based class, they incorporated interactive learning activities with group work, gaming, and direct application to their future lives as Pharmacists. As a result there was a significant improvement in many areas, including students earning overall higher grades than previous classes, students happiness with interactive teaching methodology, students giving more positive and higher evaluation of teaching faculty, and overall increased level of student comfort in prescribing medicines to patients in the future[6].

A study conducted at the University of British Columbia, which measured student attentiveness in watching a video taped lecture. It showed that as time went on during the lecture, students paid less and less attention and would fidget more and more[7].

When teaching students at a university, it is important to keep in mind the average age of these students and how they learn. Most university students would be classified as part of the Millennial Generation, born between 1980 and 1994[8, 9]. They have been exposed to computers most if not all of their life, and prefer an interactive method for learning[10]. In a focus group conducted on an American college campus among undergraduate students, more than 50% of students agreed that they wanted "hands on" and "interactive" activities as their preferred method of learning in the classroom and more than 75% wanted what they learned in the classroom to have a direct correlation with the real world[11].

Closely related to student attention is the issue of boredom during class time. It is very clear that if students are bored due to the way material is presented, their attention span will be low. In a focus group of 211 university students in a university in the UK, more than 50% of the students find their lectures boring more than half the time, with the majority of students attributing boredom in lecture to presentation style of the lecturer, particularly PowerPoint slides[12]. A study at the University of Houston echoes the sentiment that non-interactive lecture style can result in boredom and as a result, poor grades[13].

III. DATA AGGREGATION

The authors had a strong interest in how lecturers in different areas of the world motivated their students. A survey was developed to collect existing means, ideas, and teaching approaches that can contribute to higher students' attention during lecture. The main question of the survey is "How do you activate/motivate your students?" where lecturers from universities can describe their ideas and experiences. In addition, extended information about the answering lecturers is aggregated, including: their teaching experience, average classroom size, preferred teaching methods, demographic data, etc. This data will enable us to analyze, for instance, correlations between teaching style and age of the lecturer, classroom size and typical attention duration, etc.

In August 2016, invitations to participate in the survey were sent by email to approximately 250 lecturers in France, Switzerland, the United Arab Emirates. The countries of France, Switzerland, and the United Arab Emirates were chosen because these are the countries in which each of the three authors live. In addition, it was published in social media, allowing any person who teaches at university level to participate. Until October 2016, the survey received 75 replies.

Most replies came from Switzerland (40%), France (28%) and the UAE (16%), while Canada, Germany, Greece, Serbia, Spain, Tunisia, Uruguay, and USA each contributed less than 5%. Almost twice as many men as women participated. Most of the participants are between 35-45 years old and between 45-55 years old (both 28%), and over 50% of the participants

have more than 10 years of teaching experience. It turns out that even young lecturers (<35 years old) already have at least 3-5 years of teaching experience. Typical class sizes range

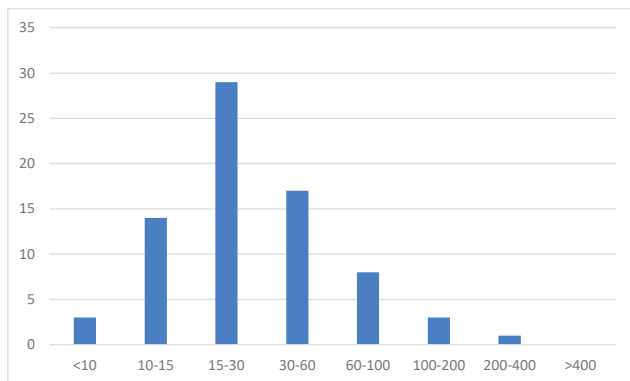


Fig. 2. Number of students per class

from 15 to 60 students, while classes with more than 100 students are extremely rare (cf. Figure 2).

Participants were also asked to estimate student attention time during a 45 minute lecture. The results are shown in Table I. The data on classroom size and estimated students' attention duration indicates that the participants of the survey observe higher student attention in smaller classes. No obvious correlation could be made between student attention time during a 45 minute lecture and teaching approach, or teaching experience.

TABLE I. TYPICAL ATTENTION TIME OF STUDENTS PER LECTURE (45 MINUTES), ACCORDING TO SURVEY PARTICIPANTS

Attention Time (in Minutes)	Number of Replies	Percentage
0-10	9	12%
10-20	16	21%
20-30	36	48%
30-40	8	11%
40-45	2	3%
no answer	4	5%

IV. CATEGORIZATION OF APPROACHES FOR HIGHER STUDENT ATTENTION

This section presents the three main categories of educational approaches, which are used to increase students' attention during a lecture. This classification is based on literature research and analysis of the survey replies. The three categories are: *established teaching methods*, *unconventional extrinsic methods*, and *tools*.

A. Established Teaching Methods

There exist various teaching methods that are recognized for their impact on student attention. Obvious examples are all kinds of methods that force the students to act by themselves, instead of listening to the lecturer: asking questions to the students, discussions in small groups or in class, role playing, or in-class exercises. This category includes, among many others, the following methods:

- **Peer Instruction:** Eric Mazur introduced this method in the 1990's, where students are explaining part of the study matter to other students. This method should yield a better understanding of the study matter, since students have to reflect and explain, instead of only listening to the lecturer. Peer instruction is often combined with Flipped Classroom and ConcepTests[14, 15].
- **Flipped Classroom:** In this teaching method (also called "inverted classroom"), lecture and homework are "flipped": first, students prepare the topic of the next lecture at home, e.g. by reading part of a text book, watching e-lectures, or working with e-learning-modules. Then, in the lecture, students work with the teacher to clarify open questions, discuss the topic and solve exercises[16, 17].
- **ConcepTests:** ConcepTests are multiple-choice questions that focus on a single concept. Answering a ConcepTest does not require any calculations or formulas, but a good understanding of the underlying concepts. They are of intermediate difficulty and are often combined with Peer Instructions[15].
- **Problem Based Learning:** In Problem Based Learning (PBL), students tackle open-ended problems from real life that are relevant for the study matter. During the process of solving the problem, they learn new technologies and aggregate knowledge about the study matter[18].
- **World Café:** In a World Café, students are seated in small groups around several tables. Each table represents a certain aspect or perspective of the learning matter. After a certain time, students move on to the next table, thus allowing them to tackle the topic from various perspectives. World Café is an efficient method for interactive discussions even in large classes[19].

B. Unconventional Extrinsic Methods

Our survey showed that lecturers apply various unconventional methods to increase students' attention. These approaches are not directly known as learning methods. These techniques include, among other things, changes to the classroom environment, the teacher's behavior, or students' rewards and penalties. We will present and discuss these methods in more detail in Section 5.

C. Tools

In addition to alternative teaching methods, lecturers from the survey utilize several tools and devices to enrich their lecture. Most of these tools are digital and support communication between students and lecturer. One example are new tools for presentations such as Prezi¹ or Dizm², which allow for more flexibility than classical slideshows. Others tools support feedback from students to lecturers (easypolls³, Google Forms⁴, or Socrative⁵), or they allow for online games and quizzes (Moodle⁶, Kahoot⁷).

V. EXAMPLES OF UNCONVENTIONAL EXTRINSIC METHODS

In this section we describe various approaches and best-practices that were suggested in the survey. For most of them, there is no evidence available whether the approach works or not. For this reason, we leave the assessment of the practicability and effectiveness of the suggested methods to the reader.

A. Classroom Environment

Building an appropriate environment in the classroom can contribute to facilitate students' collaboration and interaction. While some of the following ideas appear rather trivial, they may help in certain settings.

- Ensure there is enough oxygen by opening a window (1 reply).
- Arrange seats and tables such that interaction between students and lecturer is supported (1 reply).
- Some participants reported that making the students move (getting up, walking in the classroom, teaching from the back of the classroom) contributes to higher student attention (3 replies). Research studies from neurosciences on brain trauma appear to support this approach, since it showed that physical activities are correlated with increased brain cell production[20].
- A special case of student movement is spontaneous discussions, where students walk in the classroom, and upon stopping they have to discuss with the first student they meet about a certain topic (7 replies).
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B. Behavior of the Lecturer

The lecturer as a person can have a strong influence on the attention of his/her students. In fact, many ideas in the survey aim at the behavior of the lecturer, and how he/she interacts with the students:

- The lecturer can speak louder or speak quieter during class time. If a professor is naturally a loud speaker, speaking quieter will command the attention of students, and vice versa (5 replies).
- Several participants of the survey reported that mentioning any advice about the exam will immediately focus the students' attention to what is being said. A similar effect seems to occur if the lecturer says "this is important" (4 replies).
- A powerful rhetorical means is to be silent for, say, 60 seconds. Supposedly, Cicero, one of the great Roman orators and politicians, used pauses to create tension and to emphasize important messages. More recently, the significance of pauses have been investigated primarily in the context of synthesized speech. For an overview of typical variants of this technique, see <http://sixminutes.dlugan.com/pause-speech> [21].
- In general, there exist various ideas how the lecturer can surprise the audience: make a joke, say something totally unexpected, throw a piece of chalk, abruptly change topic, make a mistake (on purpose), etc.

C. Interaction between Students and Lecturer

Activating/motivating students by interaction and questions have long-since been a successful means for higher attention. Unsurprisingly, many methods from the survey are centered on this concept. We present here some of the most interesting ideas:

- A lecturer from Switzerland describes his teaching approach to be "a very asking based one", meaning that he often asks questions to the students. Due to the high frequency of questions, the students "know after the first class" that they always have to expect a question from him, keeping tension high.
- One lecturer uses post-it's on a whiteboard to collect open questions of the students in a brainstorming session, and then answer these questions to close gaps in know-how and understanding. She notes that the anonymous process and the physical activity helps to motivate the students to participate actively.
- In the "Cephalonia method", the idea is to give each of the students a card, with each card containing unique images and prepared questions. The instructor will go through a slideshow that contains the pictures. When the slideshow displays each picture, the student who is holding the card with the picture displayed on the slide will then read out loud the question that is on the card. The instructor will then explain the answer of this question with another slide. This method is common in library orientations and not only forces students to participate in the class, but also intends to make the class more vivid[22, 23].

1 <https://prezi.com>

2 <https://www.dizmo.com/>

3 <https://www.easypolls.net>

4 <https://docs.google.com/forms>

5 <http://www.socrative.com>

6 <https://moodle.org>

7 <https://kahoot.it/>

D. Challenging and rewarding the students

Reward is a well-known means in psychology to facilitate learning, and has been proposed, for instance, by Lev Vygotsky, a Soviet psychologist who is the founder of cultural-historical psychology, and by Jean Piaget, a Swiss psychologist who is known for his work in children development. In the survey, some lecturers revealed very extrinsic methods to increase student attention which are either based on reward or challenge:

- One lecturer used a cake recipe to help the students apply some of their obvious competencies from one field to new one. Students had to answer questions about the cake recipe and write down the cognitive procedure that allowed them to perform the task. Then they had to apply the cognitive process to another field relative to their syllabus. The students were so surprised they did not make the bond, and this extrinsic means did not convince them. But it was a playful way to establish a nice atmosphere in the classroom.
- One lecturer holds a two-minute break after twenty minutes of lecture time, during which each student has to speak to her/his neighbor. They have to identify together the important message of the last 20 minutes of lecture, or something they didn't understand. The teacher picks some students as actors for role playing, to illustrate opposite conceptions of a controversial point.
- One lecturer throws chocolate candies in class to any student who answers her questions or any student who poses a very interesting question.

VI. CONCLUSION

Constant student attention is a recurring topic in didactics, and many lecturers struggle to keep it high during a 45 minutes lecture. We have presented an overview of classical and innovative ideas and methods that can help to keep attention level high. The results were aggregated from literature research as well as an international survey among university lecturers.

The results presented in this paper are part of a research project that aims to collect inspiring and innovative ideas for teaching at the university level. All results are available at <http://dreamboxx.com/SmartTeaching>

One question that has not been answered yet is whether the suggested methods really work and increase student attention. While this seems obvious for some of the methods (e.g. direct interaction with the students), effectiveness of others is not that evident and difficult to measure. Hence, additional research is required in both educational approaches to increase students' attention and its measure in the future.

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