The EuroCALL Review
Volume 31, No. 1, 2024, 43-50
ISSN: 1695-2618
https://doi.org/10.4995/eurocall.2024.16747

REFLECTIVE PRACTICE PAPER

Using TED talks to improve engineering students' oral skills

Antonio Daniel Juan Rubio
Universidad de Granada, Spain

daniel.juan@ugr.es

How to cite this article:

Juan Rubio, A.D. (2024). Using Ted talks to improve oral skills for engineering students. *The EuroCALL Review, 31*(1), 43-50. https://doi.org/10.4995/eurocall.2024.16747

Abstract

This paper deals with the training of undergraduate engineering students and is interdisciplinary in nature. It brings together three distinct aspects of scientific dissemination: the content of an engineering degree; the oral transmission of this content following the effective TED talks model; and the use English as a medium of scientific transmission. The paper highlights the need for trainee Spanish engineers to be able to communicate their work to the public through oral presentations that are brief and entertaining, yet scientifically rigorous. The core of the study consists of an analysis of a particular TED talk that is relevant for a variety of engineering degrees. We conclude that while it is necessary for Spanish engineers to receive specific training at a professional level in oral communication skills, there is a close relationship between the mode of transmission and the subject specific content to be transmitted that needs to be considered carefully. Developing a mastery of English is important, but essential communication skills are the most crucial aspect, regardless of the language of communication.

Keywords

Engineering students; oral skills; scientific content; Technical English; Ted talks

1. Introduction

In recent years, TED talks have been used as teaching materials in various fields of education. Oral presentations have been gaining importance as an academic genre, especially for English language students, and in academic and work settings. This occurs even in countries where English is not spoken by the majority, or even taught in their schools. The skills that a person obtains from delivering oral presentations are very important to their educational, work and even social environments. The TED Talks platform allows you to choose from a wide range of topics that can serve multiple purposes. For example, students of technical subjects can learn the latest news about science and technology, or medical students can complement their studies with talks about advances in their field, or indeed about the lack of progress being made in some developing countries in terms of medicine and health.

This paper addresses issues related to oral communication strategies from an engineer's rather than a linguist's perspective and it focuses on the effective transmission of knowledge to the general public. It analyses a talk from a TED conference related to engineering, one that is particularly relevant to Engineering in Industrial Electronics and Automation, and other related degrees. The methodology followed is like that of textual analysis, with a step-by-step breakdown of form and content, intended for the engineer. It seeks to encourage the engineering student to set aside their formulas and tables and develop their ability to effectively communicate their findings and research to the general public. This also serves to open up discussions about the potential for engineers in Spanish Universities to give talks in the TED format in their own language, in parallel with English versions.

2. The use of TED Talks to teach Technical English

TED is a non-profit organization dedicated to the dissemination of ideas through short talks. Its speakers are drawn from all disciplines and cultures and those seeking a deeper understanding of the world. The talks are based on the belief that the power of ideas can change people's attitudes, lives and, consequently, the world. This global community emerged as a conference where Technology, Entertainment and Design (TED) converged, and today it covers most topics, such as science, business and global problems. The talks are translated by specialised translators on a voluntary basis into more than 100 languages, and through events held throughout the world. It has become a social phenomenon in recent years. Numerous publications have studied the importance of TED talks in educational settings (Education 3.0, 2018). Thanks to the translations, TED talks can be used as a method to learn English and other languages.

At university level, oral presentations can feature in both the English for General Purposes (EGP) classroom, and the English for Specific Purposes (ESP)/ English for Academic Purposes (EAP) classroom (Chang, and Huang, 2015, 30). In engineering degrees in particular, the oral presentation techniques that are used are based on a professional/ academic approach, with a focus on Technical English. This subject is taught in the various engineering degrees, and the presentations deal with the knowledge acquired during the degree, becoming familiar with technical vocabulary in English, and learning to develop fluency in terms of oral presentations in English. It is always difficult to present in front of an audience, even if it is only a teacher and classmates, doing this in a language other than the mother tongue raises the level of difficulty in a way that helps to train students more intensively in their academic field.

Hayward (2017) highlights a number of important considerations regarding the structure of a TED talk. She mentions a TED talk by Nancy Duarte, a consultant in oral presentations, who explores the structure of great historical talks in depth. She points out that certain people have changed the world through their speeches, but that they might not have succeeded had they not been able to communicate their ideas well. Duarte states the following, "if you communicate an idea in a way that resonates, change will happen, and you can change the world" (2011). An idea is only an idea until it is communicated to other people, and the most effective way to convey an idea is through stories.

There are many possible structures when it comes to telling a story in an oral presentation. Aristotle, for example, followed a structure with three acts: beginning, body, and end. Gustav Freytag, a German playwright, presented his stories in a five-act structure: exposition, increase in action, climax, decrease in action and outcome. Duarte, having studied these structures for years, linked two of the greatest talks in history, i.e. those of Martin Luther King and Steve Jobs on the launch of the first iPhone in 2007. Even Abraham Lincoln's Gettysburg Address follows this same form. The basis that Duarte proposes consists of presenting the problem as it is, explaining what the situation is and what is happening and, from there, comparing that situation with what it could be, i.e. a proposed solution. The bigger the gap between what is happening and what could be, the stronger the belief in the idea that is proposed. It is simply another valid structure for presenting a story to an audience.

Therefore, although TED talks may seem unstructured to the inexperienced eye, they tend to follow a specific and persuasive format that highlights a passion for a specific topic (Romanelli et. Al., 2014), this explains much of their success to date. With this common structure, it is possible to attract the wider public, focusing attention on the speaker and their presentation topic. The structure will always have an engaging story, with images and multimedia elements supporting the oral presentation. Furthermore, the interaction between verbal and visual elements highlights the interrelation of invention and organisation in contemporary public discourse, trying to achieve a perfect mix between improvisation and order. Thus, multimedia elements become a fundamental tool for developing a relationship between the speaker and the audience, fostering personal connections between both parties.

A TED talk, despite its innovation and the bond it creates between the parties, is ultimately a formal talk by a speaker in front of an audience that does not actively participate in the presentation. There is no interaction or discussion, but this one-way communication does not prevent the personal connections mentioned above. Therefore, it can be said that those responsible for student learning and education should attend these types of events, to learn how to communicate effectively and transmit information effectively.

3. TED Talk analysis

3.1. Analysis characteristics

We will now carry out an in-depth analysis of one specific talk. This talk has been chosen because of its relationship with the content of the Degree in Industrial Electronic and Automatic Engineering, although it is also relevant to the content of other industrial engineering programmes, such as the Degree in Mechanical Engineering. We will consider various characteristics such as the content of the talk, the expression and communication strategy of the speaker, and the effectiveness of the communication. This has been done within the context of the twin objective of highlighting the importance of oral scientific-technical dissemination, and the need to use English as a language of international communication, and a common lingua franca in the field of engineering. In this way, it can be said that the how matters as much as the what; the medium and the message come together to make science and technology accessible, without losing rigour when communicating with a general audience.

3.2. Miguel Nicolelis: A monkey that controls a robot with its thoughts

This talk by the neuroscientist Miguel Nicolelis, which was delivered in 2012, covers a large amount of content studied in the Degree in Automatic and Industrial Electronic Engineering. It shows how in 2003, a monkey was able to control a robotic arm without using his body to do so, only his mind. Through various tests, the movements that Aurora (the monkey) performed with a joystick, pursuing a target on a screen, were analysed so that, a robotic arm could be used to pursue the same target under the monkey's control, but with a different sequence. This was made possible thanks to an interface that transformed Aurora's thoughts into movement. By feeling the texture of an object, an electrical message was sent directly to the brain, to associate the target with a reward. A few years later, another monkey, who was made to walk on a treadmill in the east coast

of the United States, was able to control a humanoid robot that was in Japan, thousands of kilometres away.

All of this was possible thanks to an in-depth study of the brain and the behaviour of the thousands of neurons it has. These thousands of neurons carrying messages sent by the brain were analysed by means of sensors, to try to decipher them between the time they leave the brain and the point where they reach a limb to perform a movement, roughly 0.5 seconds. Therefore, the same message could also be translated into a digital language and sent to an external device that reproduces the movement ordered by the brain.

The knowledge presented by the speaker has a clear purpose, to solve one of the biggest neurological problems suffered by millions of people around the world. These are people with a spinal cord injury who have lost the ability to move their limbs. It is estimated that each year, in the United States alone, there are 17,500 new cases of injuries of this type (NSCISC, 2017). Although the brain continues to send signals and codes for movement, this injury prevents those signals from reaching the muscles. The idea is to create a bridge using an exoskeleton, and for the brain to incorporate this new element as its new body, with which movements such as walking can be performed again.

This talk featured a very specific vocabulary, which is relevant for the Degree in Industrial Electronic and Automatic Engineering. It included a large number of technical words, since it described a complex experiment that required a high degree of specialisation. Two great fields, medicine and engineering, converge in this talk and terms are used from both fields, that should be known beforehand in order to understand the presentation:

i. Robotic arm: An instrument widely used in the field of robotics. George Devol invented the first prototype in 1954 and since then it has been widely used in industry.

ii. Humanoid robot: Also from the field of robotics, this term refers to one of the forms that a robot can acquire when manufactured.

iii. Interface: This term belongs to the field of computer science; it describes an implement that is capable of transforming the signals generated by one device into signals that can be understood by another.

iv. Computational body: These terms are related to a virtual identity that a computer user chooses to represent themselves in a different application.

v. Bypass: This term describes a deviation that is made in a circuit to overcome an interruption or an obstacle.

vi. Consortium: In the field of economics, this represents an economic association of companies with common interests who seek to develop a joint activity.

vii. Exoskeleton: This term comes from the field of science, specifically zoology, and it refers to a hard and rigid organic tissue that externally covers the body of arthropods and other invertebrates.

Robotised Systems is the subject of the Degree in Industrial and Automatic Engineering that is most related to this talk. Taken in the third year, the course provides an introduction to robotics in general, including the language used for programming, and the type of robot that is needed in each industry. For an experiment of this type, it is necessary to know the language used to generate both the movements of the robotic arm and the humanoid robot. The limitations that each one has in terms of speed, movement execution times and other characteristics that are the basis for the rest of the project must also have been studied previously.

Throughout the project, sensors and devices are used to measure all the necessary parameters to be obtained from the monkey. Biomedical Engineering is taught in the last year of the degree, it covers many of the devices used in this project, such as those

related to heart rate and general data collection from a patient. Also, the placement of the sensors in the corresponding part of the body or the deduction of false positives are particularly relevant aspects of this subject.

The importance of Technical English as a subject is once again highlighted, both regarding the execution of this analysis, as well as communication between the entities involved in the project. The United States, Brazil and some European countries involved in the project use different languages, English is the common link that allowed them to carry out the project.

Regarding its social aspect, the presentation mostly consists of a showcase to attract the listener with a novel and interesting narrative. However, in the final minute, Nicolelis reveals the reasons why the study was carried out. The first reason is social-scientific. It is about putting at the service of the population, all of the data obtained from research on the incredible properties of the brain, something which is is indisputable having watched the talk. This research can serve as the basis for many subsequent studies in the field of medicine to continue obtaining information on the most complex organ of the primate body.

The second reason has a clearly social purpose. Thanks to all the knowledge acquired through these tests, a door is opened to restoring mobility to people who have lost the ability to perform any type of action with their limbs. These people have lost the ability to translate the electrical storms that their moving brain continues to generate for their body. From this arises the need to create a bypass, a bridge that surpasses the barrier created by an injury produced in the spinal cord, and that prevents the messages carried by neurons from reaching the rest of the body. The final idea consists of creating an exoskeleton with which people can regain lost mobility by means of an artificial suit, which would become their new body. This would be a great advance in the quality of life of people, since it would circumvent a medical problem for which there is currently no solution.

Regarding expression and communication, the presentation by the neuroscientist Miguel Nicolelis publicises the various tests that he carried out with his team in 2000. Nicolelis begins with an introduction about the brain, which is the main topic of the talk, showing an image and an audio about it. In the presentation, the first essay begins by showing an image in which the interface created 12 years ago is schematically represented. Through the brain-machine interface, the messages carried from the brain by the neurons are received in order to decipher a message between the time it leaves the brain and the point where it reaches a limb to carry out movement. In the first part of the trial, a monkey, Aurora, was used as a patient, who had to move a cursor on a screen with a joystick for the purpose of passing through white circles that were considered the target. The monkey carried out this action because it was subsequently rewarded with a drop of orange juice each time it crossed the target with the cursor. This initial experiment was the prelude to Aurora being able to move the cursor solely by thought. The monkey's thoughts were sent to a robotic arm, which then moved the cursor. This was the first time that a complete release of the orders of the brain to an external element had happened, without the interference of the body.

From this experiment they realised that a robotic arm was not necessary to carry out these types of tests. So, a few years later, they created a virtual arm, an avatar, for the monkey to interact with and assume the first-person perspective of the said avatar. Thus, the brain activity coming from the monkey could be used to control the movements of the avatar. For 4 weeks the animals were trained so that they could master this virtual body. The first part of Nicolelis' second essay consisted of showing three visually identical objects, but with different textures. Thus, when the avatar touched the object, a signal would be sent directly to the monkey's brain, and the monkey would have to discern whether or not it was the target, as it changed position. As in the previous experiment, the monkey gets a reward for hitting the target.

A third experiment pushed all the previous research to the limit. An animal walking on a treadmill at a US university was able to control a humanoid robot that was thousands of

miles away in Japan. The brain activity generated by the monkey when walking on the treadmill was sent from Duke to Kyoto to generate movements in the robot, which was 6 times its size. The monkey could see the robot that was in the other part of the world through a camera, and it would get a reward again after correctly performing the test, although this time it was because of each correct step that he performed. Nicolelis ends the presentation by commenting on the advantages that this study can have for people who have lost the ability to move their body. By creating an exoskeleton that overcomes the barrier created in the spinal cord, it would be possible to restore mobility to these people. This seemed like a utopia a few years ago, but now it's certainly closer.

Nicolelis begins his talk by describing what his team's goal is, i.e. to see and measure brainstorming. This goal can be quite difficult for audiences to understand as it is an abstract concept. However, Dr Nicolelis allows listeners through the use of slides, recordings and videos to gain a greater degree of understanding about his project. He begins his presentation by showing a slide in which the record of brain cells can be observed and later, reproducing a recording in which an electrical storm of neurons can be heard. Once he has explained what the objective of his work is, he begins to show its practical application. To do this, he shows a video in which a primate is observed playing a video game. Nicolelis explains how he and his team recorded the brainstorms that developed in the primate brain, and how they sent them to a robotic arm so that it was capable of replicating the movements made by the primate. The idea was that the primate was able to play with its thoughts alone. Doctor Nicolelis shows through a video how this goal had been achieved 10 years previously.

Later, Nicolelis explains how in 2011 they realised that a robotic device was not necessary to achieve the stated objective. In order to eliminate the robotic device, they created a computational body, an avatar. To show how it works and how the primate is able to develop a new sensory pathway, the speaker showed a slide in the form of a diagram that allows the public, once again, to clearly visualise the complicated processes explained during the session.

Finally, it is necessary to show the medical issue which motivated this investigation in the first place, i.e. problems that affect the spinal cord and that make it impossible to carry out motor functions in the extremities. This slide is intended to address the root problem, graphically explaining the importance of the study.

4. Discussion

In this paper we have tried to demonstrate how TED talks, when used in an effective way, help to improve the oral skills of technical engineering students, without neglecting other skills. We have mainly focused on the fostering of oral skills since these have traditionally been neglected or ignored in foreign language teaching. The use of TED talks has allowed us to choose from a varied and comprehensive set of topics in order to model good oral presentation skills. Consequently, the proficiency that students obtain from emulating these oral presentations will help them develop certain strategies that will be useful in their academic life, workplace, or social environment later on.

The scope of the paper has thus moved away from the purely philological aspects of oral communication strategies (effective expression), to include technological considerations, whereby students have learnt about science, language and communication at the same time. The TED talk analysed focused on the field of engineering in terms of content, but it fits within a philological framework in which both language and content are interrelated.

What we have attempted to demonstrate is how engineering students can improve their oral skills in a foreign language, mainly English, via the transmission of technical content related to their area of expertise. By doing so, they learn to explain their specific findings or research in an adequate communicative way in a foreign language.

As TED talks have exponentially grown in importance in recent years, they have been incorporated effectively and for a variety of purposes into the teaching methods used in the foreign language classroom. The TED talk analysed in this paper was chosen for its

technological content on the one hand, and its potential to foster oral skills in technical English presentations on the other. Not only do engineering students need to be acquainted with the technical vocabulary in English, they also need to be fluent in terms of giving oral presentations in English. Although TED Talks may seem unstructured at first sight, linguistically speaking they follow a specific and persuasive format that reveals an interest in the topic being discussed. Students have also seen how the presence of multimedia elements in these oral presentations attracts the listeners' attention and interest to a greater extent.

Consequently, we have focused not only on the specialised content of the talk itself, but also on the use of verbal and non-verbal communication strategies on the part of the students. Our ultimate goal was to keep in mind the twin objective of highlighting the importance of oral scientific technical dissemination, as well as the need to use English properly in effective communication in order to develop oral skills in a foreign language.

As a final reflection, we can affirm without hesitation that TED Talks are a perfect example of inspirational videos where the speaker shares their own experience and knowledge with both specialised and non-specialised audiences. In our specific case, we selected a talk focused on scientific dissemination which can serve as an inspiration and a motivating factor to our engineering students. As a result, the use of the TED talk can improve the oral skills of engineering students since they had to use correct intonation and stress, accurate grammatical structures, and appropriate terminology. Most importantly, students were able to maintain a fluent conversation in English without hesitation or undue pauses, and they were able to organise their ideas clearly during interactive communication in English.

5. Conclusions

Various conclusions can be drawn from the foregoing discussion. Regarding content, the vocabulary used by the speaker is very specific, aimed at an audience that must have a medium level of scientific knowledge regarding the presentation topic. In this regard, the talk is fully relevant to the content of the Degree in Industrial Electronics and Automatic Engineering, but especially the aspect of acquiring competence in Technical English. Nowadays, an engineer must be able to master all the facets of their area of knowledge. In this sense, the TED talk highlights the extent to which knowledge acquired in the various content elements of the degree can and should be used in the service of effective communication.

The TED talk chosen for analysis had a strong social aspect, i.e. using science to improve quality of life. This is something that a professional engineer should not lose sight of: the why or what of any project, beyond the immediate technical considerations. Regarding expression and communication, it can be concluded that the speaker delivers his presentation in a personal way that complies with the TED conference format: pleasant talks, with multiple images and videos leading to a great visual impact; personal references; closeness to the public; multiple non-verbal techniques (repetition, changes in the tone of voice, eye contact, rhetorical questions, humour, body language, etc.). A great capacity for synthesis is also demonstrated, as well as an undoubted ability to transmit complex concepts in a language accessible to the average citizen.

Returning, then, to the main objective of our paper as stated in the introduction, we have tried not only to verify the need for the Spanish engineering student to receive specific training in professional oral communication within university classrooms but, additionally, the close interrelation between the medium for transmitting knowledge (language) and the knowledge to be transmitted (content).

References

Altbach, P. G. (2007). The imperial tongue: English as the dominating academic language. *Economic and political Weekly*, 3608-3611.

Bürckstümmer, H. (2017). A printable, flexible, organic solar cell, https://www.ted.com/talks/hannah_burckstummer_a_printable_flexible_organic_solar_cell

Chang, Y. J., & Huang, H. T. (2015). Exploring TED talks as a pedagogical resource for oral presentations: A corpus-based move analysis. *English Teaching & Learning, 39(*4), 29-62. https://doi.org/10.6330/ETL.2015.39.4.02

Duarte, N. (2011). The secret structure of great talks. https://www.ted.com/talks/nancy_duarte_the_secret_structure_of_great_talks

Educación 3.0, https://www.educaciontrespuntocero.com/recursos/charlas-ted-inspiradoras-para-poner-en-clase/32869.html

Endicott, J. (1999). A strong template identity creates powerful impressions. *Presentations*, *13*(8), 28-29.

Eurostat, (2018). https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Renewable_energy_statistics/es#Estad.C3.ADsticas_de_energ.C3.ADa_renovable

Hachach-Haram, N. (2017). How augmented reality could change the future of surgery. https://www.ted.com/talks/nadine_hachach_haram_how_augmented_reality_could_change_the_future_of_surgery

Hayward, P.A. (2017). Incorporating TED Talk assignments into a public-speaking course. *Communication Teacher 31(*4), 239-244.

Katz, D. (2017). The surprising solution to ocean plastic. https://www.ted.com/talks/david_katz_the_surprising_solution_to_ocean_plastic

Kress, G. (2009). *Multimodality: A social semiotic approach to contemporary communication*. Routledge.

LeBlanc, A. (2015). Artificial Intelligence and the future. https://www.youtube.com/watch?v=xH_B5xh42xc

Nicolelis, M. (2012). A monkey that controls a robot with its thoughts. No, really. https://www.ted.com/talks/miguel_nicolelis_a_monkey_that_controls_a_robot_with_its_thoughts_no_really

Robinson, K. (2006). Do schools kill creativity? https://www.ted.com/talks/sir_ken_robinson_do_schools_kill_creativity?

Romanelli, F., Cain, J., & McNamara, P. J. (2014). Should TED talks be teaching us something? *American journal of pharmaceutical education*, *78*(6), 113.

Rossiter, J. (2016). A robot that eats pollution. https://www.ted.com/talks/jonathan_rossiter_a_robot_that_eats_pollution

Shah, P. (2017). How AI is making it easier to diagnose disease. https://www.ted.com/talks/pratik_shah_how_ai_is_making_it_easier_to_diagnose_disease

Shen, S., Mulgaonkar, Y., Michael, N., & Kumar, V. (2013, June). Vision-Based State Estimation and Trajectory Control Towards High-Speed Flight with a Quadrotor. In *Robotics: Science and Systems* (Vol. 1).