

# Visual Rhetoric Enhancing Students' Ability to Communicate Effectively\*

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*According to ABET (Engineering Accreditation Commission), engineering programs are required to train the students 'to communicate effectively'. This echoes the increasingly heard call from companies to deliver students with excellent communication skills. Unfortunately, this does not provide an answer to two important questions. First, what is understood by communicating effectively? Secondly, what are the implications of this requirement for the classroom practice of the majority of engineering courses, which do not explicitly incorporate communication skills? According to the authors, the first question can be answered by referring to the rhetorical definition of effectiveness (more specifically the theoretical insights provided by Quintilian) and its relevance for technical communication. According to us, 'communicating effectively' is more an attitude than a highly specific skill to be learned. Furthermore, the second issue can be answered by introducing the idea of the concept of visual rhetoric, which proves to be an ideal tool to focus on audience perception, one of the key rhetorical terms. In accordance with the teaching rationale developed by our colleagues from Antwerp University, which incorporates the strengths of collaborative working, we therefore propose a teaching methodology that can be used in any engineering course that would help students to learn to communicate effectively. After having introduced this teaching methodology in our communication course, we set up a qualitative study of the revision plans written by our students. In conclusion, we can claim that our students have successfully incorporated the 'attitude' of communicating effectively.*

**Keywords:** visual rhetoric; communication training; presentation skills

## ANSWERING THE CALL OF ABET

IN ITS RECENT DOCUMENT of Criteria for Accrediting Engineering Programs, ABET (Engineering Accreditation Commission) states that engineering programs must demonstrate that their students eventually attain eleven outcomes. One of these is 'an ability to communicate effectively' [1], which seems to respond to the increasingly heard call of professional life to deliver students who have excellent communication skills. Nowadays, job advertisements for engineers always seem to include phrases such as 'be a good communicator' in the profile of the potential candidate. Consequently, engineering curricula are obliged to focus on providing training for communication skills for their students.

In continental Europe, where the authors are based, this mainly results in a separate communication course, in which a very traditional teaching approach is being used. Engineering students are being instructed how to spell correctly, how to apply the rules of report writing and they have to give an oral presentation to finalize the course. One might wonder whether this could be understood as teaching students 'to communicate effectively'.

In previous academic years, we tried to counter this approach by designing a course which relied

heavily upon (small) group assignments, hopefully benefiting from the strengths of the communicative approach and collaborative writing.

From a pedagogic perspective, the use of small group work is supported by the communicative approach to language instruction, and its emphasis on providing learners with opportunities to use the language (to talk, to write, to negotiate, . . .) [2]. In addition, we hoped to benefit from the fact that this is a teaching method with which the students are familiar from their earlier education. Moreover, from a constructivist perspective learners should be encouraged to participate in activities that foster interaction and co-construction of knowledge. Within a collaborative writing assignment this can easily be executed, especially if the students are engaged in the acts of explaining and defending their ideas to their peers. Furthermore, working collaboratively reflects the professional writing practices that the students will face in their future working situation [3].

Ultimately, the final quality of the assignments was rather disappointing, which made us question the appropriateness and effectiveness of the teaching rationale. In addition, a survey among our students showed that emphasis on the co-operative learning method did not provoke hostility among students, but it wasn't strongly appreciated either. Moreover, a positive evaluation did not necessarily entail a high mark (see Fig. 1), whereas we had expected that if a student had acknowledged the

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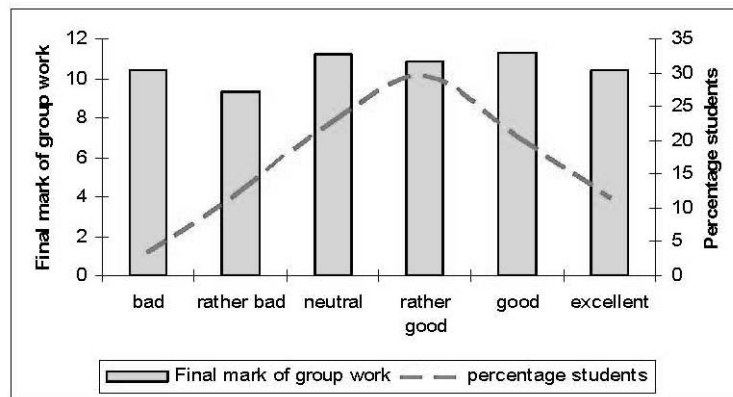


Fig. 1. Positive evaluation of collaborative writing rationale does not necessarily entail high quality of the final task.

validity of the teaching method, he or she would have produced high quality products.

Ultimately, we still acknowledge the necessity and validity of the collaborative writing practice, but our survey showed that this alone cannot be sufficient.

On the other hand, the introduction of these 'stand alone courses' is not the only possible answer to ABET's demand for students who can communicate effectively. One can also see a rise in the number of interdisciplinary courses (for instance cross-course lab sessions) where basic concepts of engineering courses are applied in classroom problem-solving sessions. Finally, the results of the experiments had to be communicated according to the rules learnt in the communication course. [4]

The latter approach is increasingly gaining ground in educational settings. One is convinced that the training of communication skills should not be limited to a separate course, but that there should be an integration of engineering content and communication skills. As most lecturers already ask their engineering students to prepare communicative tasks, such as lab report writing, one might think that this could easily be implemented. Moreover, this might also better meet the demand of ABET criteria.

Unfortunately, this classroom practice still does not address the question of what can be understood as 'communicating effectively'. Neither do we know whether merely asking students to perform communicative tasks can be considered to be the most effective way to train their communication skills. Do they transfer and apply their learned skills to new contexts? (cf. [4])

### WHAT IS 'COMMUNICATING EFFECTIVELY'?

Before we propose a teaching rationale that would successfully incorporate the training of communication skills into engineering courses, we would first like to define the characteristics of a good communicator, which implies a defense of the rhetorical nature of technical communication.

Engineering students are said to disregard communication skills during their training: 'I'm going to be an engineer. I don't need to know how to spell. Besides, I'll always have a secretary.' [5] During a personal conversation, one civil engineer who took an additional economics course after graduating, commented to us on the predominance of strict scientific thinking of most engineers: 'At university, you are trained to think logically. The basis of any engineering course is that 1 and 1 makes 2. But in company life, this is not the case. As you are working with humans, the sum of 1 and 1 could be 3, or 1, or there could even be no sum at all. Therefore, already at university, engineering students should be confronted with the reactions of an audience that, at first, may seem to be non-logical but who are nonetheless more realistic than comments which only check whether 1 and 1 are indeed added up correctly.' [7]

The same concern has also been expressed in academic research. In 2004, Boiarsky already claimed that an engineer must 'analyze the audience, purpose and context for the document in order to determine the focus, content, organization, style and format of the document.' [8] Similarly, Eric Kumpf commented on how engineering students should 'see their role as writers less as presenters of facts, whose responsibility ends at delivering supposedly self-interpreting facts, and more as writers who must interact and prepare the text for another human being to read' [9]. Although Kumpf proposes an ad hoc and therefore debatable set of categories of visual metadiscourse, he still correctly points out that students need an awareness of the audience's needs.

The very specific discourse communities in which engineers operate are now still seen as areas where 'truth' is indifferent to an audience and, consequently, no attention should be paid to the persuasive or rhetorical power of the message. Therefore, it is not that awkward that many engineering communities still depict rhetoric as being redundant. In the days of Ancient Greece the practice of rhetoric was already frowned upon. Ever since, rhetoric has mainly been regarded as the art of persuasion as opposed to philosophy, of

which the only concern would be reason and truth. In modern society, science has taken up this role of philosophy. Clearly, the fact is commonly neglected that science is also governed by strict discursive rules, and the truth displayed by science is as contingent as the subject matter of rhetoric. Freedman and Medway argue that 'science advances not by the inexorable logic of successive revelations of nature but by the persuasion of influential groups; arguments are only locally valid; there are no truths, only assertions with a backing that is not universal but communal.' Therefore, one could argue that 'whenever a case needs to be made that something is true, therein lies a situation ripe for the play of rhetoric.' [10]

Famously, Kenneth Burke revalued rhetoric positively by saying 'Wherever there is persuasion, there is rhetoric. And wherever there is 'meaning' there is persuasion.' [11, p. 172] Therefore, according to him, rhetoric could be defined as 'the use of words by human agents to form attitudes or induce actions in other human agents'. [11, p. 43] 'Effective communication' can thus only be judged by the impact it has on its intended audience. One has to accept that language is 'permeated by qualities whose effects and significance you cannot fully measure and express however strongly you respond to them' [12], and that this uncertainty lies at the heart of communication. A good communicator is able to deal with this uncertainty and has a wide range of communication techniques to choose from and selects the one that best meets both writer's goals and audience's needs.

Training students how to communicate effectively does not imply that one should teach students certain communication techniques such as report writing or the 'art' of oral presentation. Being able to communicate effectively is an attitude rather than a skill, a 'being' rather than a 'knowing'. A preoccupation with how the audience will perceive the message that precedes any other point of interest. But how can this idea be best brought into the classroom practice?

### QUINTILIAN REVISITED

If we define 'communicating effectively' as a rhetorical approach to communication, one has to specify this concept a bit further in order to discover whether the students are indeed capable of communicating effectively. One of the most important thinkers on rhetoric, Quintilian (c. 35–c. 100) provides some useful insights into the rhetorical nature of communication in his *Institutes of Oratory* [13], which could help us further define this attitude of communicating effectively. Quintilian is an interesting source for us because he does not focus on the theory and practice of rhetoric alone. Like us, his main preoccupation is designing a rhetorical pedagogy, or as Kenneth Burke puts it: 'Some theorists may choose to look upon the rhetorician as a very narrow specialist.

On the other hand, since one can be 'eloquent' about anything and everything, there are Quintilian's grounds for widening the scope of rhetoric to make it the center of an entire educational system.' [11, p. 51]

First, Quintilian does not remove content from the practice of communication, which counters the assumption that rhetoric's only concern would be the attempt to spread false information. In the second chapter of Book 6, he acknowledges the persuasive power of correct information, as 'arguments, they generally arise out of the cause and are more numerous on the side that has the greater justice.' (verse 4) On the other hand, 'proofs in our favor, it is true, may make the judge think our cause the better, but impressions on his feelings make him wish it to be the better, and what he wishes he also believes.' (verse 5) Eventually, the ideal orator should focus on the feelings of his audience. 'So true is it that the life and soul of eloquence is shown in the effect produced on the feelings.' (verse 7) These feelings can then be divided into ethos (the orator being a man of good character and pleasing manners) and pathos. The latter term is linked to exciting anger, hatred, fear, envy, or pity, which initially seems to bear no link to professional communication skills. But Quintilian supplies a deeper understanding of the issue by adding that the rhetorical power 'extra excites feelings which are not suggested by it or strengthens such as are suggested.' (verse 24) Pathos should thus be seen as a tool to clarify the message of the orator by strengthening what is suggested.

Secondly, the orator should not only devote his attention to the feelings of the audience in order to convey the message, he should also be moved by feelings. 'That we may be touched ourselves before we begin to touch others.' (verse 28)

Finally, one might ask how exactly our feelings will be affected by this rhetorical power? Quintilian ends his chapter by introducing the concept of 'visiones', which are 'images by which the representations of absent objects are so distinctly represented to the mind that we seem to see them with our eyes and to have them before us.' (verse 29) This of course resembles the well-known adage of communication theory, namely 'showing not telling'.

To conclude, if we take Quintilian's perspective on rhetoric, we can list some important features necessary for an effective orator: a focus on the feelings of the audience, to be a man of good character and pleasing manners, using 'feelings' to strengthen the message, to be moved by his own message, and finally, being able to conceive images that would move the feelings of the audience.

### VISUAL RHETORIC

But how can we train students to become the effective communicators that embody the characteristics proposed by Quintilian? How can engen-

engineering courses, which mostly have no explicit link with communication, incorporate this into their program? To this end, we propose a visual rhetorical approach. Visual rhetoric can be defined as describing how visual images communicate. But does the student's approach to communication change significantly when preferring visuals to words?

According to Charles Kostelnick, we first experience visual messages highly individually, because, 'we see documents before we read them: this initial encounter evokes an aesthetic response but one with immediate practical consequences' [Kostelnick in 9].

Second, visual communication seems to be transparent, but as Kress and Van Leeuwen point out, it is only 'because we know the code already, at least passively—but without knowing what it is we know, without having the means for talking about it as we do when we read an image.' [14] For ages, verbal communication has been preferred to visual communication, and societies have tended 'to develop ways for talking about codes only with respect that are highly valued'. [14] Only in the last decades have we seen a positive reevaluation of the image as a communication tool, for instance in the increasing use of images in scientific handbooks to transfer the message and not merely as an illustration to the words. However, there is still no widely acknowledged elaborate theoretical framework to discuss visual communication, and therefore audience responses still have to be used to test the communicative effectiveness of visuals.

In a technical report, a graph may be considered to be self-evident, but this is mainly because one can comment on this graph extensively, which will help the reader understand the message of the graph. But in visual communication, one cannot always expect that, for instance, a graph is self-interpreting. The same graph may be used to support different or sometimes even opposing points of view. Therefore, with visual communication, one has to try to be very precise, which inevitably leads to a preoccupation on how an audience will perceive one's message. Accordingly, visual communication, or visual rhetoric to be more precise, could provide us with an excellent tool to train a rhetorical approach to communication. If audience responses cannot be removed from the discussion on visual communication, focusing on visuals could help students understand the rhetorical nature of communication.

### **POWERPOINT AS AN EXAMPLE OF VISUAL RHETORIC?**

Integrating visual communication into an engineering course usually does not offer large structural problems, as we propose a visual rhetorical approach that would make use of a presentation tool such as MS PowerPoint. However, we must

nevertheless acknowledge that strong cases have been made against the use of presentation software such as MS PowerPoint in the classroom.

Famously, Edward Tufte blamed the cognitive style of PowerPoint and its bulleted lists for the crash of the space shuttle Columbia in 2003. [15] But Tufte's comments on PowerPoint slides are correct only if one blindly follows the structure and layout proposed by PowerPoint, e.g. using the dreaded 'terror of the dots'. Moreover, using PowerPoint in this 'traditional' way might immediately provoke negative sentiments among the listeners/readers of the slides. Because we have already stressed the proportional relationship between positive audience response and the effectiveness of visual communication, bullet points are unlikely to be used in the visual rhetorical approach.

Julia Keller, whose ideas are similar to those of Tufte, makes a more interesting point when she describes PowerPoint as teaching its users only to make a point and not to make an argument. [16] From a rhetorical perspective, this is not necessarily an unappealing feature, as long as PowerPoint does not become the sole tool of communication during engineering courses. In addition, PowerPoint boasts some characteristics that show its potential for the training of a visual rhetorical approach.

First, depending on which source you consult, PowerPoint has 250 million copies, with 30 million people creating or delivering a PowerPoint presentation every day [16]. Therefore, PowerPoint has become the business world's and the academic community's primary tool 'for incorporating the imagery, narrative, and self-disclosure that are hallmarks of visual eloquence in an electronically mediated marketplace' [17]. This is a business reality with which students will be confronted in their future careers.

Secondly, most students are already familiar with the basic functions of presentation software, even though they have not yet exploited its full potential, turning PowerPoint into a relatively 'democratic' software program to integrate in an engineering course. Consequently, the transition from the comfortably familiar text margins to the more distressing visual layout should go more smoothly.

Thirdly, recent research by Alley [18] and Mackiewicz [19] has focused on developing PowerPoint slides that avoid the well-known pitfalls of presentation tools; this shows that effective communication and PowerPoint can be intertwined.

### **THE NEED FOR AN AUDIENCE**

Visual rhetoric could be used to train engineering students to communicate effectively by integrating PowerPoint assignments into an engineering course. But how can a lecturer, untrained in the field of communication, be able to comment on the communicative aspect of the students' products?

Should there not be a communication expert to assist this engineering lecturer?

If we want to train students to communicate effectively, we should confront them as much as possible with audience perception. In this respect, the engineering lecturer commenting on the communicative aspect of the product can act as a first audience. As Kress and Van Leeuwen pointed out, one knows the code without knowing the theoretical framework behind it. The lecturer can draw upon his or her own personal experience, which is one 'with immediate practical consequences', as Kostelnick would say. One can give meaningful advice without first having to take an extra degree in communication. For instance, if one does not like the colors used in the slides, there are always underlying reasons for them to have this point of view that focus on the communicative effectiveness of the message. Perhaps, the colors are too lively, which could be inappropriate in an academic setting. Or the colors make the words difficult to read, which could lead to a debate on readability. Not only the lecturer, but also fellow students can and should give this kind of feedback, as a visual rhetorical approach to communication training implies incorporating as many feedback opportunities as possible into the course. But this should not become the starting point of a newly created set of guidelines for the students to follow. The main objective should be that the students interiorize 'the attitude' of communicating effectively.

### TEACHING RATIONALE

How can such an approach be integrated in an engineering course? First, students need to have a short theoretical introduction into the communicative use of PowerPoint. This should include the use of fonts (types, size, etc.), the layout of text (how many lines can be put on to a slide without interfering with readability), slide design, color, etc. During the lecture, we personally stressed the concept of 'slides you don't read' (unable to catch the attention of the audience) and 'slides you don't remember' (unable to transfer the message). Instructors however should not answer students' questions of the type 'How many slides should my PowerPoint presentation have?'. If they do, they should refer to the restrictions regarding content, audience and formal requirements of the assignment (e.g. minimum and maximum number of minutes). This way the students eventually realize that decisions concerning design depend on the rhetorical situation and that these are not determined by strict communicative guidelines. By incorporating these rhetorical strategies, they also acquire the procedural and conditional knowledge to design high quality PowerPoint presentations. Stressing the importance of the rhetorical situation instead of just asking students to blindly follow a certain set of rules will facilitate the process of

producing high standard presentations and finally communicating effectively.

On the other hand, some academics propose introducing theoretical concepts to teach communication skills. For instance, Nicole Amare suggests that students should first learn Peirce's principles before discussing visual communication [20], but focusing on this (or on Gestalt principles of design for that matter) is to stress the quintessential importance of theory to understand communication, whereas we would like to underline that this same goal can be reached by starting from the author's objectives and audience responses. In addition, teaching the principles of usability testing would lead the students to see audience response as an external tool (in this case the audience reactions put into figures) and not as determining their own communication and therefore as an inextricable part of their own communication. For the same reason, we did not mention the theoretical insights of Quintilian during our course. His characteristics of an effective orator only serve to test whether our students are indeed communicating rhetorically, and they do not form part of the study material.

Our main objective was to provide the students with a visual vocabulary in order to enable them to discuss each other's works. As any quality work about presentation techniques should contain this vocabulary, one could also just introduce one such handbook as reference material to the course, but a short lecture on this theory illustrated with visual artefacts (preferably mainly PowerPoint slides), could fulfill the same function.

We adopted this teaching rationale during the general course Communication skills (Ghent University, Flanders, Belgium), which 200 engineering students (2nd year) took during the 1st term of the academic year 2007–2008. Although this is a 'stand-alone' communication course, our approach can be replicated in any engineering course that wishes to train its students' in communication skills.

In our course, one of the assignments was to form teams of four students and to select an article from Web of Science (ISI Web of Knowledge, Thomson Scientific). The information from the article had to be put into a 10-minute presentation using PowerPoint. No other sources were allowed to be used. The intended audience was a group of 40 fellow students who had not read the article and who were not familiar with the topic. Possibly not everybody would be immediately convinced of the importance of the information. Therefore, the students would have to both inform (what is the topic of the article?) and convince their audience (why is this article important?).

We then adopted the teaching rationale developed by our colleagues from Antwerp University (Luuk Van Waes, Suzy Stals and Liesbeth Opdenacker). [21] The students were being asked:

- to make their individual version of the assignment, which was corrected by a colleague from their team of four students;

- then to produce a team version of the assignment, which was corrected by the lecturer and handed in two weeks later after the assignment was given; and
- finally to make a final personal version of the assignment based on the feedback given by their colleagues and the lecturer. In a revision plan (approximately 250 words), the student explained how and why it had been changed and therefore which comments he or she had followed.

One of the most important issues in this teaching rationale is the use of revision plans. Gibbs's comments illustrate the necessity of these revision plans. 'It is not sufficient simply to have an experience in order to learn. Without reflecting upon this experience it may quickly be forgotten or its learning potential lost.' [22] Not only are these revision plans useful from this pedagogical perspective, but in these revision plans students can also demonstrate that they have incorporated the principles of visual rhetoric, as they will be commenting on the reasons why certain decisions to change items in their final versions were taken.

In the following paragraphs we will describe how we studied the revision plans of our students.

#### STUDY OF REVISION PLANS: METHOD

We set up a qualitative study to detect if the visual rhetorical approach may have caused any improvement in the 'attitude' of communicating effectively. Finally, we analyzed the revision plans of the 200 engineering students who took our course. As analytic strategy we used a coding and retrieving procedure. In such a conceptualization the role of coding is to undertake three kinds of operations [23]:

1. noticing relevant phenomena;
2. collecting examples of these phenomena;
3. analyzing those phenomena in order to find commonalities, differences, patterns and structures.

This said, we nevertheless want to distance ourselves from the 'tabula rasa' illusions of hard-core grounded theory that prescribes an analytical procedure unpolluted by preconceived notions about the object of study. (For the origins of grounded theory, see Glaser and Straus [24].) In particular, in our situation, when the analyst sits down to start the analysis, he or she is inspired by a multitude of pre-interpretations, in our case the insights into rhetoric proposed by Quintilian. We suggest that the analysis starts from the guiding interests behind the study as they first materialized in the themes of the research topic. The analysis is thus framed by a pre-given set of codes or categories. Finding these codes in the revision plans would equal recording the students' attitude of communicating effectively. The codes Quintilian suggests are:

- a focus on the feelings of the audience;
- 'ethos': to be a man of good character and pleasing manners;
- 'pathos': using 'feelings' to strengthen the message;
- to be touched by one's own message;
- 'visiones': being able to conceive images that would move the feelings of the audience.

In the following paragraphs we will try to find these codes in the students' revision plans.

#### STUDY OF REVISION PLANS: RESEARCH RESULTS

After having closely examined the revision plans of our 200 engineering students, the following codes were found. (Owing to the limited length of this paper, only a small number of quotations from the students' revision plans can be given.)

##### 1. *A focus on the feelings of the audience*

After having studied the revision plans, the first item that comes to light is the almost complete absence of any reference to the content of the presentation. We find comments such as 'Sometimes one has to balance content and layout against each other, but with this specific slide I personally think that content should prevail.' (student 1). But these comments never go deeper than this. Although it is difficult to show that something that is absent, one might still suggest that the students have already become true rhetorical communicators as they realize that their audience will be us, non-engineering lecturers. Therefore, their comments on content could be found to be too detailed for a lecturer who will mainly be interested in the communicative aspect.

On the other hand, we double-checked this finding with the feedback given by the fellow students on the first personal version. We discovered that the students did not accept any content-related flaws from their colleagues, but that content never became the *nec plus ultra* criterion. The following quotations are illustrative: 'Again, the content is communicated poorly.' (student 2) and 'Your presentation covers the most (and the most important) issues from the article well. But you should pay more attention to your layout, which sometimes goes wrong.' (student 3) In one revision plan one could read 'Concerning content, it was definitely okay, but I tend to put too much information on the slides. That's why I'm going to drop all the redundant items so that my slides become less 'heavy'.' (student 4) The students therefore endorsed Quintilian's viewpoint that arguments lay the foundation for good communication, but that other items ultimately convince an audience. 'One student complained that the graph on slide 8 is irrelevant. I disagree. This presentation is meant for engineering students.' (student 5)

## 2. *To be a man of good character and pleasing manners*

In our case, ethos should not be interpreted as Quintilian would have done. Being a man of good character and pleasing manners refers to the specific discourse community to which the students should begin to belong. More specifically, when students start to design PowerPoint presentations, some initially use stylistic features such as WordArt to brighten up their presentation or to emphasize certain pieces of information. Very quickly, this is being remarked upon by their peers and the lecturers: using WordArt is not accepted in an academic setting nor in company life due to the informal nature of WordArt. For instance, 'I'll make the lines of my drawing half as thick because I don't want to look childish.' (student 6)

Another example is the following: 'I have also added my name to the bottom of the slide, together with the title of the presentation. This will look more professional.' (student 7) or 'I also added a reference to the source following the IEEE guidelines concerning this.' (student 1) These students realize that the impact of a presentation is linked to specific discursive rules.

The ethos of the speaker is therefore being determined by his or her choice of certain stylistic features or whether they follow the unwritten rules of business communication. Students realize that opting for a certain layout is no longer limited to the world of design, but that this influences audience response and hence how the content of their presentation is perceived. But more importantly, they realize that communicating effectively equals following rules established by their discourse community.

## 3. *Using 'feelings' to strengthen the message*

One of the most striking features discovered in the revision plans of the students is a hierarchy of communicative objectives. First, the attention of the audience needs to be caught, secondly, the audience should be pleased, and finally the audience's attention should be directed to the message that the author has intended to deliver.

For instance, one team produced a very straightforward opening slide, namely one quote by Einstein accompanied by his picture on a black background. One of the students commenting on this, 'The best element of our team version was the opening slide (. . .) It perfectly fits in with our subject because the trump card of the 3DLBB is its simplicity. And Einstein also really catches the attention. (especially with engineering students).' (student 8) This student is conscious of the fact that they have produced a slide that attracts the attention (by its simplicity) in a pleasing way (by using a well-known figure) and that this slide already introduces their message.

Although this hierarchy of communicative objectives can be read in any good handbook about communication, it is still fascinating that

engineering students, who are usually depicted as being ignorant of communication theory, closely follow this if faced with audience reception as the touchstone of all criticism.

Another example is color, which is one of the elements that a writer can use to influence the feelings of an audience. In 1841 George Field made a color-circle, by which he introduced the polar contrast of 'hot' and 'cold' for the first time. In his contribution to *Color— Art and Science*, John Cage explains: 'Colors seem 'warm' or 'cool' only metaphorically, of course, [ . . .] but most people will continue to think of yellows, oranges and reds as the 'warm' end of the spectrum, and blues and greens at the 'cool'.'\* [25] Moreover, research by Courtis [26] has shown that even the use of color in financial reports is meaningful, as brighter colors are consistently being used to denote an optimistic view on future results and attract potential investors, even if the situation is not that rosy. Therefore, color usage can increase interest and improve learning comprehension and retention.

Students realize that color can affect the feelings of an audience. For instance, 'I need to find a better way to highlight important issues. I'll borrow the thick blue arrows from the team version to make links between issues. The thin arrows can be reserved to indicate items on a figure. Apart from this, it is sometimes necessary to emphasize certain words or slogans. Then I can use frames or other colors, depending on the situation.' (student 9). The blue ('cold' colored) arrows are being used here to transfer the message, whereas other (warmer) colors should catch the attention of the audience. Another student writes 'In slide 9, 'sugar cane' was written in red, but I removed the color as it was useless indeed.' (student 10)

In our story, it is not that important whether the students used colors effectively, they could deduce this themselves from the feedback they received, but it is more important that they realized that use of color had connotational implications. Being able to communicate effectively is primarily knowing that the communication techniques used have a certain effect on the audience.

## 4. *'Visiones'*

Quintilian describes 'visiones' as 'images by which the representations of absent objects are so distinctly represented to the mind that we seem to see them with our eyes and to have them before us'. In particular, in dealing with PowerPoint slides one can easily find its modern day equivalent. In his top ten slide tips, Garr Reynolds, the successful author of *Presentation Zen*, rightly mentions that 'the best slides may have no text at all'. [27] Our students have also adopted this belief: 'I used to put all information I discussed onto the slide. Now I understand that this is rather pointless, as the

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\* In Western cultures

audience simply cannot listen and read at the same time.' (student 11) It is significant to point out that this student does not refer to any standard work, but that his decision is made based upon possible audience reaction. This proves that he has interiorized the idea of communicating effectively. Students realize that 'visones' are better than slides filled with words: 'I'll use all the drawings from the team version, because actually, they tell the whole story and clarify the text this way.' (student 12) or 'In my individual version, there are two slides with figures. I've replaced these by two slides with bar charts. This is more attractive and better understandable for the audience.' (student 13)

## CONCLUSION

As we have found four of the five codes Quintilian proposed in most of the revision plans, we can safely claim that most students have adopted this rhetorical approach to communication.

On the other hand, one code, namely 'being touched by one's own message', could not be determined, because this provided more difficulties of course. What can be regarded as 'being touched'? Can passion for the assignment or the presentation's topic be demonstrated in writing? One might argue that the length of the revision plan could be considered as a sign of 'being touched'. The longer the revision plan, the more

touched a student? Or perhaps how elaborately a drain of thought is worked out? But there is no real data to support these ideas.

In the end, we end up with the findings of our initial study, namely that a positive evaluation does not necessarily entail high quality products. By having discovered the four codes; we now can produce proof that students are able to communicate rhetorically, but we realize that students' perception of the teaching rationale and the communication practice is a matter not covered by this paper.

In conclusion, taking the data from our study into account, we believe that the use of visual rhetoric with the teaching rationale we propose can easily be adopted in any engineering course.

Of course, we are aware of the limitations of our research. This is only an exploratory study. A second qualitative study could further specify the codes of Quintilian. Perhaps it is possible to discover new links between his theory and technical communication. Furthermore, the different codes still need to be listed quantitatively. Currently, the revision plans show us that the students communicate rhetorically, but we do not know which codes dominate or whether there is an equilibrium in preference of codes.

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