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Stance and Engagement in 3MT Presentations

MA thesis

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Contents

Abstract

As more studies of spoken academic English discourse have begun to appear, scholars are rapidly exploring the vast number of different and very interesting spoken discourse genres. 3MT (Three Minute Thesis) presentations are a competitive spoken academic English genre where PhD students present their research to non-specialist audiences in only up to 180 seconds. As a highly original and standardised genre, 3MT has been receiving more and more attention in recent years and it is the object of this study. Most previous research focuses on winning presentations that were given by native English speakers. In this paper, however, using Hyland's (2005) stance and engagement framework, I analyse 30 3MT presentations from University of Bologna's competitions, subdivided into three science fields: social sciences & humanities (SH), physical sciences & engineering (PE) and life sciences (LS). The self-compiled corpus was gathered by transcribing and manually analysing all presentations for stance and engagement markers. The finding of this study show that both stance and engagement were important aspects of 3MT presentations analysed. Stance markers were used at similar frequencies among the science fields, showing that building an authorial persona and carefully crafting an argument were similarly important in all three fields. Engagement markers, which are important in establishing a more personal connection with the audience while gripping their attention, were found significantly more often in presentations in social sciences & humanities and physical sciences & engineering, showing that these scholars tended to focus not only on how they build their authorial stance but on how they accommodate their listeners as well. Among the individual stance and engagement markers, the use of hedges and boosters showed that life sciences' presentations were characteristic of building a both carefully phrased and authoritative argument, especially when dealing with more sensitive topics. The use of questions and hearer mention further showed that speakers in social sciences & humanities, as a softer field, tended to be more dialogic in nature and relied more in the academic community to approve and support their claims. The stance and engagement markers that occurred infrequently perhaps did so because of the very concise nature of 3MT presentations' genre and indicated that the presenters have to carefully craft their speeches, balancing between having to explain complex issues and having to do that very quickly to a non-specialist audience.

Keywords: stance, engagement, 3MT, spoken academic discourse, cross-disciplinary study.

1. Introduction

Academic discourse, both in its written and spoken forms, is central to academia as it is the way how scholarly knowledge is communicated and accumulated. For the past four decades, analyses of academic discourse have gained increasingly more attention and different kinds of academic communication as genres of specialised language and its use have been a focal point of understanding how academic texts are and should be produced (Swales 2004; Bhatia 2014). As a key element of higher education, academic discourse has been studied with pedagogical aims in mind (Yang 2017). Being arguably among the most complex ways of communication in general, academic texts have inspired a number of different ways of analysis that embrace many different aspects of language use. Both spoken and written academic discourse receive considerable attention by scholars working with how it should be instructed by various teachers, from perspectives such as recontextualisation strategies (Carter-Thomas & Rowley-Jolivet 2020), keyword analysis (Yang 2020), genre moves (Hu & Liu 2018) and stance and engagement (Jiang & Qiu 2021; Hyland & Zou 2021, 2022a, 2022b).

An important issue that has been raised is that academic communication, which could seem to be rather impersonal, is actually a complex web of choices that the writers and speakers make which reflect not only plain facts but their social role in the academic community (Hyland 1999). In other words, academic texts can be seen as an interaction, between the addresser and the addressee, where the addresser is conscious of the need to engage with the addressee and the need of persuading them (Hyland 2005). A number of different scholars studied the interactive aspect of discourse. Martin's (2000) system of appraisal and Marín-Arrese's (2011) analysis of effective and epistemic stance offer interesting insight on how writers and speakers build their arguments and what role subjectivity plays in their communication. Du Bois's (2007) stance triangle is a complex framework on deciphering how stancetaking, which is seen as a social act, works. However, though the three examples mentioned here can be effective in in analyzing genres such as political speeches, real-life conversations or even personal letters, Hyland's (2005) framework of stance and engagement has proved to be effective in analyzing academic discourse.

In the nearly two decades since its publication, Ken Hyland's framework of stance and engagement (2005) has been applied to a large number of different texts, by a large number of scholars. Considerable attention, for instance, has been shown to research articles. In the publication that introduced this framework, Hyland studied how writers of research articles from hard and soft sciences use stance and engagement. In addition, it has been analysed how stance and engagement is used in pure mathematics research articles (McGrath and Kuteeva 2014) as well as how writers from different cultures employ it (Alghazo et al. 2021). Comparing the use of stance and engagement

between different science fields and cultures has shown interesting results which will be discussed in greater detail in the literature review part of this paper.

In the last decade, research of spoken academic discourse has been receiving more scholarly attention (Mauranen 2023) and applying the framework of stance and engagement is not an exception. This might be due to the fact that both higher education students and scholars are more often required to communicate their research via different kinds of spoken academic genres (Carter-Thomas and Rowley-Jolivet 2020). Examples of such could be university lectures and seminars (Yang 2014; Drozdova 2022), audioslide presentations (Yang 2017), research group videos (Carter-Thomas and Rowley-Jolivet 2023) and 3MT presentations (Carter-Thomas & Rowley-Jolivet 2020; Jiang & Qiu 2021; Hyland & Zou 2021, 2022a, 2022b). Many studies of academic discourse, the aforementioned ones included, offer their insight as information to be used in instructing academic writing and speaking and as English has become the primary international language of academic communication, such instructions, in my mind, may become invaluable in the future.

A good example of a spoken academic genre that has been becoming more and more popular is the Three Minute Thesis (3MT) presentation. Hyland and Zou describe 3MT presentations as a hugely successful new genre that more and more universities discover and take part in (2022a). 3MT presentations have been devised by the University of Queensland as a very concise spoken academic discourse medium that helps PhD students from all over the world present their findings and promote their research to a wider audience (University of Queensland 2024). Traditional PhD dissertations are lengthy written texts that are aimed at a rather exclusive group of readers, who are specialists of that field, understand it thoroughly and are able to offer insight on the study in question. The genre of 3MT presentations, on the other hand, gives an opportunity for PhD students to present their findings to non-specialist audiences and they have to do so in only three minutes, which in turn dictates that they have to communicate the aspects of their work carefully, so that they would be interesting and comprehensible to the more general audiences. The purpose of this genre is to help participants improve their presentation skills and it is highly competitive as large numbers of participants compete for prestige and sometimes even monetary prizes. The university of Bologna, for example, is offering prizes of 2000 and 1500 euros to the winner and the runners-up of this year's competition.

There has been an increasing number of studies delving into the language use in 3MT presentations in the recent years. There are studies of the genre moves across different disciplines (Hu & Liu 2018), keyword analysis (Yang 2020), and stance and engagement (Jiang & Qiu 2018; Hyland & Zou 2021, 2022a, 2022b). All of the studies mentioned offer interesting observations of how 3MT presenters use language, which is rather dense and complex in terms of genre moves, stance and engagement and other aspects. Particular interest has been shown to 3MT presentations taking

place in Australian universities, the birthplace of the genre. Some interest has also been shown in 3MT presentations taking place in other English-speaking countries, as well as Hong Kong. Virtually no studies have been carried out analysing 3MT presentations given in non-native English-speaking European universities which could potentially offer insight on non-native English speakers' language use and could prove to be helpful in teaching them.

Thus, the object of this paper was chosen to be University of Bologna's PhD student's 3MT presentations and, having shown its usefulness in analyses of spoken academic discourse, Hyland's framework of stance and engagement (2005) was chosen as a tool to carry out this analysis. Science fields have been chosen as a point of comparison, drawing from many other studies that employed this perspective. The aim of this study, therefore, is to analyse and compare the use of stance and engagement markers in 3MT presentations given by PhD students in University of Bologna in three different science fields. The objectives raised for this study are: Do University of Bologna's 3MT presenters use more stance or engagement? How are individual stance and engagement markers used in University of Bologna's 3MT presentations? Are there differences in the use of stance and engagement between presentations given by speakers from different science fields?

2. Literature review

First and foremost, it is important to explain the framework used in this paper. Taking the perspective that an academic text is not simply a straightforward representation of facts and reality, Hyland's (1999) argumentation serves as the main viewpoint. Hyland (1999, 100) puts forward this argument:

texts cannot be seen as accurate representations of what the world is like because this representation is always filtered through acts of selection, foregrounding and symbolisation; reality is seen as constructed through processes that are essentially social; involving authority, credibility and disciplinary appeals.

In this study, Hyland describes the concept of stance and how he sees it but his conceptualization is far from being the only one and it would be useful to first be aware of other perspectives on stance. At a similar time, Biber et al. described stance and what linguistic devices can convey it in great detail (1999). Stance here is seen to "express personal feelings, attitudes, value judgements, or assessment" (1999, 966). Having provided an exhaustive list of potential linguistic devices, Biber et al. do admit that the category of stance can be particularly ambiguous and hard to analyse as it can often be hard to determine what the writer or speaker intends to communicate (1999). This framework, being extremely complex and having been created to study English language in its entirety, would hardly be applicable in a smaller scale study. Another interesting framework to analyse stance was proposed by Du Bois (2007). In describing the stance triangle, he saw stance as "a linguistically articulated form of social action whose meaning is to be construed within the broader scope of language, interaction, and sociocultural value" (2007, 139). Compared to the way Biber et al. saw stance, Du Bois's framework is much more focused and can be applied in a smaller scale study. However, Du Bois's stance triangle is an excellent tool to study language from a pragmatic linguistics' perspective and perhaps less applicable in studying academic discourse.

Ken Hyland's concept of writer stance (1999) and his influential framework of stance and engagement (2005), on the other hand, have served as a methodological basis for many discourse analyses since the studies were published. Hyland describes stance as a way in which "writers project themselves into their texts to communicate their integrity, credibility, involvement, and a relationship to their subject matter and their readers" (1999, 101). This description is rather useful in analysing academic discourse as it focusses on aspects that are important for scholars, such as showing certainty, authority and experience in the field. Hyland's concept of stance was later complemented with the concept of engagement. In his view, engagement is how "writers acknowledge and connect to others, recognizing the presence of their readers, pulling them along with their argument, focusing their attention, acknowledging their uncertainties, including them as discourse participants, and guiding them to interpretations" (Hyland 2005, 176). In other words, this is the addressee's side of discourse and the focus here is on the fact that the addressers may make conscious choices in order to connect

to their reader and to hopefully make them take the addresser's side of the argument. In general, stance and engagement is a framework that acknowledges the interaction that takes place between the addresser and the addressee and helps analyse how the addresser controls how their authorial persona is communicated and how a connection to the addressee is established.

As mentioned already, Hyland's framework of stance and engagement has been applied to the analysis of academic discourse and some examples will now be provided. Firstly, Hyland's paper that introduced the framework also analysed stance and engagement in scientific articles and compared its use between hard and soft sciences (2005). He found that establishing an authorial persona and interacting with the reader was indeed an important aspect of the articles analysed (Hyland 2005). Also, the framework helped show that, for example, writers in soft fields tended to express their personal positions more freely and engaged the readers more frequently, whereas the writers in hard fields tended to focus more on their credibility and the novelty and importance of their research (Hyland 2005). Other studies, such as McGrath and Kuteeva's (2012) paper on stance and engagement in pure mathematics' research articles, combining the framework with interviews of the writers, found that writers do make conscious decisions based on the conventions within their discipline. Taking on a different perspective, Alghazo et al. (2021) compared research article abstracts written by English and Arabic scholars. They found that there are clear differences in how stance and engagement was employed by writers from different cultures (Alghazo et al. 2021). More specifically, Arabic writers tended to use more boosters and were more open in communicating their own attitude whereas English writers used more first-person pronouns, referring to themselves and creating author's presence withing the text (Alghazo et al. 2021). It can be seen that stance and engagement framework has been applied to study and compare texts of different cultures or written by scholars of different disciplines. The application of this framework, though, is not limited to written discourse.

As spoken academic discourse has been receiving more attention, so has stance and engagement been more often applied to study various lectures, seminars and presentations. Yang (2014), in analysing the use of stance and engagement in university seminars and lectures, found that there are only slight differences in how speakers of different disciplines employ it. Comparing the findings to ones from analyses of written academic discourse, the author found the use of stance and engagement to be much more diverse when it is written (Yang 2014). This, however, does not mean that the use of stance and engagement is not varied between speakers of different science domains in spoken genres. A spoken academic English genre that did show variety is 3MT presentations, described in the previous part of this paper. Jiang and Qiu (2021), in analysing how stance and engagement is used in 3MT presentations given by speakers in a Hong Kong university, found that the speakers of hard sciences used interactional features more than speakers of soft sciences. In addition, stance was found

to be used more than engagement and mentions of the speakers themselves as well as the audience were found to be a defining feature of these presentations (Jiang and Qiu 2021). Thus, 3MT presentations, which are the object of this study, seem to display the use of stance and engagement and its use might be more varied between the speakers working within different science fields.

Finally, moving onto the last two studies of stance and engagement in the genre of 3MT presentations to be discussed here, it is important to mention that the author of the framework himself has also recently analysed 3MT presentations. As a way to perhaps show interest in 3MT presentations as a genre, Hyland and Zou (2022b) studied stance in 3MT presentations and academic blogs to which they referred as contemporary spoken academic genres. Having examined blog posts and 3MT presentations, the authors found that stance was more frequent in 3MT presentations, most often used as a way to show certainty and establish authorial presence (Hyland and Zou 2022b). In their other study, Hyland and Zou (2022a) turned to engagement and analysed 3MT presentations in social sciences and hard sciences. The study found that, in general, engagement is an important feature of 3MT presentations because they, pushing speakers to communicate in a very precise and concise manner, influence the speakers to be more openly persuasive and to establish a closer connection to the listeners (Hyland and Zou 2022a). In addition, hard sciences presenters were found to use engagement more, signalling that they are more prone to bring their audience into the discussion, perhaps in order to better explain the more complex science that is unfamiliar to the non-specialist audiences (Hyland and Zou 2022a).

These recent studies delving into the use of stance and engagement in 3MT presentations are the final mentions in this part of the paper and the next part will present the data chosen for the analysis done in this paper as well as the method applied in order to show how the analysis was carried out.

3. Data and Methods

A corpus or 30 3MT presentations has been compiled for this study. The presentations used, which were given between the years 2018 and 2023, were gathered from University of Bologna's YouTube channel [1] as well as their website[2]. All the presentations were divided into three scientific fields, drawing from European Research Council's panel structure (2022). The fields in question and their respective abbreviations, both of which will be used after this point, are: Social Sciences & Humanities (SH), Physical Sciences & Engineering (PE), and Life Sciences (LS). In addition, a list of all presentations with their respective numbers, titles and panels, which are the sub-units of the mentioned science fields as described by ERC, are provided in appendix 1. After collecting and dividing all presentations into the three aforementioned groups, they were sorted alphabetically and the first 10 presentations from each science field were chosen, only disregarding a few presentations due to unsatisfactory audio quality or incomplete recording. The number of presentations was 10 due to finding roughly only that number of presentations the fields of social sciences & humanities and life sciences, while the number of presentations within physical sciences & engineering was around double compared to the other fields. Thus, to ensure the comparability of the data, 10 as the lowest possible number of presentations was chosen in order to represent all three fields equally. Later, selected presentations were transcribed with the help of Tilde transcription tool [3] and all output was then manually corrected. The corpus consists of presentations that were both winning and non-winning. No other aspects were considered when selecting the presentations for the analysis in order to ensure a fair representation of the specific genre of 3MT presentations given by PhD students in University of Bologna. The composition of the corpus can be seen in Table 1 below.

Table 1. Composition of corpus of University of Bologna's 3MT presentations.

Sub-corpus	Number of words	Number of presentations
Social sciences & humanities	4,170	10
Life sciences	3,816	10
Physical sciences & engineering	3,672	10
Total:	11,658	30

For this corpus-based, qualitative, quantitative and comparative analysis, Hyland's framework of stance and engagement (2005) was used, including a slight update that can be found in Hyland and Zou (2022a, 29) that changes the original marker name of 'reader pronoun' into 'hearer mention', to accommodate the type of discourse analysed. As already discussed in the previous part of this paper, this framework was chosen as it is an effective tool in analysing interactional aspects of academic

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[1] University's official Youtube channel - https://www.youtube.com/@unibo

[2] Lists of all University of Bologna's 3MT presentations - https://eventi.unibo.it/3mtcompetition/unibo-3mt-past-editions

[3] The tool can be found here - https://tilde.com/products-and-services/transcribe

discourse and it is widely used, allowing for data to be compared to as well as providing excellent examples on how to use it correctly.

As described by Hyland, academic writing involves positioning which means that the addresser has both to provide their point-of-view as well as others' (Hyland 2005). In this way, stance is the way how the addresser positions themselves, communicating their own opinions, certainty and feelings. Engagement, then, is the way how the addresser approaches the addressee, acknowledging their presence and manipulating information in a way that presents it as a product of dialogue, instead of a monologue. The general classification of all stance and engagement markers can be seen in Figure 1 and their more specific descriptions are to follow.
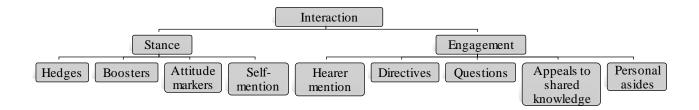

Figure 1. Stance and engagement markers (Hyland 2005, 177; Hyland & Zou 2022a, 29)

Figure 1 shows the markers of stance and engagement. It is based on Hyland's (2005, 177) initial classification of stance and engagement and an update is included in the form of 'hearer mention' which comes from Hyland and Zou (2022a, 29) and serves to adapt to the fact that the data analysed is spoken.

Stance and engagement in this framework are conveyed using interactional discourse markers that most often come in the form of adverbs, adjectives, modal verbs, sentence adverbials and other kinds of words. Next, I will describe and illustrate every type of stance and engagement marker.

- **Hedges** are used to show lower certainty and/or commitment to a proposition. They can help avoid making too broad generalisations, thus not breaking scholarly conventions.

(1) *And then when we go to the doctor, we think that we already have an idea of what we **might** have or what exams we need to take and so on. (SH-7)*

- **Boosters** are opposite to hedges and they are used to emphasize the certainty and commitment to a proposition. They can be used to catch the addressee's attention specifically where the addresser needs it.

(2) *Globally, it has been estimated that one in five people suffer from pain, and currently **the only** way that person has to communicate it is by his voice. (LS-2)*

- **Attitude markers**, on the other hand, serve a broader function. As suggested by their name, they help convey the addresser's "affective, rather than epistemic, attitude to propositions"

(Hyland 2005, 180). Thus, attitude markers often convey importance, necessity, uniqueness and other meanings.

(3) *My PhD project is based on the idea that adolescence is still a **crucial** time window for neuron maturation. (LS-3)*

- **Self-mention** markers most often come in the shape of the personal pronoun '*I*', and, sometimes as exclusive 'we', that show author's presence and even authority in the text and, in the case of presentations, can give an impression of dialogue.

(4) *Well, **I** have developed a method to detect cheaters during the test, so it's possible to intervene immediately. (PE-7)*

- **Hearer mention** markers, similarly to self-mention, are personal pronouns, usually occurring as 'we' inclusive or second-person 'you', that refer to the addressee, making them part of the discussion.

(5) *To give **you** some data, women and children are 14 times more likely to die in ecological disasters than men, and this vulnerability is not innate but it's a result of inequalities produced by gender roles, discrimination, and poverty. (SH-3)*

- **Directives** tell the addressee to perform a certain communicative, physical or cognitive act. Once again, this builds a dialogic dimension and, in the case of presentations, can be used as an excellent tool to sway the listeners into a direction more beneficial to the presenter.

(6) ***Imagine** a broken planet like the one you've just seen in my slide.(SH-3)*

- **Questions** are a way for the speaker to directly engage with the audience and to start a dialogue with or without expecting an answer. Spoken discourse may benefit from them even more as here the listeners are actually able to respond. The contents of a possible response are rather unimportant but the fact that questions can grip listeners' attention is key to a presenter.

(7) *The next question is, is the healthcare system ready? (SH-6)*

- **Appeals to shared knowledge** are used to present information in a way that makes it seem already agreed upon. Addressers can use them to manipulate their addressees into believing an idea that could otherwise be contested. In spoken discourse especially, as it is temporal in its nature, listeners are less likely to remember to fact-check later or to rewind and fact-check.

(8) *Alzheimer's disease is the major cause of dementia worldwide and, **as you probably know**, if you have friends or relatives affected by this disease, it is still incurable. (LS-5)*

- **Personal asides** are, in a way, digressions where the addresser may slightly digress and offer a more personal comment. They can offer the addresser's honest opinion on what has already been stated. The function here is again to give a feeling of dialogue which engages the addressee. This marker, however, did not occur in the corpus, and thus no example is provided below.

The analysis part of this paper was carried out by close reading the presentations' transcripts and identifying the aforementioned stance and engagement markers. As stance and engagement markers can differ heavily depending on their context, no pre-determined list of potential markers was used. All presentations were re-read several times and all markers identified were re-checked to ensure accurate and replicable results. The ambiguity between self-mention and hearer mention markers was solved by using Harwood's (2005, 343-347) taxonomy that separates the uses of pronoun 'we' into inclusive, referring to both the addresser and the addressee, and exclusive, referring to the addresser and people associated with them, excluding the addressee. In this light, exclusive 'we' was considered to be a self-mention marker and inclusive 'we' was considered to be a hearer mention. Furthermore, in order not to skew the results, some highly formulaic phrases, such as 'thank you', 'thank you for your attention' and 'my name is' were disregarded and not counted as self-mention or hearer mention markers due to them being a standard part of most presentations and for the most part not exhibiting the same effect as those markers did in other parts of presentations. In addition, some other cases of first and second person personal pronouns were not marked as either self-mention or hearer mention, due to them not referring to either as well as not having a generic reference. The corpus, together with the markings and their explanations, can be found in appendix 2. The raw frequencies found through the analysis were turned into normalised frequencies and will come as occurrences per 1000 words from this point. From a quantitative comparative perspective, the numerical data was checked for statistical significance (McEnery and Hardie 2012). To find whether a statistical significance existed, Lancaster University's log-likelihood test tool[4] was used. In finding if a difference between numbers of uses was statistically significant, log-likelihood score at $p < 0.05$ level had to be higher than 3.8 (McEnery and Hardie 2012). Log-likelihood scores will be specified in places where statistical significance is going to be mentioned. Finally, the qualitative part of the analysis was carried out according to Hyland's framework of stance and engagement (2005) and by also comparing to other related studies that will be mentioned in the results and discussion part that is to follow.

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[4] This tool can be found on Lancaster University's website - http://corpora.lancs.ac.uk/clmtp/2-stat.php

4. Results and Discussion

4.1. Overall distribution of stance and engagement markers

The general distribution of stance and engagement markers will be discussed first, as the most general aspect of this study. Overall, as can be seen in table 2, the use of stance and engagement between the three scientific fields does not differ greatly.

Table 2. Overall distribution of stance and engagement markers

Type of marker	Social sciences & Humanities		Physical sciences & Engineering		Life sciences	
	Raw frequency	Per 1000 words	Raw frequency	Per 1000 words	Raw frequency	Per 1000 words
Stance	139	33.4	127	34.6	158	41.5
Engagement	152	36.5	137	37.3	99	26.0
Total	291	69.9	264	71.9	257	67.5

Stance markers were used in rather similar frequencies between the three sub-corpora. Presenters in life sciences used stance markers most frequently, perhaps showing that the way how the speaker positions themselves in accordance to the facts and issues they present was more important. Yet, log-likelihood test does not show a statistical significance between the use of stance markers in life sciences' presentations and the presentations of social sciences & humanities, with the log-likelihood score of 3.5. The same can be said about the difference of use of stance markers between life sciences' presenters and physical sciences & engineering's presenters as the log-likelihood score in this case was even lower, 2.3. Comparing to Jiang and Qiu's (2021) study, the findings here are similar as they found 3MT presenters in hard sciences to use stance more frequently than their soft sciences counterparts.

Engagement markers, on the other hand, were used with greater difference. Social sciences & humanities' and physical sciences & engineering's presenters both used engagement markers significantly more frequently than life sciences' presenters, with the log-likelihood scores of 7.1 and 7.6 respectively. This might signal that engaging with the audience, building their presence and including them as part of the issue that the scholar tackles was less important in life sciences' presentations. Comparing to other studies, Hyland (2005) observed that writers of disciplines similar to the ones that comprise life sciences in this study used engagement markers least frequently, which corresponds to the findings in this paper. In a more recent study that looked at 3MT presentations given by PhD students in Hong Kong however, presenters within the discipline of medicine, as the only corresponding discipline to the ones analysed in this paper, used engagement markers at a very similar frequency to the other disciplines (Jiang and Qiu's 2021). Thus, it is not entirely clear whether engagement is much less important to life sciences' presenters but there is a tendency that shows a lower reliance on including the audience in the discussion in order to make it more relatable.

In general, looking at the overall numbers of distribution of the markers, it was shown that stance markers occurred in similar numbers across the presentations of all three science fields and engagement was used significantly more often by presenters of social sciences & humanities and physical sciences & engineering. It would be hard to draw many specific conclusions from the overall distribution of stance and engagement markers, thus, analysis of the types of stance and engagement markers and their distribution across presentations of the different science fields is going to follow next.

4.2. Distribution of individual stance markers between science fields

The overall use of stance markers in 3MT presentations given by University of Bologna's PhD students did not differ greatly. However, table 3 below shows that some individual stance markers were used rather differently across the presentations of different science fields. To see how the individual stance markers were used in the corpus as well as across the presentations of the three science fields, the next sub-sections of the paper will discuss the stance markers as shown in table 3. The stance markers shown in table 3 are arranged by the number of occurrences across the whole corpus, in a descending order.

Table 3. Distribution of stance markers

Type of stance marker	Social sciences & Humanities		Physical sciences & Engineering		Life sciences	
	Raw frequency	Per 1000 words	Raw frequency	Per 1000 words	Raw frequency	Per 1000 words
Self-mention	64	15.4	51	13.9	52	13.6
Attitude markers	29	7.0	29	7.9	35	9.2
Boosters	21	5.0	33	9.0	37	9.7
Hedges	25	6.0	14	3.8	34	8.9
Total	139	33.4	127	34.6	158	41.5

4.2.1. Self-mention

By far the most frequent and perhaps the most important stance marker in the corpus of this study was self-mention. As mentioned before, self-mention as a stance marker can be used to build the presence of the author as a scholar and together with different claims, to take responsibility for achieved results. Log-likelihood test, showed that the difference between the use of self-mention markers in social sciences & humanities' presentations compared to physical sciences & engineering's and life sciences' presentations was not statistically significant, with the score of 0.3 and 0.4 respectively. Hyland and Zou (2021) in their study have also found that the use of self-mention in 3MT presentation across different science fields did not differ greatly, despite previously observed tendencies of soft sciences' speakers using them more frequently due to being more prone to promote themselves. The reason behind this rather standardised use of self-mention markers might

be the fact that 3MT presentations are a very concise genre, allowing its participants only three minutes which could in turn influence the use of some lexical resources.

Nevertheless, as the most frequently occurring stance marker, self-mention in this corpus signals that among the other markers, having the presenter as a clear figure that is responsible for their research, was key in most if not all presentations. This is hardly surprising because as scholars, the participants of 3MT competitions not only compete against each other but also strive to promote their research and themselves in order to continue and improve their academic careers.

Further delving into the use of self-mention markers showed some interesting details about the kinds of self-mention markers used. Table 4 illustrates how each scientific field made use self-mention markers referring to themselves only (I, me, my, myself) and the forms referring to several people (we, our). The latter use is seen to refer to the speaker and the group of researchers they are part of.

Table 4. Self-mention markers by number

Type of marker	Social sciences & Humanities		Physical sciences & Engineering		Life sciences	
	Per 1000 words	%	Per 1000 words	%	Per 1000 words	%
I, me, my, myself	15.4	100	12.3	88.2	10.8	78.8
We, our	0.0	0	1.6	11.8	2.9	21.2
Total	15.4	100	13.9	100	13.6	100

As seen in table 4, social sciences & humanities' presenters used self-mention markers referring to themselves only which in turn referred to the presenters as sole researchers. This seems to suggest that in social sciences & humanities, all PhD students carried out their research individually, as opposed to in a team of researchers. Example 9 illustrates this use, where it is clear that the speaker was indeed the person who performed the analysis.

(9) *Well, **I** analysed the Italian House Library and **I** found out Formiggini's books on its shelves until now.(SH-1)*
(10) *Therefore, **we** tested a treatment in a Down syndrome mouse model during this period. (LS-3)*
(11) *In this system **we** will produce a situation closer to the clinics where the treatment, the aforementioned treatment, could induce cancers of death with reduced damage on a surrounding healthy cells. (LS-8)*

The use of self-mention was different with the presenters in physical sciences & engineering and life sciences where 11.8 and 21.2 per cent of pronouns respectively referred to multiple referents. Example 10 shows how the presenter refers to testing a treatment as done not by them alone but by a group of people. Hyland and Zou (2021) found very similar use of self-mention, where the presenters in hard sciences were more likely to use plural personal pronouns because their kind of research is

far more likely to be a collaborative effort, rather than a single scholar's work. In addition, the use of plural self-mention was seen to sometimes have an effect when the presenter communicates their certainty towards the future of their research by placing their team in the statement and thus strengthening their claim. It is a rather smart use of the marker and, as mentioned before, in life sciences' presentations in particular, this might sometimes be necessary in fully convincing the audience in cases where application of a new method might pose a real danger to a potential patient due to the method having had limited testing. In example 11, that comes from presentation LS-8, the research is concerned with an innovative cancer treatment, it would be fair to have doubts or to at least be careful in trusting the new method as it may potentially be dangerous, dealing with a very serious illness. Thus, the speaker uses 'we' to show that their research is a group effort, hopefully achieving some level of trust from the audience.

Coming back to self-mention markers in general, it is clear why the presenters of all three science fields felt the need to establish their authorial presence and credibility. Self-mention, thus, is a useful tool to reassure the audience of one's authority and responsibility.

4.2.2. Attitude markers

In Hyland's framework, attitude markers help communicate "affective, rather than epistemic, attitude to propositions" (2005, 180). This means that they are a way for the writer, or in this case speaker, to interject and offer their own stance from a more personal perspective. In practice, attitude markers can often be a way to focus more attention on the propositions that might otherwise seem less important. In the corpus compiled for this study, attitude markers were the second most used stance marker but, as can be seen in table 3, they were much less frequent than self-mention and only slightly more frequent than boosters and hedges. This is reasonable, though, as 3MT presentations being a very concise genre, one still has more opportunities to use pronouns whereas the use of attitude markers, that most often appear as adverbs and adjectives, is confined by the three-minute time limit.

Among the three science fields, the presenters of life sciences used attitude markers most frequently but not significantly so as the difference in the use between the presentations in social sciences & humanities, where attitude markers occurred least frequently, and life sciences, where they occurred most frequently, yielded a log-likelihood score of 1.2. Similar results were found in an analysis of project proposal summaries by Mėlinskas and Šinkūnienė (2023) where very experienced scholars working in social sciences & humanities also used attitude markers less frequently than their colleagues in other science fields. There, however, attitude markers occurred more than two times as frequently as in the 3MT presentations analyzed here. A comparatively more frequent use of attitude markers in general was also observed by Hyland and Zou's (2021) study of 3MT presentations. Thus,

the conclusion that can be drawn is that attitude markers in general might be of lesser importance to the speakers of University of Bologna's 3MT competitions.

Though presenters from all fields presented research that is relevant and important, presenters in life sciences once again felt more need to communicate their research in a more personal and affective way. Overall, the attitude markers identified in this study were found semantically to refer to feelings of importance, interest, novelty, difficulty, as well as some other more idiosyncratic uses that were employed in specific contexts. Examples 12-16 will illustrate these uses.

Example 12, for instance, shows how the presenter tries to persuade their audience that their study is important and the reason behind it. Replacing *why it is important* in that sentence with 'the reason', for example, would still communicate the rationale for the research but explicitly stating that it is *important* leaves the guess work out for the audience and they are arguably more likely to see it as important. In example 13, the presenter uses a very emphatic verb *fascinated* in order show their dedication to the subject. For the listener, the speaker's dedication might qualify as proof that the subject is worthy of dedication and is thus something that should be studied.

(12) *So, when we build health care policies, we need to take all of these things into consideration, so this is why it is **important** to study how these factors are changing and to build practices that promote the empowerment of cancer patients. (SH-7)*

(13) *I'm **fascinated** by how this publisher, an absolute beginner, managed to reach such a wide audience abroad, pushing his books toward the United States. (SH-1)*

A rather different effect is illustrated in example 14, where the presenter names the methods they are working with as *innovative*. In life sciences' and physical sciences & engineering's presentations, new discoveries and inventions are key and innovation is of high importance because advancement can sometimes be hardly achieved by using the same methods. That might be the reason why the speaker chooses to not just simply name the methods they are using but to specifically pin-point their being *innovative*. Example 15 shows how a specific issue that the scholar is trying to solve is described as *challenging*. Alone, though, this description does not necessarily have a very positive meaning. In example 15, however, the issue discussed is the use of plastics and the researcher is working towards an easier production of bioplastics. It is widely regarded that the use of plastics is a key issue for the environment and the listeners without doubt being aware of that, might feel that by defining it as *challenging*, the speaker has a good understanding of them and could be a qualified person to work towards solving it.

(14) *I'm focusing on the moderation of time-temperature conditions of coffee during coffee roasting on the application of new formulation and alternative cooking system for bakery products and on the use of **innovative** pretreatments like post-electric fields before frying the potato chips. (PE-2)*

(15) *The research is moving towards the search of bioplastics instead, which are biodegradable materials called biopolymers that derive from renewable sources. However, this is very **challenging,** and the progress is at the industrial level are very slow because the production costs are very high, but because their properties are still not enough competitive with those of plastics. (PE-6)*

Lastly, example 16 shows one of the more idiosyncratic uses of attitude markers. The sentence itself has a rhetorical effect to appeal to the audience but the attitude marker *stubbornly* appeals to the listeners to show that change is needed for the betterment of the field in question, if not the world itself. While generally change is neither good nor bad, the speaker rather smartly uses an adverb with a negative connotation to portray a perspective that would not be beneficial for them, hopefully swaying the audience into their direction.

(16) *I'm going to leave you with this, goals are not achieved by **stubbornly** walking a straight road, you always have to be able to change your perspective and to face the curves. (LS-3)*

Overall, attitude markers were used slightly more frequently by the presenters in life sciences but all the fields did employ them in order to communicate their affective attitudes related to the research, though comparatively less frequently than was found in other studies. As a persuasive tool, attitude markers can be used to influence how the audience feels towards the issues that the speaker finds more noteworthy and could be effectively used in academic discourse.

4.2.3. Boosters

Boosters are used to show higher certainty towards a proposition that the writer or speaker makes. In the corpus of this study, boosters were used significantly more often by the speakers of physical sciences & engineering and life sciences. The difference between the use by the presenters of the two aforementioned fields and social sciences & humanities yielded log-likelihood scores of 4.4 and 6. Social sciences & humanities' presenters, thus, used boosters much less frequently. Very similar results were found by Mėlinskas and Šinkūnienė (2023). In this study of research proposal summaries, which is a very concise academic genre not unlike 3MT presentations, writers in life sciences used boosters most frequently, compared to the other two science fields analysed in both papers. It can clearly be seen that social sciences & humanities, which are traditionally seen as softer, communicating high certainty is less typical. The reason for that might be that the scholars working within softer sciences deal with methods and concepts that are more flexible, or fuzzy, in their nature. Because of that, analysts cannot sometimes in full certainty state their findings as it might go against their disciplinary conventions. Example 17 illustrates how a booster was used in a presentation within social sciences & humanities. Interestingly, though the speaker does show higher certainty in their proposition, thus perhaps persuading the audience to believe it, the proposition itself discusses a lack of *consensus* within the field in question.

(17) *Some scholars have called this concept a slippery, spectral and even sexy, whereas Mueller has said it's one of the most misinterpreted concepts of our time, **indeed** many scholars have not reached a consensus, whether it's an ideology, political style, logic or performance. (SH-8)*

The harder sciences, namely physical sciences & engineering and life sciences found boosters a much more useful tool as being certain of one's methods and results is more necessary due to the stricter nature of their scholarly work. This is supported by McGrath and Kuteeva's (2012) analysis of pure mathematics' research articles where boosters, though not the most common stance marker, were found to be an integral part of the articles due to helping scholars communicate the clarity and precision that is highly valued in their disciplines.

In example 18, the speaker very firmly states their certainty in that their proposed solution is effective, thus assuring the audience and showing deep commitment to the issue in question.

(18) *In that way we are able to produce more food using less land, less water and less energy, we **strongly** believe that by applying our funding on plant biology to the crop industry, we would be able to reduce the impact of agriculture and making our food system more sustainable. (PE-1)*

The use of boosters between the presenters of different science fields in this corpus does seem to indicate what was already noticed by other scholars. The softer sciences are more careful with using boosters to show certainty, whereas the harder sciences feel a need to use them in order to pertain their authority and present their research as sound.

4.2.4. Hedges

As already mentioned in the data and methods part of this paper, hedges are act in an opposite way to boosters. They are used in order to decrease certainty towards a proposition in cases, for example, when a fact is contested, the findings are not completely conclusive or when one is actively avoiding making a too broad generalisation. Depending on specific situations, hedges can be critical, especially in academic discourse. Table 3 shows that hedges were used most frequently by speakers of life sciences, whereas the use of hedges by speakers of social sciences & humanities was in the middle and the speakers of physical sciences & engineering used them least frequently. According to log-likelihood test, presenters in life sciences used hedges significantly more frequently than their colleagues in physical sciences & engineering, with the log-likelihood score of 7.9, and only slightly more than social sciences & humanities, with the log-likelihood score of 2.3. It is hard to say why life sciences' speakers in particular used hedges most, when at the same time they also used boosters, which have an opposite effect, most. The first speculation was that, like in example 19, combinations of hedges (*so far*) and boosters (*show*) could have been used frequently but that did not prove to be true.

(19) *Results obtained **so far show** that our treatment fully restores neuron maturation in the hippocampus in adolescent mice. (LS-3)*

A more likely conclusion, then, goes in accord with what was already said about the general use of stance within the three science fields. Namely, it seems that the only explanation could be that hedges were most popular because of a couple of reasons. Firstly, in life sciences' presentations, many issues discussed by the presenters were of a more sensitive nature. The topics were concerned with subjects like mental health issues, cancer treatment, advanced surgery and pregnancy among others. The topics in the presentations within physical sciences & engineering and social sciences & humanities, on the other hand, had more to do with issues related to the environment, politics, history and other relevant issues that were of less immediate concern to health. It is natural, then, that the presenters in life sciences tended to more carefully make claims, like in example 20 where the speaker uses a common hedge, *could*, to refrain from misleading their audience into believing a perhaps yet not fully proven consequence.

(20) *And exposure to these compounds, even if their concentration is sometimes lower than in conventional cigarette smoke, **could** lead to the worse scenario. (LS-6)*

Secondly, stance markers in general were used much more frequently in life sciences. That, as already mentioned, might be cause why the presenters discussing health-related issues need to be clear, precise and show an authority within their field of study.

Comparing to previous research, Hyland (2008), analysing the use of stance markers in soft and hard sciences' research articles, found hedges to be used much more frequently by writers within soft sciences. In addition to that, the aforementioned study also found that hedges were by far the most frequent stance marker. This drastic difference could be attributed to, in my opinion, genre. It is safe to say that research papers are an immensely different genre from 3MT presentations. This is supported by the findings of Jiang and Qiu (2021) who also found hedges to be among the less occurring stance markers in 3MT presentations. Thus, it is entirely possible that, in the genre of 3MT presentations, speakers are less likely to use hedges for several reasons. The very short time limit pressures the speakers to present their studies as quickly as possible, thus being more straightforward in their phrasing. Also, as pointed out by Carter-Thomas & Rowley-Jolivet (2020), it is a competitive and promotional genre, the presenters in 3MT competitions are more likely to choose a braver approach when it comes to discussing the issues that drive their studies, their methods and their findings. All of that, of course, is done in research papers as well but their comparatively lengthy format allows for scholars to have a more detailed and precise discussion.

Hedges, though occurring least frequently among the other stance markers, did give interesting insight into 3MT presentations analysed for this study. The relative scarcity of hedges might be due

to the short format of the presentations overall. Between the science fields, though, life sciences' presentations stood out as using hedges most frequently and that might be due to the fact that the speakers were dealing with sensitive subjects and there was need for the scholars to establish authority.

4.3. Distribution of individual engagement markers between science fields

Moving onto engagement markers, as was shown in table 2, engagement occurred only slightly less frequently than stance markers in the corpus of this study as the difference yielded a log-likelihood score of 1.6. For comparison, Jiang and Qiu (2021) found engagement markers to overall occur much less frequently than stance markers and interpreted this difference to show speaker's lack of confidence in communicating their PhD studies to non-specialists. In the present study, however, such difference was not observed, perhaps showing that engagement is an important part of University of Bologna's 3MT presentations. This could be better supported by the fact that engagement markers most often occur less frequently in written academic texts like research articles (Hyland 2005) or their abstracts (Alghazo et al. 2021). In spoken academic discourse, like 3MT presentations, however, as pointed out by Yang (2014), the fact that one is speaking to a live audience influences language use where the speaker naturally refers to their listeners much more that they would refer to their readers in a written text. Thus, the use of engagement markers being only slightly less frequent might be indicative of the genre specifics of 3MT presentations that are influenced by its format.

Despite the fact that engagement markers were rather frequent in the corpus, occurrence frequency numbers of individual engagement markers, where one type of marker occurred much more frequently, point to some interesting tendencies. The distribution of individual engagement markers is shown in table 5 below and they will be discussed in greater detail in the next sub section.

Table 5. Distribution of engagement markers

Type of stance marker	Social sciences & Humanities		Physical sciences & Engineering		Life sciences	
	Raw frequency	Per 1000 words	Raw frequency	Per 1000 words	Raw frequency	Per 1000 words
Hearer mention	120	28.8	107	29.1	75	19.7
Questions	26	6.2	13	3.5	14	3.7
Appeals to shared knowledge	4	1.0	10	2.7	5	1.3
Directives	2	0.5	7	1.9	5	1.3
Personal asides	0	0.0	0	0.0	0	0.0
Total	152	36.5	137	37.3	99	26

4.3.1 Hearer mention

As the most frequently occurred engagement marker, hearer mention is a very good indication of the dialogic nature of 3MT presentations. Generally, it seems that engaging with the audience through inclusive first-person and second-person personal pronouns was a defining feature of 3MT presentations analysed in this study. To compare to other studies, Okamura (2009) as well as Lee and Subtirelu (2014) found the same pronouns to also be highly popular in university lectures. Hyland and Zou (2022a) found hearer mention to be used very frequently in winning 3MT presentations. It does seem to suggest that hearer mention is very widely used in spoken monologic academic discourse in general. As for the presentations studied in this paper, I would speculate that the 3MT contestants presenting their PhD studies wanted to establish a more personal connection to their audience in order to achieve their promotional goals.

The uses of hearer mention were not the same as they ranged from more to slightly less personal in how close they placed the listener to the speaker. In example 21, for instance, the speaker directly addressed the audience in asking them to *look in* their *pockets* which is rather personal and places the listener in a very close proximity to the speaker. In example 22, on the other hand, *we need oil* refers to the listener less personally, as part of society. Both uses, however, do address the listener and place them in the middle of the subject and effectively make them a participant.

(21) *Hello, I would like to start by asking **you** to look in your pocket. **You** will probably find a smartphone. (PE-8)*
(22) *And, well, there is one big drawback, as **you** said, **we** need oil, petrol, to make plastics and that's an issue because **we**'re running out of it and because it's bad for the for the environment. (PE-5)*

The generally high number of occurrences, similarly to the use of self-mention, did suggest a deeper look into hearer mention.

Table 6. Hearer mention markers by person

Type of marker	Social sciences & Humanities		Physical sciences & Engineering		Life sciences	
	Per 1000 words	%	Per 1000 words	%	Per 1000 words	%
We, us, ourselves	17.5	60.8	21.8	74.8	12.3	62.7
You, your, yourselves	11.3	39.2	7.4	25.2	7.3	37.3
Total	28.8	100	29.1	100	19.7	100

Table 6 above shows how hearer mention occurred in first-person inclusive we, us, our and ourselves or in second-person you, your and yourselves. Similarly to examples 21 and 22, it can be seen that in presentations of all sciences at least a quarter of hearer mention used was in second person, drawing the listener closer to the speaker. Furthermore, what seems to be rather logical is that

the presenters of social sciences & humanities both proportionally and by frequency of occurrence used second-person hearer mention the most. This suggests that the speakers in social sciences & humanities could be more reliant on the discussion of the academic community which is something that was also observed by Hyland (2005) in his study of genre differences between research articles in soft and hard sciences.

Continuing on to how hearer mention was used among the different science fields, as can be seen in table 5, life sciences' presentations contained the least number of hearer mentions and that number was statistically significantly lower than in presentations of both social sciences & humanities and physical sciences & engineering, with both log-likelihood scores of 6.9. Judging from this number alone, life sciences' presenters felt a lesser need to include their listeners in the dialogue that they were leading. Jiang and Qiu (2021), on the other hand, did not observe the same differences, perhaps leading to believe that University of Bologna's 3MT life sciences' presenters in particular were less prone to use hearer mention. With the use of stance markers that were already discussed in mind, it might suggest that life sciences' speakers were indeed more focused on their own authorial persona and building a carefully crafted argument that is suitable for their specific context, than including their audience as part of the discussion. Speakers of social sciences & humanities and physical sciences & engineering, then, seemingly drew their listeners into the discussions as more active members in order to gain their attention and perhaps even approval.

4.3.2 Questions

As another important way of building rapport and dialogue with the listeners, questions were the second engagement marker that occurred rather frequently but much less so than hearer mention. In fact, questions occurred significantly less frequently than hearer mention as log-likelihood test score for the difference between the two in the whole corpus was 192.9. This might be due to the fact, as Hyland and Zou (2022a) point out, that thought questions help speakers present their monologue as dialogue and create a discourse where the listener is an integral part of the discussion and their opinion is respected, the effect of questions is used sparingly due to being rather invasive and showing unnecessary authority. Despite that, questions appeared at least once in 24 out of 30 presentations and were among the most noticeable ways to engage the audience among all presentations.

Though systematic way of differentiating types of questions did not present itself, probably due to the limited size of the corpus, several more distinctive ways of using questions were noticed. In example 23 the speaker uses questions to formulate and present the main theoretical issues in their subject while in example 24 the speaker uses questions to address the audience from up close, both starting a discussion in terms of the issues they are dealing with in their study and the issues that the audience should be very well aware of. Questions like these were a key part of presentations,

establishing a connection to the audience and engaging them with well versed and relevant issues. Combined with the perspective that questions are a powerful tool but should be used sparingly, presenters can make use of questions during key moments of their presentations, such as while introducing the main issues related to their research.

(23) *Is the consumer the subject, or rather the object of a specific political action? And what is the relationship between gender and consumption? (SH-2)*

(24) *Do you feel responsible for the climate change? Do you want to heal your planet? Do you want to protect your environment from pollution? (SH-6)*

In addition, there was a difference between how often the speakers of different science fields used questions. Though statistically significant difference was not found between the numbers for use of questions presented in table 5, it is arguably due to the size of the corpus. Having that in mind, analysis of a higher number of presentations might show more significant differences in the use of questions. Nevertheless, questions occurred almost twice as frequently in social sciences & humanities' presentations. Together with the fact that similar results were found by Jiang and Qiu (2021), where questions were found more often in soft sciences, it is entirely possible that questions are more characteristic of the soft sciences. This goes in accord with what was found in the previous sub-section, where social sciences & humanities were found to be more dialogic and reliant on academic community to find agreement.

4.3.3 Appeals to shared knowledge and Directives

Appeals to shared knowledge and directives were the least frequently occurring engagement markers in the corpus of University of Bologna's 3MT presentations. They are being discussed together, unlike the other markers, because their infrequent use does not offer many conclusions about the genre of 3MT presentations or the differences between how speakers of different science fields used them.

Appeals to shared knowledge, being a marker that helps the addresser stress the apparent consensus on an issue, are often infrequent in both spoken register (Jiang and Qiu 2021) and in written register (Hyland 2005, McGrath and Kuteeva 2012). The effect that these markers can have could be rather persuasive, as illustrated in example 25. Here, the presenter stresses a very general issue that their audience surely already knows. It would be hard to argue that *we* are not *living in a world that is facing a lot of challenges* but the fact is that the presenter uses an appeal to shared knowledge to give the impression that everyone in the audience is already thinking about that, which might not actually be the case. In this way, the speaker emphasizes a sharedness of a fact that might or might not be something that everyone agrees upon in order to persuade their audience.

(25) **We all know** *that we are living in a world that is facing a lot of challenges and one of the biggest is to produce more food for an increasing population while using less resources. (PE-1)*

The differences between how presenters in the three science fields used appeals to shared knowledge were not found to be statistically significant, comparing social sciences & humanities with physical sciences & engineering where the difference was greatest yielded a log-likelihood score of 3.5. Seemingly, the presenters in physical sciences & engineering did use appeals to shared knowledge more frequently, perhaps showing that there was more need to stress the sharedness of some facts but this difference, according to log-likelihood test, might be due to random occurrence.

As mentioned already, though, the effect of appeals to shared knowledge was persuasive but not frequent. Thus, it might be safe to say that appeals to shared knowledge were most probably unnecessary because of already employing other engagement markers, namely hearer mention and questions. Also, they could have appeared less frequently because stressing the sharedness of a fact, especially a scientific one, when presenting to a non-specialist audience might not seen as a useful move as it could potentially alienate the audience.

Similar conclusions could be drawn about the use of directives. As can be seen in table 5, they occurred even less frequently than appeals to shared knowledge. Example 26 shows how directives can be used to address the audience with the use of verbs in the imperative mood. The explanation in example 26 is a rather effective one and with the use of a directive, the audience could be more engaged and likely to actually imagine and understand the concept of *polymers*.

(26) *Okay, **imagine** one Lego brick is 1 molecule. And just like molecules, you can stick two Lego bricks together. You add some and couple of hundreds and you get a castle. That castle is a polymer, a very large big molecule made of many small ones. (PE-5)*

The differences in the use of directive by the presenters of the three science fields were also not found to be statistically significant. With the greatest difference in their use being between the presenters of social sciences & humanities and physical sciences & engineering, log-likelihood score was 3.6. Though physical sciences & engineering's presentations contain most directives, conclusions could hardly be drawn knowing that the difference of use might be random.

As already mentioned, directives were used very scarcely across the whole corpus and their effect seems to be unnecessary for these kinds of presentations. Interestingly, Jiang and Qiu (2021) found directives to occur more than two times as often in 3MT finalists' presentations as they did in the corpus of this study. This comparison could lead to the conclusion that directives are one of the markers that are used more often by more skilled presenters because the effect they offer is rather strong and engaging.

Overall, both appeals to shared knowledge and directives were not favoured by University of Bologna's 3MT presenters and no statistically significant differences between their uses across science fields was found. However, the effect they can add to a presentation can be engaging and persuasive. Thus, in order to successfully present one's PhD research in a format such as 3MT, it would be useful to make use of these markers.

4.3.4 Personal asides

The last engagement marker to be discussed in this section of the paper is personal asides. They did not occur in the corpus of this study and there might be a reason for that. Personal asides are a way of interrupting the speech or text in order to give a more personal comment that could offer more context. In essence, they are slight digressions, and they can be rather lengthy. Personal asides are perhaps among the most elusive and rare engagement markers. They are found rarely in lengthier academic texts such as research papers (Hyland 2005) and in short spoken academic texts such as 3MT presentations (Jiang and Qiu 2021; Hyland and Zou 2022a). Where they occur more often are genres such as motivational speeches which are lengthier and less formal (Farnia and Shirzadkhani 2023). In my opinion, personal asides did not occur in this corpus due to the fact that they require more time within a presentation, which the presenters are very short of and they offer extra context which might be necessary in a more spontaneous spoken genre but 3MT presentations are very well prepared and recited so as to condense a massive piece of research into three short minutes.

5. Conclusions

The aim of this study was to analyse how stance and engagement markers were used in University of Bologna's 3MT presentations and whether there were differences in how they were used by speakers of different science fields, social sciences & humanities, physical sciences & engineering and life sciences.

To begin with, University of Bologna's 3MT presentations did contain a substantial number of cases of both stance and engagement markers, showing that the effects offered by them were important for the presenters. In general, the presenters of all three science fields used stance in similar frequencies. Life sciences' presenters used stance most often and the presenters in social sciences & humanities and physical sciences & engineering used stance less often but a statistically significant difference was not identified, leading to believe that stance, and thus the effect of communicating the speaker's opinions, feelings and certainty, was almost equally important for presenters of all three science fields.

Engagement, on the other hand, was used rather differently in the presentations of the different science fields. Presenters in social sciences & humanities together with their colleagues in physical sciences & engineering used engagement markers significantly more frequently than life sciences' presenters. This leads to a conclusion that creating a connection to the audience, creating an impression of a dialogue, instead of a monologue, and manipulating information in order to make it seem already agreed upon was more important for the presenters in social sciences & humanities and physical sciences & engineering.

As for the use of individual stance markers, self-mention was found to be the most frequent. Self-mention markers showed that it is important for the presenters to establish their presence to be seen as reliable and experienced scholars, further promoting their research. Significant differences in the use of self-mention markers between different science fields were not found. Furthermore, two types of self-mention were identified, 'I', referring to the speaker as a sole author, and 'we', referring to the presenter as part of a team of researchers. Their use showed that life sciences' and physical sciences & engineering's presenters referred to themselves in the plural more often due to the fact that they often work in teams of researchers whereas social sciences & humanities' presenter did not use such pronouns showing that their research is done individually.

Attitude markers were used to offer the speakers' personal outlook on the issues at hand but this effect was used rather less frequently, only to very specifically focus on what the speakers wanted to be more emphasized. Significant differences between the use of attitude markers between presentations of the three science fields were not found. Boosters were not used very frequently but

they did help presenters show particular certainty in key moments, such as the methodology used or the severity of the issue tackled. Life sciences' and physical sciences & engineering's presenters used them significantly more often, leading to a conclusion that being determined and certain in one's methods was important in the two fields. Hedges were used a similar amount as boosters and their use indicated that only at critical moments, such as when dealing with a sensitive issue, speakers made use of them to appear more academic and careful in making claims. This is supported by the fact that life sciences' presenters used hedges significantly more often, as the issues they were presenting were mostly concerned with life threatening health conditions and ways of treating them.

Concerning engagement markers, the use of hearer mention, by far the most frequently occurred engagement marker, pointed to the presenters' need to include their audience in the dialogue in order to catch the listeners' attention and make them relate to and understand the issues presented. Life sciences' presenters used hearer mention significantly less often that social sciences & humanities' and physical sciences & engineering's presenters. This could mean that social sciences & humanities' and physical sciences & engineering's presenters were more concerned with creating a feeling of connectedness in order to engage their audience. It was found that presenters used two sub-types of hearer mention, first-person inclusive 'we' to refer to the audience as part of the academic community or society and second-person 'you' to refer to the audience alone. There were slight differences between how the different pronouns placed the audience in relation to the speaker. 'You' was more personal, placing the audience in closer proximity and 'we' was less personal, referring to the audience as part of the academic community or society, which created greater distance. The use of the sub-types between the science fields showed that presenters in physical sciences & engineering used second-person pronouns least often compared to social sciences & humanities' and life sciences' presenters, indicating that the proximity within the communication where the audience is placed is not the same in the three fields. Presenters of social sciences & humanities and life sciences did tend to refer to their audience in second-person pronouns more often, building a close relationship with them.

Questions were the second most occurring engagement marker. They helped connect to the audience and to engage in a dialogue in order to pique their interest. Though they were used most frequently in presentations within social sciences & humanities, no statistically significant difference compared to the other two fields was found. As statistically significant difference was found, on the other hand, to the general use of hearer mention, showing that questions, though occurring in most presentations, were used sparingly. This is thought to be due to the fact that questions' effect on presentations can be rather strong and even intimidating but used in smaller amounts, they can help presenters grip their listeners' attention at the time when it is needed. Appeals to shared knowledge

and directives were used scarcely, possibly due to the temporal limits of the genre, but their use was seen to have a positive effect on the presentation, suggesting that making good use of them could be a useful strategy for the presenters. Concerning their use within the different science fields, no statistically significant differences were found. Lastly, personal asides did not occur in the corpus, mostly due to the fact that the 180 seconds that the presenters have to promote their research is not enough time to have a digression to explain the broader context of an issue. Also, because personal asides could occur more spontaneously whereas 3MT presentations are very carefully crafted in order to successfully compete and to fit into the tight time frame.

Finally, the limitations of this study became a little more noticeable while analysing the less frequently occurring stance and engagement markers. The relatively compact size of the corpus meant that some markers could not be subdivided into clear types and some frequency numbers were harder to compare as a more robust statistical analysis does require a large data set. Thus, for a continuation of studying stance and engagement in 3MT presentations, I would suggest a larger dataset when the possibility arises. As for this moment, there are few organisations that reliably upload the recordings of 3MT presentations onto the Internet and there are even fewer who do that in larger quantities apart from the ones connected to the University of Queensland whose presentations have already been analysed rather exhaustively. Lastly, the results of this study could be applied in understanding how effective academic presentations are and should be given and, especially if further analyses are carried out, such knowledge could be applied in order to help the academic community improve their presentation skills.

Summary in Lithuanian

Sakytinio akademinio diskurso tyrimai pastaruoju metu tampa vis populiaresni ir vis daugiau tyrėjų renkasi analizuoti įvairius ir gana skirtingus sakytinio akademinio diskurso žanrus. Trijų minučių disertacijos, sutrumpintai vadinamos 3MT, yra prezentacijų žanras, kuriame doktorantai varžosi tarpusavyje, savo disertacijios tyrimo pristatymui turėdami viso labo 180 sekundžių. Didžioji dalis klausytojų auditorijos nėra pristatomų temų ekspertai.

Pastaraisiais metais šis žanras susilaukia vis daugiau dėmesio, tačiau didžioji dalis iki šiol atliktų tyrimų analizavo gimtakalbių, anglų kalba pristatinėjusių doktorantų, prezentacijas 3MT žanro gimtinėje Australijoje. Siekiant prisidėti ir papildyti 3MT žanro tyrimų lauką, šiame darbe tiriamosios prezentacijos, pristatytos Bolonijos Universiteto 3MT konkursuose. Tyrimui pasitelkiama tekstynais pagrįsta kiekybinė ir kokybinė analizė bei Keno Hylando (2005) metodologinė prieiga, kurią sudaro autoriaus pozicijos raiškos ir santykio su klausytoju kūrimo žymiklių sistema. Tyrime naudojamą tekstyną sudaro 30 transkribuotų 3MT prezentacijų, kurios atstovauja tris mokslo sritis: socialinius ir humanitarinius mokslus, gyvybės mokslus ir fizikos bei inžinerijos mokslus (po 10 prezentacijų iš kiekvienos mokslo srities).

Tyrimo rezultatai parodė, kad autoriaus pozicijos raiška ir santykio su klausytoju kūrimo būdai yra pasitelkiami beveik tiek pat dažnai ir vaidina svarbų vaidmenį analizuotose prezentacijose. Lyginant mokslo sritis, autoriaus pozicijos raiškos priemonės buvo pasitelkiamos panašiai dažnai visų sričių mokslininkų, o tai rodo, kad autoriteto kūrimas ir atsargus teiginių pateikimas buvo svarbus visų sričių tyrėjams. Santykio su klausytoju kūrimo žymikliai buvo gerokai dažnesni socialinių ir humanitarinių mokslų bei fizikos ir inžinerijos mokslų prezentacijose. Galima teigti, kad būtent šiose mokslo srityse yra didžiausias poreikis pritraukti klausytojus, sutelkti jų dėmesį ir perteikti savo monologą kaip dialogą, taip siekiant klausytojų pritarimo. Atskirų autoriaus pozicijos raiškos ir santykio su klausytoju kūrimo žymiklių analizė parodė, kad gyvybės mokslų prezentacijose, labiau nei kitų sričių prezentacijose, buvo svarbu pateikti gerai apgalvotą argumentą, kuriame perteikiamas ir autoriaus tvirtas įsitikinimas, ir atsargumas. Tai buvo ypač akivaizdu tam tikrose situacijose, pavyzdžiui, aptariant su žmogaus sveikata, rimtomis ligomims, bei jų gydymu susijusius tyrimo aspektus. Socialinių ir humanitarinių mokslų prezentacijose, kita vertus, buvo pastebimas didesnis noras sukurti artimą ryšį ir dialogą su klausytojais, nes argumentavimas yra dažniau grįstas samprotavimu ir nuomonėmis. Galiausiai, tyrimo rezultatai galėtų būti pritaikomi padedant doktorantams bei kitiems akademinės bendruomenės nariams ekeftyviai pristatyti savo tyrimus 3MT ir panašaus žanro prezentacijose.

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Appendix 1. List of presentations by panel according to ERC Work Programme 2023

Presentation	Title	Panel
Social sciences and Humanities		
SH-1	Crossing borders through books. Angelo Fortunato Formiggini	Cultures and Cultural Production
SH-2	Consume austerely. The Seventies and the paradigm shift	The Study of the Human Past
SH-3	Climate Change, Social Justice and Intersectionality in Contemporary Women's Speculative Fiction	Cultures and Cultural Production
SH-4	Automatic Study of Symbols in Cultural Heritage	Cultures and Cultural Production
SH-5	Punic Metrology Studies: Templar Architecture in the Central Mediterranean	The Study of the Human Past
SH-6	Buy Our Products to Save Your Environment	The Human Mind and Its Complexity
SH-7	Living with cancer: illness experiences and patient empowerment practices	The Social World and its Diversity
SH-8	Populism as a political battlefield: populist actors and their representation on social and legacy media during the European Parliament elections 2019 in Finland, Italy, and The Netherlands	Institutions, Governance and Legal Systems
SH-9	A Computer Simulation of the Brain and its Disorders to Study the Action Recognition System	The Human Mind and Its Complexity
SH-10	Internet Fragmentation and Digital Sovereignism: A Perspective on China and Global Internet Governance	Institutions, Governance and Legal Systems
Physical sciences and Engineering		
PE-1	Strategies to Increase Resource Use Efficiency in Vertical Farms with Artificial Light	Earth System Science
PE-2	Innovative strategies for the mitigation of acrylamide and other toxicants content in different food products	Earth System Science
PE-3	Satellite images and information technologies to cope with climate change	Earth System Science
PE-4	The Positive Aspects of Climate Change: Water Savings and Higher Fruit Quality	Earth System Science
PE-5	Novel Polymers from terpenes	Synthetic Chemistry and Materials
PE-6	Functional properties of chitosan films modified by snail mucus extract	Materials Engineering
PE-7	Don't Cheat So Fast!	Mathematics
PE-8	Hydrogen production in membrane reactors	Physical and Analytical Chemical Sciences
PE-9	TARMA models as a key to the interpretation on of dynamical phenomena	Mathematics
PE-10	Silicon Nanocrystals shine light on nanomedicine	Synthetic Chemistry and Materials
Life sciences		
LS-1	Pre-Pregnancy Diet and Vaginal Environment in Caucasian Pregnant Women	Physiology in Health, Disease and Ageing
LS-2	Wearable Sensors and AI To Automatically Assess Pain	Prevention, Diagnosis and Treatment of Human Diseases
LS-3	Is It Possible to Improve Intellectual Ability in Down Syndrome With a Pharmacological Treatment During Adolescence?	Neuroscience and Disorders of the Nervous System
LS-4	Fractal geometry for the analysis of cerebral complexity in magnetic resonance imaging	Prevention, Diagnosis and Treatment of Human Diseases
LS-5	Ibuprofen-Cromolyn co-drugs as polypharmacological tools for Alzheimer disease	Prevention, Diagnosis and Treatment of Human Diseases

LS-6	Electronic Cigarettes: What Are the Risks?	Prevention, Diagnosis and Treatment of Human Diseases
LS-7	Vaginal Microbiome for the Preservation of Women's Health Using Food Strategy	Prevention, Diagnosis and Treatment of Human Diseases
LS-8	Ovarian Cancer: Would You Place a Bet on an Innovative Therapeutic Strategy?	Physiology in Health, Disease and Ageing
LS-9	Expanding the Benefit from Immunotherapy in an Aggressive Type of Lung Cancer	Physiology in Health, Disease and Ageing
LS-10	A New Therapeutic Approach Against Helicobacter Pylori Infection	Cellular, Developmental and Regenerative Biology

Appendix 2. The corpus of University of Bologna's 3MT presentations

Hedges – light blue

Boosters – dark blue

Attitude markers – bright green

Self-mention – dark green

Reader pronouns - yellow

Questions - olive

Appeals to shared knowledge – purple

Directives - teal

The corpus of University of Bologna's 3MT presentations, compiled for this paper, is provided below with the different stance and engagement markers coded in colours provided above.

Number	Social Sciences & Humanities
SH-1	Good morning. At the beginning of the 20th century, Angelo Fortunato Formiggini, an Italian publisher, founded his publishing house on an idea. Books could unify readers beyond rates, religion and culture. For him, what all people, what we have in common is irony, the capacity to laugh at life and at ourselves. That was the aim of his most famous collection, classics of numerous literature. But his dreams were bigger. He took part in World War One and realized that irony was not a powerful enough weapon. People must find a way to coexist in peace, and the only way to do that was mutual knowledge. We tend to be afraid of different cultures because we don't know them, and what you don't know, you usually fear. So, he decided to spread Italian books and, with them, Italian culture beyond Italian borders, so other countries could know Italy better through them. What about me? I'm fascinated by how this publisher, an absolute beginner, managed to reach such a wide audience abroad, pushing his books toward the United States. You may think he was just a greedy businessman. Good point. The truth is, you spent much more money than he gained, and he struggled hard to contact scholars, institutions, newspapers all over the country just to help people going past mutual differences by reading and learning about each other. I traced down the connection between him and the largest library of Italian studies in America, the Italian House of Columbia University, New York, an institution created to help American students and scholars to learn about Italian culture. So, what better place for him to reach to fulfill his goal? Well, I analysed the Italian House Library and I found out Formiggini's books on its shelves until now. So somehow, in those difficult years, with fewer resources and money than others, his desire for peace through mutual understanding was so strong that he managed to reach the American dream. Unfortunately, he was a Jew in between the rise of the fascist government, which didn't share this idea of equality. 1938 Russian laws, all Jews were forbidden to run businesses and Formiggini, couldn't continue

	running its publishing house. For that he took his own life. But what had left us? The idea that we can fight war by fighting ignorance? We can use books as bridges through different cultures to create a world where people, by reading about each other, learn how to respect and accept one another. Formiggini didn't live long enough to see that happen, but hopefully with his example, knowing him, we might. Thank you.
SH 2	Good afternoon. Let's think about what comes to mind when you hear the words consumption and consumerism, and when people call you a consumer. We use these words every day, especially in an era in which we need to face up to new, urgent responsibilities related, for example, to climate change. However, we often take the meaning of these words for granted. But in truth, consumption is a history, and a very complex one. This is the focus of my fields of study. To analyze our consumption, the role of consumption in shaping the citizens' social political identity. Is the consumer the subject, or rather the object of a specific political action? And what is the relationship between gender and consumption? These are just some of the questions that we, consumption historians, ask ourselves. My specific focus is on the relationship between austerity and consumption in Italy during the 70s. The 70s. So that, I mean, the end of the so-called Golden age. The 70s, were marked by two energy and economic crises. The first one took place in 1973 and led to a series of austerity policies and by social and political turmoil, and thus represent a crucial decade in Italian history. It is in those years that the environmental issues became of public concern, and in those years Italian consumerism was born. However, despite its significance, this period is in part understudied by consumption historians. First, one of my aim is to help filling this gap. Specifically, I analyze, on the one hand, how a selection of prominent Italian enterprises, namely Eni, Fiat and Enel reacted to the crisis and the challenges of the newly born consumer society. On the other, I explore how different cultural tendencies that constituted Italian society back then interpreted those changes and their own role within that social context. And this is leading me, to this end, I am currently investigating mass culture through magazines and advertisements, and what is emerging is that there was a really strong debate around topics such as austerity and consumption, and that's leading me to deconstruct some common, but maybe not entirely right images that we have of the 70s. To conclude, the overall aim of my research is not only to deepen our knowledge of the 70s, but, more importantly, to reconsider the struggle between austerity and consumption in modern Italy. First, shedding light on what consumption has meant and means. And that's important because understanding consumption and our role as consumers and more importantly, as citizens, is the first step towards a new and more responsible global economy. Thank you.
SH 3	Good evening, everyone. Imagine a broken planet like the one you've just seen in my slide. A planet which is constantly hit by devastating climate events and people live in a perpetual state of disaster preparedness. A planet in which some people have the ability to manipulate and control the Earth. And finally, a planet in which two women have the power to save the world from climate apocalypse and racial injustice. I'm talking about the Broken Earth trilogy by American science fiction writer M.K. Jemisin, but you may have read some parallels with our current situation. This trilogy, indeed, is a perfect metaphor for the Anthropocene and for climate change. Plus, it places gender and environmental racism at its center. Switching from fiction to reality, we are living in the so-called Anthropocene, this new epoch in which humans, the anthropos, human footprint on the planet has become pervasive enough to constitute a distinct geological change and has become a major threat to the environment, and there's a high level of scientific consensus on that. But what do gender and race have to do with climate change? And what does literature have to do with climate change? My PhD project seeks to answer these two questions using a climate justice perspective and an environmental humanities methodology. These frameworks understand environmental crisis not as a mere techno-scientific problem, but also as a question of socioeconomic inequality, cultural difference, and so on. The Anthropos, after which geologists have named the current epoch, doesn't seem to have a class, a race, a gender, a nationality. But the climate crisis isn't the product of human nature as a whole. Both human responsibility for climate change and vulnerability to environmental harm are unevenly universal. Minority groups, women, indigenous communities, low income people are the ones most severely affected by natural disasters. To give you some data, women and children are 14 times more likely to die in ecological disasters than men, and this vulnerability is not innate but it's a result of inequalities produced by gender roles, discrimination, and poverty. So how to convey this information to a wide and non-expert audience and to create an ethics for the Anthropocene? One possible way could be literature, given its potential for creating an empathetic awareness of climate injustice in the ones who are not yet experiencing the effects of global warming first hand. So what I'm doing is looking at climate fiction, so novels about climate change, novels written by feminists, postcolonial and indigenous authors that challenge these hegemonic discourse of the Anthropocene, suggesting that the impact of catastrophes is not gender neutral nor colour blind. I can read a question in your eyes, how can literature save the world from climate change? It probably can't. But it can help us to elaborate a consciousness of the Anthropocene that takes at its core structural power imbalances, suggesting that we can't solve the problem of climate change without a deep transformation in society. Thank you.
SH 4	Do you know why it takes about 5 seconds to find out that Climt is the author of The Tree of Life and it takes a little bit more than an hour, if you're lucky, to find out the common symbolic elements between that painting and Spring by Miller? The answer is that general information such as title or creator or date of creation are currently computer processable. That means that web users can answer their curiosities and at the same time

scholars can use the data about those fields to highlight connections between cultural heritage objects. But in my research, I want to make sure that also symbolism can be computer processible. And I do that because I argue that the most interesting connection lie on a deeper symbolic level when it comes to cultural heritage. But, in order to break this so-called symbolic wall, I need the correct tools. The set of tools that I've chosen are logical models that can be understood by humans and processable by machines because they are written in a language that is machine readable. That language is called OWL, the Web Ontology Language, and I've used it to develop a model to describe symbolism as a series of relationships between a symbol like a beach, its symbolic meaning like marriage, and the context in which the symbolic meaning exists, like, for example, the Chinese context, I have converted the content of dictionaries of symbols using my model and I've generated a data set that contains more than half a million statements about symbolism that are both understandable by humans and computer processible. I'm also working on a second model to describe art interpretation in three layers, because, for example, when you look at the painting, you may see a tree and then you recognize that the tree is the tree of life and then you associate a symbol to the tree because you know the cultural context in which that painting was painted. By combining these two models, I can automatically generate context dependent interpretation of artworks. And this is very important because I can highlight how cultures can share symbolism and I can also highlight the uniqueness of some cultures. For example a bat, the animal is a symbol of luck in both Polish and Chinese cultures, but it is a symbol of rain in a Native American culture. With the results of my research, I can also create a platform in which both art historians and people passionate about art can ask questions and generate interpretation about the paintings that they may love and they can also use my data to connect paintings based on symbolism and you can also ask a question, such as, can you give me two paintings that depict a tree and contain a symbol of death? And the use of my research can also go beyond a single individual because, for example, cultural institutions may use my research to add new symbolic meanings to their artifacts in their collections, or my results can also help them curate their own collections based on symbolism. But, I mean, the possibilities are endless once you break the symbolic wall. Thank you.

SH 5	Man has always measured the world. We measure it to explore it, to interact with other men, to understand their present and to plan for the future. Human society therefore needs to share the measurement system to ensure the stability of organized coexistence. For the modern school are the definition of measurement system is crucial to understand the economic and administrative dynamics of control of the ancient community. Since the beginning, measurement system have been developed from intuitive concepts, the part of the human body definition. Punic civilization, also had to have a conventional units of measurement, but the absence of written sources constitutes a significant obstacle to their full understanding. The Phoenician Punic system cannot be traced back to a singular unit. We need to recognize the adoption of several units influenced by Mesopotamian and Egyptian influences. The aim of my research is to attempt to reconstruct the Punic measurement system started from that, extrapolated from the preserved architectural emergencies, in particular Templar buildings, located overall in the central Mediterranean, with a particular focus on Sardinia. Using a published reliefs, I collected metric data from singular blocks to the total dimension of a structure. Then, I use a digital processing of this data in a geographical information system to have an holistic reading and to verify which kind of land cubit is used in that specific area and that specific period. But what are the potential of these numeric data? They can reveal us about how the building was designed and technical level of the ancient architect and the cultural ties between different agents, the clients, the architects and the workers. And it is so crucial for those unique sites in North Africa, Sardinia and Sicily that have undergone romanization processes. We can understand the strength of local architectural tradition and the adaptation of Roman models. Finally, what begins to emerge is the presence of a meteorological tradition, maybe with an identity character, perceived as a priority over other factors and in tendency from the ancient community to perpetuate its own canals even in different periods. Thank you.
SH 6	Do you feel responsible for the climate change? Do you want to heal your planet? Do you want to protect your environment from pollution? If yes, we could help you. All you have to do is buy our environment friendly product. It is nicely compacted with natural ingredients, however it is little expensive. Sounds strange? This is how you are encouraged to buy eco-friendly products because you feel responsible, you want to feel good about yourself and the environment and you may want to correct the mistakes which have caused damage to this environment. This realization is exploited for commercial purposes and you are deceived by... you are deceived by a marketing strategy called greenwashing. In other words, you buy a certain company's products and they help you protect your environment in return. In this way, climate change is sold under an environment-friendly take. You find a lot of products claiming to be sustainable, green, organic and eco-friendly and you are also asked to make the conscious choice. My study analyzes such advertisements from an eco linguist prospect to reveal the exploitation the big companies make. An ecolinguist concept called ecosophy, which is an ethical and a scientific framework is employed as a tool to show that these advertisements not only make a lot of money but also promote consumerism and promote in consumerism and centrality of human beings. My study reveals that these advertisements are designed to mislead the customers and undermine the scientific facts. So what does my study do? My study spreads critical language awareness. It helps buyers differentiate and distinguish between misleading green washing and real green

advertisement. What is green advertisement? Green advertisement does not undermine scientific facts. It is not designed to deceive the customers. It is friendly to the environment and is supported by scientific research. So next time when you buy something, you will know whether you are buying climate change or real green products. Thank you so much.

SH 7	Receiving a cancer diagnosis is a traumatic event in someone's life, but different people can have a different approach towards a cancer diagnosis. Some can develop a more proactive approach and take a cancer diagnosis as a battle that they want to fight and they want to win. Others can feel hopeless or more fatalistic. The different approaches that we have towards the cancer diagnosis can depend on different factors such as the network of relationships that support the cancer patient like family and friends, or the relationship with the body, or the trust we have in the healthcare system or the relationship with the doctor. All of these factors have profoundly changed in the past few decades. So if we take, for example, the doctor-patient relationship. If we think about it, when we don't feel well, what's the first thing we do? We check our symptoms on the Internet. And then when we go to the doctor, we think that we already have an idea of what we might have or what exams we need to take and so on. Before the arrival of doctor Google, we would just go to the GP and ask and trust him. So now trust in the medical knowledge is not something taken for granted anymore and the relationship and the trust between doctor and patient is something that needs to be built every day. Cancer patients now have also the opportunity to share their illness experience online on cancer blogs and meet other people who have the same disease and share knowledge and share experiences and difficulties. So this is what is called lay knowledge, which means the knowledge of someone who is not an expert but has experience on something and he's learning by experience. So all of these, so the doctor-patient relationship is just one of the examples of all these factors that are actually changing right now. So, when we build health care policies, we need to take all of these things into consideration, so this is why it is important to study how these factors are changing and to build practices that promote the empowerment of cancer patients. Empowerment means being able to have a sense of control over the disease and be active in the management of your health. The next question is, is the healthcare system ready?
SH 8	What is populism? This concept we hear about when we open the TV or radio or just take our cell phone out to listen to watch the news or listen to a podcast. According to political scientist Muda, we are living in populist times and indeed populism was chosen as the word of the year by Cambridge Dictionary in 2017. Some scholars have called this concept a slippery, spectral and even sexy, whereas Mueller has said it's one of the most misinterpreted concepts of our time, indeed many scholars have not reached a consensus, whether it's an ideology, political style, logic or performance. But why should we care? Why should you care? Well, the populist victory trap is undeniable at the moment. They have doubled their mean vote share in the last 50 years in Europe from less than 7 per cent to 14. And if you look across the Atlantic to the US or to India or even Israel, we can say that populist radical right parties are part of the mainstream. If you look at my home countries, Finland or Belgium, the mere presence of populist parties are shaping policy and here in Italy we have two populist parties in the government at the moment. In my research, I acknowledge the concept of populism to the contemporary definitions and approach it in the hybrid media system. To put it simply, I observe what populism is in the legacy media, which refers to TV, radio and newspapers and the digital media, in this case Twitter. Legacy media and digital media are part of the same hybrid media system even though they follow a different logic. My data consists of 10s of thousands of tweets from Italy, Belgium and Finland and hundreds of newspaper articles from each three countries. The focus point is the European Union elections of 2019, and these countries have been chosen because the prominent populist presence in the countries and, of course, because I also comprehend and speak these languages, so I will not need translation. I will propose to contact, I'm conducting a content analysis using mixed methods and within the research questions you can observe from my slides I will see how populism, but also populist actors and non-populist actors emerge from legacy media and digital media. These results so far have already provided and shown us how in the hybridization of the media system, populist logic has been created and also how populist communication has been observed, created and retweeted. I hope that the initial and their last results will also show us and give us an answer to the debate whether populism is a threat to democracy or not. And maybe the next time an angry mob tries to storm a Parliament house, provoked by populist actor and digital media, we will be more prepared. Thank you.
SH 9	One of the best ways to understand the brain is to build one. The recent progresses in neuroscience and artificial intelligence have led to the discovery of the principles that answer to some of the fundamental questions concerning the functioning of the brain and behaviour, such as why do we have a brain, how does it work, and why sometimes it doesn't work properly. Today, we can formalize this concept to create different computer simulation of many different brain systems. In my project, I applied this idea to create a simulation of the neural systems that encodes our ability to understand the intentions and the meaning of other people's actions. The system is essential for everyday social interactions because it allowed to predict and respond properly to others' behaviour and importantly to learn by imitation. The neuropsychological research have demonstrated that this system can be compromised at different level. For example, damages in one area of the brain can lead to an impaired understanding of the meaning of an action, while damages in another area can lead to an impaired recognition of the kinematics of an action. Indeed, we can reproduce these differentiated

deficits in our simulation by creating virtual damages that impair the artificial brain ability to understand the action. We can then compare our simulated results with the real clinical population, observing how the manipulation of specific parameters correlates with the severity of patients' damages and deficits. From this comparison, we can then, from this comparison, we can then formulate generate predictions about the devolution of the damage and formulate targeted treatments to improve the remission of the deficit. At last, by looking at the efficacy of these predictions and treatments, we can further improve the design of our simulation. My idea is that from this process we can bring about a virtuous cycle of constant improvement between the clinical application and our understanding of the brain. The more we refine our simulation, the more we can compensate to more severe deficits as we comprehend the rules that govern our brain and behaviour and we come closer and closer to the building of a true human like artificial intelligence. Thank you.

SH-10	Will the Internet fragment? Do we have to expect strong influence on the rules and norms of the Internet from the Chinese government? Will we be able to communicate seamlessly between one corner to the and another of the world through the Internet as we do in our days in 10 years time? These are questions that are debated on a daily basis on global media. However, how much of this is pure geopolitical talk? Now, through interviews with people engaged first hand in Internet governance in making Internet standards, with technologists in particular, who possess a technological knowledge that mostly people, including myself, don't have, I try to reconstruct what is going on. Now, of course, there's good and bad news. The evidence is mixed. On the bad news end, we can see that the unknowns on the relation between the Chinese government and Chinese private stakeholders such as Huawei are still unknown. However, what emerged through interviews with technologists is a dialectical relation between Huawei and the government, between Chinese stakeholders and the government, one where the space for private actors to act autonomously. Although the governmental role is still there and it's still strong. And on the fragmentation side, actually, evidence is better than we usually think. It's true. China is censoring the Internet. Censorship in China is stronger and stronger. It started with the Golden Shield project. It went up to Facebook, Google, WhatsApp in 2017. However, this is happening because Chinese companies are becoming global, they are becoming global players and this exposes the Chinese government to external pressure to external information influxes. After all, Huawei will not want the Internet to fragment, they will not want different protocols to be applied on one corner of the world and another protocol elsewhere, because this will mean having to produce different devices for different markets. So, for the government not to lose the advantages of having such a strong player like Huawei, they recall to censorship. But that kind of censorship is there because Chinese stakeholders are interested in keeping the Internet unified. And this is all for me. Thank you.
Number	Physical Sciences & Engineering
PE-1	Do you know what we do when we run out of space? I'm sure you do if you have been living with flatmates who didn't want to wash the dishes and once the sink become full, they start stacking the dishes one on the top of each other. This way of stacking, exploiting the vertical dimension, is also what we do in vertical farms, but this time to grow plants for food. In a vertical farm we can grow a lot of crops in a small area. And this is possible thanks to the use of cultivation shelves one on the top of each other. In this way we can really optimize the space and we can reduce the pressure on our land. We all know that we are living in a world that is facing a lot of challenges and one of the biggest is to produce more food for an increasing population while using less resources. To produce all the food we need, we can continue impacting the land, causing water shortage, reducing the biodiversity and decreasing the quality of the soil. To make this system work we need mainly 3 input. We need land, also building a farm, we need water and we need energy. If we look at the picture we can see that there is something missing compared to a traditional cultivated open field and this is sunlight. All the light that is the driving force for photosynthesis in a vertical form is coming from an artificial lighting source. Basically, from a lamp. In this way we can grow crops thanks to the combination of knowledge in plant biology and the use of advanced lighting technology that allow us to control all the property of the light, such as the colour, the duration and the intensity. In that way, we can reproduce what happened outside with the sunlight. But we know from our experience that sunlight is not always constant and it can change according to the season, the region or the time of the day. What I found with my research is that by providing to plants shedding conditions, such as the ones that occur in a forest or at the end of the day just before the sunset, plants can grow faster and more. In that way we are able to produce more food using less land, less water and less energy, we strongly believe that by applying our funding on plant biology to the crop industry, we would be able to reduce the impact of agriculture and making our food system more sustainable.
PE-2	Good evening to everyone. Now I would like to take your attention on food safety importance. There are common foods such as fried potato, bakery products and coffee drinks that are very very delicious. Also, thanks to high temperature processing that induced chemical reactions, very important to develop the main sensorial properties. Nevertheless, the same heat treatments are responsible for the formation of toxic compounds. One of those is acrylamide, classified by the International Agency for Research on Cancer as probably cancerogenic to humans. So you may easily understand how it is important to focus on this problem because all these kinds of foods are commonly consumed worldwide due to their sensorial properties as well as their important nutritional value. Since the discovery of acrylamide presence, institution and regulation

have become more and more restrictive concerning acrylamide levels allowed in foods. In fact, following the scientific opinion, the European Commission regulation on 2017 established acrylamide mitigation measure and benchmark levels for the food industries. So far, several techniques have been proposed for acrylamide reductions. Unfortunately, these strategies are not easy to apply at industrial scale. Moreover, most of these negative influence the organic and nutritional properties of final products. So the challenge of my studies is to find positive solutions for acrylamide mitigation with an holistic risk benefit approach. In particular, I'm focusing on the moderation of time-temperature conditions of coffee during coffee roasting on the application of new formulation and alternative cooking system for bakery products and on the use of innovative pretreatments like post-electric fields before frying the potato chips. All these strategies are very promising because it can be potentially applied at industrial scale to bring safe foods on our plates without losing the desired taste and flavour. Thank you very much for your attention.

PE-3	Agriculture is facing terrible consequences from damaging. Last year, severe droughts affected many countries across all over the world. As a result, millions of farmers lost their others. Climate shock like this can compromise the local and the global food security. But with the use of satellite images, it is possible to forecast broadband and tell which field will need more water. Authorities managing water and agriculture could use satellite images together with information technologies to help farmers in preventing losses from climate change. For example, if a drought is forecasted, the water authority could enforce rules to plant drought resistant crops and forbid irrigation where it's not strictly needed. But, what if the forecast was wrong? What would happen in case of false alarm? Would it cause farmers to get hungry? These are the doubts that make water authorities sceptical and limit the adoption of information technologies in agriculture. The research I'm carrying out aims at defining a decision model to understand when and how to use such technologies. To do so, I'm working together with water authorities across Europe and in developing countries. The implementation of my decision model showed the first results. If the accuracy of the forecast is above predefined thresholds, preventive action can be implemented and water is delivered only to the field with the crop which are more thirsty. Losses due to climate change are mitigated, more stable harvests are guaranteed across years to farmers, and finally, the environmental impact of irrigator agriculture is reduced. I estimated the benefits of such decision model to be around €100,000 per year in each water authority considered. Up to the 40% of the water used every year in agriculture can be saved, but such results are not to be considered individually. They are a further step in the achievement of a secure and safe access to food and water in those years and those countries where water is always and always more precious and limited. Thank you.
PE-4	Have you ever thought that climate change could bring also positive aspects? For sure, climate change is challenging the agricultural sector since the higher summer temperatures lead to higher plant evapotranspiration and this water lost by the plant needs to be restored by irrigation. But, unfortunately, water is a scarce resource and contented among different productive sectors. The purpose of my PhD is to understand how a plant reacts to a 50% irrigation decrease and which are the effects on food quality. In this spring and summers, I constantly monitored in the field several physiological parameters such as the photosynthetic level or the three water fluxes, trying to evaluate the plant status in the most objective way. In apple, results show that plants can afford a period of water stress and that fruits maintained the same level of quality in terms of crunchiness, sugar content and even nutritional value. Moreover, those fruits were able to keep those quality characteristics also during storage, while fruit that received a normal irrigation amount decreased their values. In conclusion, apple positively reacts to water deficit irrigation maintaining the same quality level. But in other species, such as apricot and sour cherry, the nutraceutical value of the fruits even increased. So where to from here? Well, at the moment, growers are paid on the basis of the fruit size they produce. The bigger the fruits, the higher the price. So, since water stress will produce smaller fruits, we need to change this rewarding system and towards a new one in which we pay for the quality. In this case, we can say that less is more. Thank you.
PE-5	I am Ulisse and my project is novel polymers from terpenes. By show of hands, who knows what a polymer is? OK, not bad. You know Lego, the plastic bricks? Okay, imagine one Lego brick is 1 molecule. And just like molecules, you can stick two Lego bricks together. You add some and couple of hundreds and you get a castle. That castle is a polymer, a very large big molecule made of many small ones. OK, and we can do amazing stuff with polymers. As you know, all plastics are polymers. And, well, there is one big drawback, as you said, we need oil, petrol, to make plastics and that's an issue because we're running out of it and because it's bad for the for the environment. And this is why we're all looking for alternatives such as terpenes. Terpenes are a group of molecule found in several different kind of plants and that makes them our renewable resource. Another advantage of terpenes is that we already make a lot of them. Take the fruit, the orange juice industry. To make orange juice, you take an orange, you squeeze it and you throw away the peel. It turns out, from orange peel you can obtain that molecule, that terpene limonene and we drink so much orange juice that we produce 60,000 tonnes of limonene each year. And in my group we decided to use it as our little Lego block. And we decided to make a whole range of polymers out of it. In particular, I focus on amphiphilic polymers. They are formed of two parts, one which likes water, it's hydrophilic, and one that doesn't, it's hydrophobic. This kind of polymers can help dissolve things. For example, you know that drugs don't dissolve well in water, right? So, with the use of amphiphilic polymers, we can dissolve your drugs into the

	bloodstream and let them do their work. So, let me just sum up all I've said. In my PhD, I took some biomass waste and I recycled it to make polymers, in particular, amphiphilic polymers, which are used, as we said, for drug delivery, but also to make soaps and cosmetics. And the whole reason we're doing this is that if we can manage to replace the old polymers with renewable ones, then we will save quite a lot of oil. Thank you.
PE-6	My PhD project focuses on the research of a new biodegradable and sustainable material able to replace the plastic films that are currently on the market. In fact, today imagining a world without plastic seems impossible, but actually they're large scale production and their widespread use occurred only from the end of World War 2. Just think that half of all plastics ever manufactured has been made in the last 15 years. And the 50% of all plastics is used only once. Why is this a problem? Because plastics are not sustainable, they are derived from oil and they are very hardly biodegradable materials. But you know that we have a plastic island reminding us of that every day. The research is moving towards the search of bioplastics instead, which are biodegradable materials called biopolymers that derive from renewable sources. However, this is very challenging, and the progress is at the industrial level are very slow because the production costs are very high, but because their properties are still not enough competitive with those of plastics. In my project I used chitosan as biopolymer since it is the second most abundant one on Earth after cellulose and because it is derived from shrimp and crab shell, so that we can give new life to the food industry waste. A strategy to improve the properties of bioplastic, making them competitive for replacing plastics is to introduce in their composition some natural extract and I combine chitosan with snail slime. Snail slime is a natural extract that was employed already in the ancient Greece because it's adhesive, antibacterial, emollient, protective and today is also an ingredient of several cosmetic and parapharmaceutical products. I spent quite a lot of time trying to find a good recipe, but at the end I obtained 100% natural and biodegradable film which showed, actually, very good properties and in addition it also preserved some of the peculiar properties of the snail slime being antibacterial and adhesive. These properties make these films very versatile and interesting material so that we patented this formulation and we are sure that they are very suitable candidates for replacing plastics not only in the food packaging applications, but also in the cosmetic and in the pharmaceutical sectors. Thank you all.
PE-7	I suppose that many of you at least once in your life have done a test for the assessment of abilities such as a university admission test or a language placement test and some of you may also have done such a test on a computer, where given the answer to a question, the next appears immediately on the screen. Well, you must know that behind many of these computer rights test there is a very complex statistical algorithm that will select next question based on the answer given previously. In this way, with a few hundred questions from the database, the statistical algorithm could build in real-time different tests for thousands of students. However, there are several misconducts called cheating that make this job completely worthless and lead to incorrect ability estimation. Of course, already exists statistical method to estimate the probability that someone is a cheater, especially to see if they come into possession of the correct answers. However, these are methods that can only be used after the test has ended. And most importantly, in order to be sure that they are cheating, multiple tests are usually done, such as oral tests that takes long time and is not terribly feasible, especially in large scale tests. So what? Well, I have developed a method to detect cheaters during the test, so it's possible to intervene immediately. And to do that I get help from a very powerful ally that is easily available during a computerized test, response time. In fact, it is recognized that cheaters tend to answer more faster than average time needed. So, I use the difference between the actual response time and the average response time for each question to define a statistical index for each test taker, which can be calculated in real time by the statistical algorithm and which indicates the probability of being a cheater. When this probability becomes large enough, we must take action. But how? Of course we can't just stop the test and invalidate it because we might be wrong. So, I have trained the statistical algorithm that, when you find a person with a high probability of being a cheater, we start to select next question for that person from our secure database that contains question that has never been used, so as to drastically reduce the probability that the cheater come into possession of the answer of those items too. But be careful, more secure doesn't mean harder, in fact, and this is really important. My final goal was not to punish the cheater, but instead, let's say, counterbalance the cheating effect. In this way, I have increased the probability of correctly estimating the true ability of the cheater while still maintaining the fairness of the test. And all this thanks to the statistical algorithm and response time. So remember, don't cheat, so fast.
PE-8	Hello, I would like to start by asking you to look in your pocket. You will probably find a smartphone. Now, think when you came here you probably came by bus or by car. This invention have something in common. They both need energy and in fact in the world where we live today, energy and life are strictly related. However, we are in a period in which we need to face a crucial decision about energy. We need to choose between fossil fuels or renewables. The first choice, fossil fuels, is very easy for us because we know we have to find petrol, we still have quite a bit of it and we know how to take out energy of it in a really good way. However, this choice is making out to the destruction of our world. We are providing climate change and pollution. And, going on with this route is like being a heavy smoker who knows he's providing cancer to himself. The other choice is more challenging because we can take energy from renewables or from biomasses, for example, but we are not able to do it in a continuous way. We have some periods where we

can get a lot of energy and some periods where we don't have enough. But, now we need something where we need when we can store the energy that is found in in biomasses. And this something is hydrogen. Hydrogen is a molecule that can be directly produced from biomasses, and we can store the energy of biomasses in the chemical bonds of hydrogen. And now, once we have hydrogen, we can transport it somewhere else and we can use it to produce energy in something like fuel cells, so we can get electricity production or we can also run a car with it. So my PhD study is devoted to the development of hydrogen production processes from biomasses and from bio gas, and in particular I look into two things which are catalysts and membranes. A catalyst is a material which is able to speed up hydrogen production, so we can produce hydrogen in a faster way with a catalyst. A membrane instead is a setup which allows us to produce pure hydrogen, and pure hydrogen is fundamental for energetic applications. Moreover, it can allow us to produce hydrogen with a lower energy cost, which is fundamentally an energy production process. And in particular, I tried to look into the nature of catalyst and membrane, what stands behind them in order to understand how to make this process cheaper, because I think that the only way to make people choose hydrogen over petrol is to make hydrogen much cheaper than petrol. Thank you very much.

PE-9	Good afternoon everyone. So predicting the outcome of the next financial bubble, understanding the spread of a disease, designing and equipment for deaf people. These are just three different situations where we can use the TARMA models analysed in my thesis. TARMA models are a nonlinear models that allow to describe many dynamical phenomena. They are based on the threshold principle introduced in 1978 by Howell Tong. When the phenomenon crosses a threshold, then the dynamic changes. This can be seen in this figure where there are two threshold that identify the lower green regime, the red middle regime and the yellow upper one. TARMA models have a great descriptive power, but the theory behind them is very complex. In fact, the research has been stuck for 25 years due to unsolved probabilistic and statistical challenges. My thesis solves such open problems by mean of new theoretical approach. So now, the result can help solving big problems such as understanding the climate change due to the sunspots. The time series sunspot is one of the oldest recorded time series and it is a proxy for the magnetic activity of the sun. Many researchers agreed that sunspots and solar wind could be playing a role in climate change. Here, we can see that TARMA model allowed to identify the red region of stability in the solar cycle, and this is a very important information for identify the climate change. Thanks for the attention.
PE-10	Good evening everybody. I would like to focus the attention of you all on two important keywords in my slide which are medicine and light. Since there is a unique relationship between them too. Surgeons, for instance, have to shine light on the patients to see what they have to operate. Actually, light allows them to see what they currently don't see. Well, medical books have plenty of illustrations where everything inside the human body is color-coded. So, in this way, it's very easy to distinguish between the different tissues. Unlikely in real life everything is red. So here is my question, is there a way for surgeons to immediately, in real time, understand where the tumour is? Well, the answer is yes. Thanks to luminescent materials, we can inject them inside the human body and they can react with tumour cells, so they can create a new chemical bonds. Now, human cells can emit light and it's easier in this way for surgeons to understand where the tumour is and they can remove it. So this is how light-guided surgery works, and this is where chemistry meets medicine. Chemists are making a lot of efforts finding new luminescent materials. So now I can tell you that my research is focused on the synthesis of such materials which are called quantum dots or nanocrystals. Quantum dots are usually made of cadmium or lead which are toxic elements. I'm trying to improve in these systems using silicon quantum dots. Silicon is cheap, health abundant and non-toxic elements widely used in the electronic industry nowadays. By approaching the nanoscale dimensions, silicon shows new interesting properties such as the luminescence. So, irradiating silicon nanocrystal solutions with ultraviolet light, we can observe the luminescence and the emitted colour can be is different depending on the different size of the silicon quantum dots. We can also program them in order to mark both the tumour and the nerves. So in this way, if we choose two different sides silicon nanocrystals, the two different tissues can emit two different colours, and in this way the surgeon can, in real time, immediately understand he can recognize them too and he can remove the first one by preserving the second one in what we call active targeting. So, all of this with silicon nanocrystals. Thank you.
Number	Life Sciences
LS-1	In this period we feel like we are living in a dystopic world, so every time we hear the word microorganism, we can feel a sense of anxiety or even fear. But today I would like to change your perspective in just three minutes and let you know that some microorganisms could be our best friend if we take care of them. Indeed then, do you know that friendly bacteria can support us in the most beautiful moments of our life? And, in particular, are you aware that vaginal bacteria have a key role into the pregnancy outcome? This is what my PhD project is about. In normal pregnancy, women have a high number of good vaginal bacteria called lactobacilli. In contrast, abnormal bacterial composition is associated to a pathological state, as, for example, bacterial vaginosis that can lead to pregnancy complications as miscarriages or pretend birth. So, in this context, the biomedical scientists are looking for new strategies to better understand how we can modulate the vaginal microbiota composition. When I talk about vaginal microbiota, I mean all the bacteria that all together lead into the vagina. And so let's now back to me. The goal of my study is to correlate the vaginal

microbiota composition to the pre-pregnancy nutritional habits. In fact, it's a well known diet have a key role into the health of women and their babies but little is known about the role of the diet in vaginal microbiota modulation. So the aim of my project is to improve the knowledge about how we can limit pregnancy complications, tailoring our vagina microbiota. Preliminary results are very interesting and, let me say, even comforting, especially for Italian women who are in love with pasta. In fact, a pre-pregnancy diet rich of carbohydrates is associated to healthy vaginal microbiota composition. On the other hand, a diet rich of animal proteins is associated to abnormal vaginal bacterial composition and so can bring to pregnancy complications. At last but not least, you should keep in mind that women, overweight at the beginning of the pregnancy, are at increased risk to have abnormal microbiota during pregnancy. And so my research is still ongoing and I hope that my results could be able to better understand how we can correctly feed them both us and our special bacteria. Thank you all.

| LS-2 | Have you ever heard or said you can't understand the pain I'm feeling? I guess that some of you can relate to this sentence. Globally, it has been estimated that one in five people suffer from pain, and currently the only way that person has to communicate it is by his voice. But although we try hard to put into words, our vocabulary can never fully describe the pain we feel because it is intrinsically complex as it results from the activation of a net of cerebral regions involving emotions, past experiences and attention. Imagine then, those who cannot even use their voice and are therefore forced to suffer in silence, such as newborns, cognitive-impaired patients or people in coma. As a consequence, pain may not be treated adequately, lasting longer and leading to frustration, anxiety, and depression, factors that, in a vicious cycle, worsen the feeling of pain. However, even if we are not able to completely describe pain, our body involuntarily produces evidence signs of the experienced pain. The heart changes its pace, sweat increases, the temperature rises and falls, the way we move is altered. All these signs can then represent a new window on pain, eliminating the need to communicate it by voice. Such manifestations have been studied for decades and today we are able to exploit them thanks to two unprecedented conditions. The availability of wearable sensors, nowadays daily used by millions of people, which can continuously record our physiological state everywhere. And the exponential development of artificial intelligence algorithms, which allow analysing patterns that are invisible to the human eye. To properly and automatically assess pain through the use of wearable sensors and artificial intelligence algorithms, there is the aim of my PhD project. Several challenges need to be addressed and which I'm working on, such as finding the optimal combination of those physiological parameters that best describe pain in a reliable way, or understanding how the baseline physiological state changes throughout the day. Or also other factors related to both health and personal conditions can play a role in modifying the pain response. This innovative system would have a significant impact on patients suffering from pain, giving a tool to clinicians to monitor pain when and where it is actually experienced, gathering information to personalize the antalgic therapy and consequently bring in relief more quickly with the ultimate aim of ameliorating the quality of life of that one in five people suffering from pain. Thank you. |

| LS-3 | Do you remember Robin Williams standing on a school desk in the movie Dead Poet Society, right? Well, I watched that movie when I was 15 and I was impressed. To grow or succeed, you always have to be able to change your perspective. Changing, however, doesn't mean losing sight of the fulcrum of your story, and that is more or less the central idea of my PhD project. I bet all of you know what Down syndrome is. But I also bet if you know how the brain of a person with Down syndrome looks like. In short, there is an alteration in neuron generation and maturation, imagining the brain as a forest and each neuron as a tree, in Down syndrome, there are fewer trees that are also less branched. Considering this, the facts are early, appearing during foetal life and infancy, early pharmacological interventions are critical, but I guarantee you, at the same time, that it's very hard to transfer the testing of a drug to a child, or worse, to a pregnant woman, even if that drug is effective and safe in mice. And that's why it's essential to change perspective. My PhD project is based on the idea that adolescence is still a crucial time window for neuron maturation. Therefore, we tested a treatment in a Down syndrome mouse model during this period. Consider the considering the results are transferable to humans with less risk. But what kind of treatment? We bet on a natural molecule to reduce side effects as much as possible. And this molecule has a really complicated name, 7,8-Dihydroxyflavone, but you can find it in really simple things such as fruits and vegetables, so it's supposed to be safe. Results obtained so far show that our treatment fully restores neuron maturation in the hippocampus in adolescent mice. Do you remember the last branched trees I mentioned before? Well, they become the giant redwoods they always should have been, and this improves memory abilities. Showing for the first time that it is not too late if treatment is started during adolescence. I hope this would lead to clinical trials with 7,8-Dihydroxyflavone in adolescents with Down syndrome, and maybe then, at a younger age, with an even greater impact. I'm going to leave you with this, goals are not achieved by stubbornly walking a straight road, you always have to be able to change your perspective and to face the curves. I believe in this idea. And what about you? Can you stand on a school desk looking at your life from a different perspective without betraying your own story? |

| LS-4 | I am Chiara and she is my wonderful grandmother. This was my last birthday party and I would like to add other special moments with my lovely granny. But she's getting old and the world population is getting old with an increasing onset of neurological diseases such as Alzheimer's and Parkinson's. Everybody in this room |

knows that this kind of diseases are very challenging for patients and their family, but also for the society which must improve medical and service at hospital. For this reason, it's very important to predict the onset of neurological diseases. Imagine now our complex brain as a tree, the red human tree in the slide where a lot of leaves have fallen down, could represent our old brain and, in some cases, our ill brain. The yellow one, instead, could be our adult brain, where a lot of leaves are still on side. But the complexity of the morphology has started to change, and it is in this moment that we would like to investigate deeper the complexity and the morphology of our brain. Nowadays, to study the morphology of the brain is used in Euclidean geometry. And I suppose that all of you are able to calculate the length of a straight segment, the area of a triangle or a volume of a cube. But this kind of geometry may capture morphological changes too, later. When the pathology is already present in the patient lives and in their family lives. So, during my PhD study, I have analysed the brain morphology using fractal geometry, a very useful tool able to describe complex object. Look at the brain and tell me, is a portion of the brain similar to the whole brain, isn't it? This property is the property of self-similarity and a lot of other natural objects presented, such as wall loop and Roman cabbage. The fractal dimension is the most popular index of the fractal geometry, and I have calculated it for our brain having available only a structural magnetic resonant image. The fractal dimension decreases with aging because our brain loses its morphological complexity and moreover it is able to predict the dementia before symptoms are clearly evident. So, fractal dimension could be a very important and useful tool to investigate our brain morphology deeper and able to predict illness onset. And, why not, it will allow me and all of us spend other nice birthday parties with our lovely grandparents. Thank you.

LS-5	Alzheimer's disease is the major cause of dementia worldwide and, as you probably know, if you have friends or relatives affected by this disease, it is still incurable. Probably the loss of an effective cure is due to the complexity and the multiplicity of the pathological processes involved in these diseases. For this reason, at the moment, a very promising strategy seems to be the polypharmacological approach. Polypharmacology means modulating simultaneously more pathways involved in the pathology by different drugs. So currently, the polypharmacological approach obtained by drug combination is under investigation in different clinical trials that are ongoing. You can see an example of them on the right side of the slide. In this case, Cromolyn and Ibuprofen are simultaneously administrated by two different pharmaceutical form in order to target new inflammation in Alzheimer's disease. That is one of the of the pathological processes involved in this pathology. Indeed the these two drugs are already in the market and have anti-inflammatory activities. In this case Cromolyn is administrated by united powder while Ibuprofen by oral drug. So also if this strategy is very promising, you can imagine how difficult could be for a patient of Alzheimer's disease remember the correct way and the correct number of every administration because the most important symptoms is the loss of memory. Moreover, is very difficult too take a powder for an Alzheimer's patient because an other symptoms is the loss of the coordination. So I'm a medicinal chemist and my project concerns a switch from a polypharmacological approach obtained by drug combination to a polypharmacological approach obtained by co-drug. What is a co-drug? A co-drug is a potential active principle obtained by the link between two drugs already known. So, in this case we can imagine to connect directly or by a linker Ibuprofen and Cromolyn and choosing, in the correct way, the chemical bind that to use to putting them together, we are able to obtain a potential active principle that can exploit the normal metabolism of the body in order to release the two drugs after one administration. So this is a way to overcome a limit of the polypharmacological approach that can be obtained by drug combination, because in this case we can hopefully use only one drug. Thank you very much.
LS-6	Globally, smoking is associated with an important increase in risk factor for various disorders, such as cardiovascular and respiratory diseases and also infections and cancer. So, tobacco smoke has been considered as a threat to health by World Health Organisation. To help replace conventional cigarettes, various devices have been designed. Among these devices, we find patches, chewing gum and electronic cigarettes. Electronic cigarettes can use different technologies. Some can vaporize a liquid and others can heat the tobacco, avoiding the combustion phenomenon. The use of electronic cigarettes spread widely because they have been considered as a way to help quit smoking and also a safer alternative than conventional cigarettes, but their safety has never been demonstrated. In latter years, researchers started to investigate about it and observe the presence of toxic compounds in vapor generated by electronic cigarettes. Compounds there are carcinogenic, such as formaldehyde and acetaldehyde. And exposure to these compounds, even if their concentration is sometimes lower than in conventional cigarette smoke, could lead to the worse scenario. The users of electronic cigarettes usually don't know the risks they're exposed to, and what's really concerning is that the youngs, they never smoked conventional cigarettes are appealed to electronic cigarettes mostly because of their aesthetics and also because of the variety of flavors that they offers. My thesis aim is to investigate the putative toxicological effects of the exposure to the vapor generated by electronic cigarettes. In this way, people could be aware of the risks that are exposed to and choose consciously how to stop smoking conventional cigarettes. Moreover, the government agencies could regulate health through appropriate laws. Thank you.
LS-7	Good afternoon everyone. Now I would draw your attention in the main aim of my PhD research that is highlighting the production of high quality and functional dairy gender foods conceived as an innovative food

strategy to promote women's well-being. In this time, food can be perceived not only to satisfy younger but also to directly contribute to consumer health. Most specifically functional food, as a dietary strategy to reduce human illness could affect human health also in relation to the gender. In fact, the recent studies have highlighted the anti-candida and anti-chlamydia activities showed by some probiotic microorganisms such as lactobacillus crispatus and lactobacillus gasseri. So, also the dairy products such as fermented milk and cheese could represent excellent carrier of probiotic bacteria also widely appreciated by consumers for the good amounts in calcium, phosphorus and vitamins. Therefore, also in order to protect women from specific dysbiosis related to their gender, the purpose of my research is the development of high quality and functional dairy gender foods containing active lactobacilli with anti-candida anti-chlamydia and anti-foodbome pathogens activity that could represent an hedonistic strategy for ingestion of selective probiotics and also a valid alternative to pharmaceutical preparation. In this framework the tenant result fulfil three of the main criteria to include probiotics in a food system. First one the main compatibility with starter culture, second one is the maintenance of high viability also after the justice process also in order to express for the probiotic strain their specific functionality and the final one is the capability of the probiotic strain to impart to the final product good sensory properties. In conclusion, the principal outcome of my research would be the development of a commercial with high impact dairy gender food that could represent a great challenge for the female gender and also a useful contribution to innovate the dairy sector. Thank you so much for your attention.

| LS-8 | What do lightning, neon lights and the ionosphere have in common? The answer dates back to the 1920s, when the chemist Irving Langmuir first described and named the fourth state of matter, plasma, an ionized gas, full of charged particles like reactive oxygen and nitrogen species, but also provided an electromagnetic fields. Well known for its uses in industry and technology, its application to the medicine is subject of a relatively young discipline called plasma medicine. Important the research field is the application of this matter, the potential of plasma in oncology. Biological plasma activity is used as synergistic effect of their components, whose interaction both with the liquid cellular environment and cellular structures trigger two specific biological cascades in the cell. To delve into the mechanism by which plasma interact with the living system, the chemistry of plasma liquid interaction is definitely of help. Plasma activated liquid are produced by exposing them to high voltage electrical discharges, leading to the production of reactive oxygen and nitrogen species which can trigger cell death. We showed that in-vitro treatment using a plasma liquid treatment suitable to the clinics are effective against cells of ovarian cancer. This is one of the most lethal diseases in women due to its aggressiveness and poor prognosis, whose therapy often fails as cancer systems sets in. In this context, plasma activated liquid treatments seem promising as a new therapeutic strategy to be used in combination with standard therapies. Given the ability to act locally against cancer cells, preserving healthy tissue and thus limiting chemotherapy side effects. The biggest challenge in developing this potential targeting agent is to test it on a research model capable of mimicking the complex nature of ovarian cancer. In this regard, we established a reproducible ovarian cancer 3D model using excised tumour cultured and a perfusion by reactor and showed the efficiency of perfusion-based cultures in obtaining uniform tissue-like structures in a context of a dynamic and controlled macroenvironment. In this system we will produce a situation closer to the clinics where the treatment, the aforementioned treatment, could induce cancers of death with reduced damage on a surrounding healthy cells. We are fully convinced to place a bet on these innovative therapeutic strategy as an extra weapon to fight cancer. Thank you all for the attention. |

| LS-9 | Good afternoon. Thank you for the presentation. Cancer is one of the greatest challenges of modern medicine. The recently updated hallmarks of cancer have included the avoidance of immune system surveillance. Indeed, immune system has been protecting us from any kind of infection from viruses, bacteria and parasites for million years. The fact is that immune system also defends us against cancer, any kind of cancer. That is why people with dysfunction in the immune system are developed cancer more frequently and more easily. Immune therapy is a new kind of anti-cancer strategy that boosts immune system to fight against cancer, against cancer and provided impressive results in many hard to treat tumours. Lung cancer is the deadliest tumour worldwide. And, small cell lung cancer is one of the most aggressive cancer. For over 40 years, chemotherapy has been the only available treatments when tumour, once a small cell lung cancer spread outside of the thorax. Chemotherapy is very effective in shrinking deeply and rapidly tumours. But as fast as the tumour shrink, as fast it goes back, it gets back. These are true until a couple of years ago when immunotherapy showed to prolong the remission and survival time. But these were limited to a small subset of patients. So we asked how could we make immunotherapy work for more patients? There are factors within the tumour that inhibit and block immune system from working. There is a protein called VEGF, short for vascular endothelial growth factor, that is produced in great amounts in small cell lung cancer cells. As the name says, the main activity of VEGF is to build new blood vessels that feed the tumour. However, it has been showed also to prevent immune cells to get into the tumour to fight it. It comes out that there are many drugs that are able to block VEGF activity, however these have never been studied with immune therapy in small cell lung cancer yet. The idea is that blocking VEGF can make, can allow immune cells, boosted by immune therapy, to get into the tumour and fight it. So we decide that phase two clinical trial with of chemotherapy, immunotherapy and anti-VEGF therapy to investigate its efficacy in prolonging survival in |

	small cell lung cancer patients. The trial is currently ongoing 15 patients have been enrolled throughout Italy and the full results will be available when 52 patients will be enrolled and followed up for at least one year. Hopefully by the end of my PhD, being late 2022. Thank you.
LS-10	Have you heard about Alexander Fleming? He won the Nobel Prize in Medicine for his contribution to the development of the first antibiotic, penicillin. These revolutionary compounds alone have saved millions of lives since. Now, back then, if you had a patient with a suspected bacterial infection, you gave him the antibiotic and without really needing to know anything else about the bacteria causing the disease, most of the patients recovered. Antibiotics have contributed tremendously to our life expectancy and, a few decades ago, the notion was, we'll solve bacterial infections. It turns out we were wrong. We have extensive use of antibiotics. We are selecting the bacteria that can survive our pharmacological treatments. Today, we are threatened by so-called superbugs and in a recent study was estimated by 2050 ten million people could die every year for multi drug resistant infection. Helicobacter Pylori is one of these tiny monsters out there. Epidemiological studies show that Helicobacter has colonized the stomach of at least half of the world population, causing, sometimes, mild disorders that can result in peptic ulcer and gastric cancer. When a patient tests positive for a Helicobacter, medical guidelines suggest a combination of three antibiotics that can be implemented with a fourth when the first approach shows inefficacy. And this happens more and more often since Helicobacter evolves rapidly, developing resistance to the common antibiotics used. One of the innovative solutions to this huge problem is represented by small RNA-like molecules called PNAs or Peptide Nucleic Acids. These compounds can work efficiently and extremely narrowly against pathogens such as Helicobacter. But how, you may ask? Well, it's easy. You study the biology of the pathogen and then design PNA to target essential systems of the bacterium and silence it. Which means that we could be able to block the expression of genes that are vital for the pathogen and hence kill it. The identification of bacteria target is so accurate, it makes PNA a precise weapon against specific bacterial species. And we have good news, we may have found the right target, the switch of Helicobacter Pylori. With this biotechnology, we can easily design and adapt PNAs to target any kind of pathogens that are becoming more and more immune to our current therapies. Thank you.