How do universities tweet about research? Disciplinary variations in the content, stance and engagement strategies of University Research Tweets (URTs)

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Abstract

Research dissemination has recently undergone a profound transformation with the advent of many new digital genres. Some researchers now present and promote their research through academic tweets, conference tweets, and tweetorials, but little is known about how universities communicate about this research on X (Twitter).

Our aim is to investigate the functions and forms of University Research Tweets (URTs) and to explore potential differences in the way research is reported in Social Sciences and Humanities (SSH) as opposed to in Science, Technology, Engineering, Mathematics and Medicine (STEMM).

The corpus contains two hundred URTs published by high-ranking Anglophone universities in SSH and in STEMM. After carrying out a content analysis (identification of topics, purposes, moves, attachments, visuals and reader responses) across the two sets of tweets, we analyse the linguistic and multimodal resources used to express stance and engagement in the tweets, principally relying on Hyland's framework (2005) and Luzón's (2023b) adaptation of the model.

Results reveal that URTs share a number of organisational, semiotic and linguistic features aimed at promoting research within the limited space available. However, some disciplinary differences in the use of these features are identified. STEMM URTs are for instance more likely to contain traditional moves such as 'rationale' or 'methods', and adopt stance positions to underline authorial authority and highlight the importance of the research. SSH URTs try

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harder to engage with the reader through 'orientation' and 'action' moves, and the greater use of proximity-creating and attention-seeking resources. We conclude by proposing some future avenues of research.

Keywords: University research tweets, disciplinary differences, dissemination of research, stance, engagement

Resumen

¿Cómo tuitean las universidades sobre investigación? Variaciones disciplinares en las estrategias de contenido, posicionamiento y compromiso de los tuits de investigación universitaria

La divulgación de la investigación ha experimentado recientemente una profunda transformación con la aparición de un gran número de nuevos géneros digitales. Algunos investigadores presentan y promocionan ahora su investigación a través de tuits académicos, tuits de conferencias e hilos explicativos, pero se sabe poco sobre cómo comunican las universidades esta investigación en X (Twitter).

Nuestro objetivo es investigar las funciones y las formas de los tuits de investigación universitaria y explorar las posibles diferencias en la manera en que se informa sobre la investigación en dos grandes áreas disciplinares: Ciencias Sociales y Humanidades (CSH) y Ciencias, Tecnología, Ingeniería, Matemáticas y Medicina (CTIMM).

El corpus contiene doscientos tuits publicados por universidades anglófonas de alto nivel en CSH y en CTIMM. Tras llevar a cabo un análisis de contenido en los dos conjuntos de tuits centrado en identificación de temas, propósitos, movimientos, adjuntos, elementos visuales y respuestas de los lectores, analizamos los recursos lingüísticos y multimodales utilizados para expresar la postura y el compromiso en los tuits, basándonos principalmente en el marco de Hyland (2005) y en la adaptación de Luzón (2023b).

Los resultados muestran que los tuits de investigación universitaria comparten una serie de características organizativas, semióticas y lingüísticas destinadas a promover la investigación en el limitado espacio disponible. Sin embargo, se observan algunas diferencias disciplinares en el uso de estas características. Por ejemplo, es más probable que los tuits de CTIMM contengan movimientos tradicionales como "fundamentos" o "métodos", y que adopten un posicionamiento para subrayar la autoridad del autor y destacar la importancia de la investigación. Los tuits de CSH se esfuerzan más por atraer al lector mediante movimientos de "orientación" y "acción" y recurren en mayor medida a recursos de creación de proximidad y búsqueda de atención. Concluimos proponiendo algunas vías futuras de investigación.

Palabras clave: Tuits de investigación universitaria, diferencias disciplinares, difusión de la investigación, posicionamiento, compromiso.

1. Introduction

Research dissemination has undergone a profound transformation in recent times. Alongside traditional communication channels (journal publication of research articles, conference presentations, etc.), an increasing number of research-related activities are now conducted via digital media. This has led to the evolution of existing genres and to the emergence of many new or web-native forms of communication, including research blogs (Luzón, 2013, Mauranen, 2013), wikis (Myers, 2010), academic social network sites (ASNSs) such as Academia (Jordan, 2019), research group videos (Rowley-Jolivet & Carter-Thomas, 2023) and micro-blogs or tweets (Puschmann, 2014).

In this paper we focus on university research tweets[1] (or URTs hereafter) and more specifically on the use of X – formerly known as Twitter – by universities to disseminate information about individual or collective research projects. URT authors have the possibility of sharing their messages with a vast, theoretically unlimited, audience. Through its digital mediation, X provides them not just with an "inreach" tool for communicating with disciplinary specialists, but also with an outreach tool for influencing the media or other institutional bodies (Côté & Darling, 2018). Research tweets can also play a role in informing the public about science-related concerns and helping to "democratise" science (Luzón & Pérez-Llantada, 2019). We aim to examine how URT writers – who may be experts in communication, but not necessarily experts in the disciplines concerned –address this relatively unpredictable readership.

The second focus of our article is to explore the potential importance of disciplinary factors. Although there has been a recent influx of studies on the use of academic Twitter (Orpin, 2019; Luzón, 2023a, 2023b; Tardy, 2023) and its sub-genres – tweetorials (Graham, 2021), twitter conference presentations (Villares, 2022, 2023) – few studies have focussed on URTs from a disciplinary perspective. We will compare and contrast tweets from the STEMM fields (Science, Technology, Engineering, Mathematics and Medicine) with those in SSH (Social Sciences and Humanities) to identify the potential impact of disciplinary factors on their content, form and functions.

To what extent does the discipline affect the way URT authors position themselves and engage with their readership(s)?

In order to present and share information and promote research, writers need to develop strategies that best respond to the communicative needs of these publics. Tweets take place in a space-constrained context, which means they convey "small bite-sized pieces of information" (Rowley-Jolivet & Carter-Thomas, 2019, p. 82). The language and content must be selected so as to respect the limitations of the genre, whilst at the same time taking advantage of the technological affordances and the linguistic and semiotic resources available in order to attract and persuade the audience. The contrastive analysis proposed here aims to examine in detail how URTs enhance the visibility of research and engage with readers.

The organisation of the paper is as follows. We first briefly review the literature focusing on the general characteristics and development of X, before considering academic tweeting and its role in disseminating knowledge. We then present the corpus of research tweets collected for our contrastive study. The results and discussion section is divided into three sections: a) the content of the two series of tweets (topics and purposes, moves, affordances and reader responses), b) authorial stance and positioning (self-mentions and attitude markers), and c) engagement strategies (proximity-creating resources, attention-seeking resources and appeals to shared knowledge). We analyse potential differences between the STEMM and SSH corpora in each section and in a final part attempt to identify some useful avenues for future research that emerge from our small-scale study.

2. Background

Social media and particularly microblogging platforms play an increasing role in science and science dissemination. X is the most popular microblogging platform (Sugimoto et al., 2017). The platform was created in 2006 and achieved figures of 200 million active users in 2012 and nearly 400 million users in 2022, according to Villares (2022, p. 132). Any institution or person can create an account, and then use it to follow people or groups that they find interesting or post messages with a maximum of 280 characters. Due to the length constraint, users have developed strategies to express more complex ideas, such as the use of "threads" (the publication of a series

of consecutive and connected tweets) or the use of hyperlinks and attachments, and so provide access to longer texts. To publish a tweet on X, the user must be aware of its main affordances and technical features, namely how to categorise information (with hashtags), mention people (with the sign @ followed by a username), and add links and attachments or other multimedia content (thanks to URLs and embeddings). Interaction with other users is conducted by "retweeting" (republishing another user's tweet so that it appears in your own "feed"), liking (signalling a positive reaction to another user's tweet) or commenting (in the section below the post) (Darling et al., 2013).

For a researcher, publishing on X makes it possible to promote oneself and one's work (to increase research impact and personal influence), to obtain and share information in real time (to keep up to date, exchange ideas and resources), and to network with colleagues and peers (Büchi, 2017; Luzón & Pérez-Llantada, 2019). Furthermore, X can be used to increase the research impact of traditional forms of publication and to announce publications and conferences.

However, uptake of the platform by academics for professional purposes has not been systematic (Holmberg & Thelwall, 2014). According to the literature review on scholars' use of social media by Sugimoto et al. (2017) between 5 to 30% of researchers use X. This suggests that the landscape is still highly voluble and dependent on disciplinary domains and sample frame. In a recent study of French academic faculty use, Birch-Becaas et al. (2023) found that 22% of those questioned used X to disseminate their research to the general public. It seems likely that the form of new literacy required for publication on X might be an obstacle for some academics (Greenhow & Gleason, 2012).

Given the growing, albeit not resounding success of X in attracting researchers, and the fact that individual researchers and research groups still seem to struggle to reach a wider audience (Bombaci et al., 2016; Tardy 2023), we decided to look at the role of universities in the dissemination of research. Universities, like individual researchers, use X to share web resources and to promote their activities (Linvill et al., 2012). Mogagi et al. (2021) identify three missions for universities in their use of X: "recruit, retain and report". Kimmons et al. (2017) point out that universities use X for internal communication but also to a lesser extent as a "public relations tool" to reach other types of readers, such as prospective students, alumni or donors.

We therefore propose to investigate universities' preferred linguistic and semiotic choices in the dissemination of research. Studies of science tweets and institutional academic tweets have mostly been concentrated in communication and information studies, using approaches based on topic modelling, content analysis or network analysis (cf. Linvill et al., 2012). More recently, linguists have attempted to characterise the strategies employed in tweets and have turned increasingly to genre and linguistic analyses. Orpin (2019) focused on linguistic markers of proximity in tweets and reports by the European Health Agency dealing with epidemiology. Villares (2022, 2023) studied not only the structure, affordances, semiotic resources but also stance and engagement in "Twitter conference presentations" and Luzón (2023a) focused on intertextuality in tweets published by research groups in the field of medicine. Xu et al. (2023) focussed on engagement strategies in the twitter accounts of individual researchers.

However, none of the above authors (with the exception of Xu et al.) has looked at the impact of discipline on tweets. Is research in SSH disseminated in the same way as in STEMM? Holmberg and Thelwall (2014) compared the use of X by researchers in ten different disciplines, including both hard and soft sciences and showed that, depending on their discipline, researchers tweeted in different ways (e.g. biochemists retweet more and economists share more links) and for different purposes (e.g. researchers in digital humanities and cognitive sciences tweet in order to discuss a subject, while researchers in biochemistry, astrophysics and cheminformatics use X to share results, ideas and resources). Can the discipline also have an impact on content selection and on the stance and engagement patterns mobilised? In his cross-disciplinary linguistic study of research articles, Hyland (2001) suggested that soft sciences employed more strategies such as questions, pronouns, shared knowledge and directives to engage with the reader. Philosophers for instance used such resources on average ten times more frequently than biologists. Harwood (2005) found that soft disciplines used more inclusive first-person pronouns while hard sciences made greater use of exclusive pronouns in research articles. Stance and engagement patterns appear to be discipline-sensitive in other genres such as abstracts, theses or textbooks (Hyland, 2006). In recent research, Zou and Hyland (2020) have suggested that research blogs in soft disciplines make greater use of interpersonal strategies (such as reader pronouns, directives, questions) than science blogs. Do university research tweets also present cross-disciplinary variation?

Our research questions are summarised as follows: How do universities use tweets to disseminate research? What are the preferred linguistic and semiotic choices and is there a difference in research dissemination between the disciplines?

3. Corpus and methods

3.1. Corpus compilation

The corpus, compiled in 2023, contains two hundred tweets published by high-ranking universities. To make our selection we first considered the top twenty universities in the world according to QS World University Rankings® 2023.[2] This was then narrowed down by selecting only English-speaking universities that published in English on X the research results obtained by their researchers and research teams. Ten universities met these criteria.

For each university, the official X feed was accessed and reviewed. Tweets were only selected if both researchers agreed they could be categorised as URTs, that is a tweet published on a university X account, presenting recent scientific results obtained by a researcher or research team affiliated to these universities. Some of the tweets were in fact retweets from research group accounts (10.5%), but the content of most was original (89.5%). The tweets were published between April 2022 and April 2023. For each tweet, we decided whether it reported results in the fields of SSH or STEMM. In STEMM, the corpus includes topics in medical sciences, astronomy, biology, engineering and environmental sciences. Disciplines in the SSH corpus include history, education, business studies and sociology. The tweets were stored in two separate files, with each disciplinary corpus comprising one hundred tweets (see Table 1).

Name of the university	Number of SSH tweets	Number of STEMM tweets
University of Oxford	10	10
Cambridge University	10	10
Princeton University	10	10
Stanford University	10	10
The University of Edinburgh	10	10
Yale University	10	10
The University of Chicago	10	10
University of Pennsylvania	10	10
Cornell University	10	10
University College London	10	10
	Total= 100	Total= 100

Table 1. Composition of our URT corpus.

3.2. Methods of analysis

Our aim was to characterise the tweets as accurately as possible and to identify potential differences between the SSH and STEMM subsets. We first carried out a manual content analysis, identifying the topics as well as the main purpose(s) of the two sets of tweets (cf. Luzón & Pérez-Llantada, 2022). A contrastive moves analysis (Swales, 1990) was also proposed in order to identify the main rhetorical moves. Although scientific tweets are short, some form of moves analysis is clearly possible, since segments of the tweets serve precise recurrent communicative functions, akin to a certain extent to those present in a research article (Swales, 1990) or in academic soundbites (Rowley-Jolivet & Carter-Thomas, 2019). We manually identified eight moves on a subset of the corpus (30%) before annotating the whole corpus, discussing and resolving a small number of disagreements. This analysis enabled us to identify a number of disciplinary differences in the structure of URTs. We also examined the type of follow-up attachments and links signalled by the tweets, as well as the type of embedded images and reader responses to URTs (comments, retweets and likes) across disciplines.

The tweets were then coded for stance and engagement. Once again categories were discussed and tested by both authors on a sample of the corpora (30%). Following Hyland, we define "stance" as features which refer to the ways "writers present themselves and convey their judgements, opinions, and commitments." (Hyland, 2005, p. 176). We focused on self-mention and attitude markers. Self-mention includes the use of first-person pronouns and determiners, or references to the X accounts of university teams and individuals responsible for the research projects. In order to examine the use of attitude markers we manually extracted and analysed all evaluative expressions considered to be indicative of the "writer's attitude or stance towards the entities or propositions that he or she is talking about" (Hunston & Thompson, 2000, p. 5). The linguistic markers analysed include positive adjectives or nouns and expressions indicating positive feelings. Attitude expressed through emojis was also searched for.

By "engagement", we refer to ways in which "writers relate to their readers with respect to the positions advanced in the text" (Hyland, 2005, p. 176). We also take into account Luzón's (2023b) adaptation of Hyland's model to the language of tweets, which is highly multimodal. We focus on three types of resources which seem central to the way universities try to engage with their readers: 1) proximity-creating resources (reader mentions, questions

relating to the reader's experience, familiar register and humour), 2) attention-seeking resources (imperatives, attention-seeking emoji, attention-seeking use of syntax and capital letters), 3) appeals to shared knowledge or interest (research questions, semantic hashtags, shared-knowledge emoji, discipline related humour, comparisons and metaphors).

4. Results and discussion

4.1. Content and moves analysis

4.1.1. Topics and purposes

In both corpora the emphasis is on scientific breakthroughs that will improve quality of life: in STEMM, finding new treatment or cures, developing alternative energies and reducing global warming and in SSH, addressing racism and gender equality. These topics seem general enough to be of probable interest to most readers, specialists or non-specialists. Their selection appears to confirm Bondi et al.'s (2015, p. 3) point that making specialist knowledge relevant or interesting for non-specialists is often accomplished by stressing the social dimension of knowledge rather than by detailing the scientific content.

The emphasis on societal issues in URTs raises questions concerning their purpose and intended readership. In their study of tweets published by Spanish research groups, Luzón and Pérez-Llantada (2022, p. 129) identify four main purposes: a) community building and networking, b) self-promotion and publicising of research output, c) calls to action and d) public outreach. In our URTs, it is difficult to pinpoint one overarching purpose with, as Luzón (2023b) also found, many tweets being multipurpose.

The community building and networking function appears, for example, to be a prominent feature of URTs across disciplines, with most tweets displaying their disciplinary affiliations prominently, as well as underlining their collaborations with other research and funding institutions. An element of self-promotion and publicising of research output is also a feature of the great majority of URTs. The tweets inform readers about a new project, discovery or publication with this information very often accompanied by a call to action in the form of an encouragement to readers to access other resources (see section 4.1.3 below). In our corpus such resources do not mainly appear to be addressed to disciplinary experts but rather to a general

university readership: students, administrative personnel, members of other departments, as well as to a potentially interested general public. The concern for public outreach is also visible in the desire to show the relevance of research for society already underlined. The biomedical engineering tweet in Figure 1 below illustrates this multipurpose character, with its clear mix of promotional (*Cornell researchers*, *new approach*), networking (*@Corne*ll, *@NSF grant*) and outreach features (topic choice, use of direct question, striking image), with the reader being encouraged to click on the accompanying popularised university article for further information. The precise mix however can very according to the discipline, SSH or STEMM, as the analysis of stance and engagement features below shows.

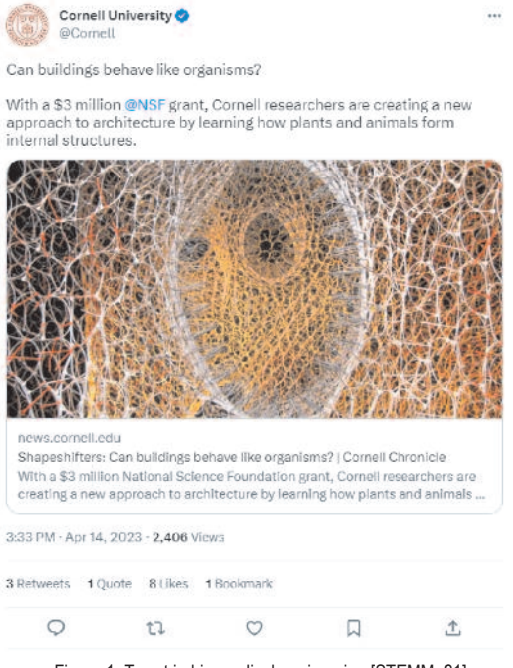

Figure 1. Tweet in bio-medical engineering [STEMM_81].

4.1.2. Moves analysis

We then carried out a corpus-driven moves analysis of URTs. We identified eight moves, which regularly appear in both corpora: orientation (introducing the topic), rationale (exposing aims or reasons for the research), methods, results, significance (pointing to implications or value of the study), action (encouraging the reader to read on or do something), credit

(presenting the people involved in the project) and themes (defining the zone of interest for readers). When they appeared, the moves usually followed this precise order.

		SSH_CORPUS	STEMM_CORPUS
A.	Orientation	**32**	25
B.	Rationale	19	**29**
C.	Methods	8	**16**
D.	Results	66	66
E.	Significance	25	**33**
F.	Action	**42**	31
G.	Credits	**28**	19
H.	Themes	21	18

Table 2. Moves analysis in scientific tweets (expressed as percentage of Tweets in which the moves occur).

Results (Move D) are present in 66 tweets in each corpus and themes (Move H) in 18 STEMM URTs and 21 SSH URTs.

[D] Promotion at work has greater emotional benefit for men than women. [SSH_17]

[H] #MentalHealth #Depression #Research [STEMM_33]

For the other moves, disciplinary differences were identified. In the SSH corpus, engagement with the reader and peers seemed a priority. More SSH tweets introduce the topic and try to attract the reader's attention (Move A Orientation in 32 SSH tweets against 25 STEMM tweets), attempt to elicit action (Move F Action in 42 SSH tweets against 31 STEMM tweets) and mention people engaged in the project (Move G Credit in 28 SSH tweets against 19 STEMM tweets).

[A] HOW DOES A #PANDEMIC END? 🤔 We all want to know... [SSH_9]

[F] Learn more ⬇ [SSH_5]

[G] @psychiatry_ucam @DarwinCollege [SSH_11]

These three moves are not found in traditional research genres such as research articles, but rather in scholarly soundbites (for Move A orientation) or social media (for Move F Action and Move G credits). SSH disciplines seem keener to use these moves, suggesting that more effort is made and possibly needed in SSH to persuade the reader. Disciplinary culture might also come into play. Stronger engagement strategies in the SSH corpus are also confirmed below in the linguistic analysis.

In the STEMM corpus on the contrary, there is a greater focus on science, with more frequent mentions of the aims of the research projects (Move B Rationale present in 29 tweets in STEMM against 19 tweets in SSH), more frequent presentations of the methods (Move C Methods identified in 16 of the tweets in STEMM against 8 tweets in SSH) and more frequent explanation of the significance of the research (Move E Significance in 33 STEMM tweets against 25 SSH Tweets).

[B] An interdisciplinary team (…) aims to transform our understanding of the molecular events behind lupus.[STEMM_53]

[C] For example, Oxford researchers are using Mindfulness-Based Cognitive Therapy (MBCT) [STEMM_9]

[E] This new system has potential as a reliable and renewable way to power large numbers of small devices: [STEMM_17]

STEMM tweets use a condensed form of these three moves that are also present in research articles, implying that STEMM tweets focus more on traditional rhetorical strategies to present research.

We see therefore that the range and presentation of URT topics, the development of their content through links to various written and audio-visual resources and their moves structure, can all have a vital role to play in the way readers are targeted in the two subsets. We propose now to examine how these choices translate in terms of the interpersonal resources adopted in the tweets, by examining features of stance and engagement.

4.1.3. Affordances and reader responses

URTs systematically include a link (to university articles, general press articles, research articles, videos or audio) and/or an embedded image (general topic image, scientific image or photograph of researcher or research team).

	SSH_CORPUS	STEMM_CORPUS
Links (all)	101	105
Link to university article	81	77
Link to general press article	11	11
Link to research article	1	0
Link to video	4	**16**
Link to audio	4	1
Images (all)	**96**	81
General topic image	**85**	45
Scientific image	1	**23**
Photograph of researcher/ team	10	13
Infographics	0	1

Table 3. Number of links and embedded visuals in SSH_corpus and STEMM_corpus.

The generalised use of links suggests that these affordances compensate for the character limitation of tweets (Villares, 2022). They allow the authors to develop key research aims, methods and results and to highlight the significance of the work when the text itself rarely allows for a full narrative of the research project.

Most links lead to popularised resources, which are aimed at a non-specialist readership: either popularised articles published on university websites[3] (81% of all tweets in SSH and 77% in STEMM) or articles from the general press (11% of all tweets in SSH and STEMM). Other links provide access to videos or podcasts. Images also target a lay audience. Tweets also contained embedded images (96% of SSH URT and 81% of STEMM URT), the majority of these illustrating the topic of the tweet and capturing the reader's attention.

URTs contained very few links to research articles or infographics. While Villares (2022) and Luzón (2023b) reported that most links in Twitter conference presentations and research group tweets were links to research papers, we observed that only one SSH URT provided such a link. There was also only one attachment to an infographic in the STEMM corpus and none in the SSH corpus. This suggests that URTs do not specifically aim to increase interaction between researchers but rather to communicate snippets of research to current and prospective students and staff.

Some disciplinary differences were observed. As table 3 shows, STEMM tweets were more likely than SSH tweets to include videos, while SSH tweets more frequently included an embedded image. STEMM tweets also more regularly used scientific visuals. We can hypothesise that procedures, methods and results can be more easily illustrated via videos and scientific images in STEMM, especially in applied fields, than SSH research. Tools,

laboratories, machines, fieldwork and physical observations are more likely to make an exciting photograph or video than intellectual work, work in the archives or on the computer, a tendency also observed in research group videos (Rowley-Jolivet & Carter-Thomas, 2023). It is possible also that more finances are available in STEMM to produce high-quality videos.

When it comes to responses to the URTs (comments, retweets and likes), liking is the most common reaction (see Table 4).

	SSH_CORPUS	STEMM_CORPUS
Comments	228 (2,28/ tweet)	**276 (2,76/ tweet)**
Retweets	770 (7,7/ tweet)	**972 (9,72/ tweet)**
Likes	2165 (21,65/ tweet)	**2930 (29,3/ tweet)**

Table 4. Responses to URTs in SSH and STEMM.

STEMM tweets trigger more reactions than SSH tweets on average. Causes for such a difference remain unknown. However, we can wonder whether this could be the reason why SSH tweets try harder to engage with the reader in the tweet message itself (see section 4.3).

4.2. Expressing a stance

Table 5 shows the distribution of self-mentions and attitude markers in the two subsets. These features can be seen to play an important role in URTs, with more than two markers per tweet on average. We observed slightly more stance markers overall in SSH (244 occurrences).

Stance features examined		SSH	STEMM
Self-mentions	First person pronouns	14	**23**
	@mentions or #mentions of university teams and researchers	**123**	95
	Names of the universities	15	**22**
	Proper names of researchers	**30**	15
	Total self-mentions	**182**	155
Attitude markers	Linguistic expression	60	**71**
	Attitudinal emoji	2 (👍, 🤔)	0
Total stance markers		**244**	226

Table 5. Self-mentions and attitude markers in SSH and STEMM subsets.

4.2.1. Self-mentions

Since URTs promote the research projects of the universities, it is logical that self-mentions include not only first-person pronouns and determiners, but

also references to the X accounts of the university teams or individuals in charge of the projects. Following Luzón (2023b) we consider these other self-mentions to cover variety of forms, some exclusive to social media such as, @mentions or hashtag mentions to the university research teams, departments (1) or their individual researcher (2):

(1) An *@oxmartinschool* study has found that since 2010 (…) [SSH_2]

(2) Historian of medicine *@EricaCharters*. [SSH_9]

In other cases, universities or researchers were referred to by their full names, either in addition to or without an introductory hashtag or @mention (3):

(3) *Cambridge researchers* have redesigned the way a computer's brain works [STEMM _13]

First-person pronouns, although not used extensively, suggest some interesting disciplinary differences. There are no examples of the first-person singular pronouns in the tweets in either corpus, undoubtedly because the 'I' perspective does not correspond to the universities' aim of sharing and showcasing research they support. There are, on the other hand, occurrences of the plural pronouns WE and US, as well as possessive OUR. These are more numerous in the STEMM corpus, 23 occurrences as opposed to only 14 in SSH. However, it is when we look at the semantic values of the pronouns that the differences become particularly pronounced.

Two main values of first-person plural pronouns are usually distinguished in academic discourse (Harwood, 2005): exclusive and inclusive. With the exclusive value, it is the voice of the researchers as a specific group, constructing their identities as experts, that is identified. With the inclusive value, on the other hand, readers are also included in the scope of the pronoun. The distribution of these two values in SSH and STEMM is very different. All but one example (13 out of the 14 occurrences of "we") in the SSH corpus have an inclusive value, and as such form part of the engagement resources exploited by the URTs:

(4) Professor Sian Bayne (@sbayne) and her team (…) are challenging how *we* use technology in education and encouraging *us* to rethink how *we* learn online [SSH_50]

(5) Prof. Jonathan Lear (…) discusses why mourning is essential to *our* well-being—and how it helps *us* find meaning [SSH_67]

In these cases, inclusive "we" serves to create a bond with the readers, through for example a shared interest in (4) or a personal situation in (5). Readers are thus made to feel concerned by the arguments put forward. In (5) there is also evidence in SSH of a desire to present information through personal experience rather than by citing measures of objective proof, a point also noted by Zou and Hyland (2020) in their study of blog posts in "soft" fields.

In the STEMM corpus on the other hand, the great majority of the pronouns (15 out of the 23 occurrences of "we") have an exclusive value. To attract the audience's attention, the universities are keen to underline the implication and authority of their researchers.

(6) Learn more about other ways *we* are helping create healthier societies [STEMM_48]

There appear to be fewer instances of the desire to bond with the audience than were observed in the inclusive examples noted in the SSH sample. Instead, the emphasis in the STEMM corpus appears to be on highlighting the competence and contribution to the discipline of the university team or laboratory. This is in line with Zou and Hyland's (2020) finding in their cross-disciplinary study of blogs, where they suggest that hard science blogs rely on resources that are considered to convey greater author authority.

The distribution and analysis of introductory hashtag and @mentions also reveals some potentially important disciplinary differences. Overall, as Table 5 shows, these interactive mentions are more frequent in the SSH subsets, with 123 occurrences in SSH versus 95 occurrences in STEMM.

(7) Chickens were originally tempted down from trees and into domestication by rice, according to new research featuring *Oxford's @school_of_arch* [SHS_1]

(8) *@OxfordDemSci, led by Prof Mills*, has been at the forefront of research into patterns of #COVID19 mortality [SSH_3]

@mentions such as these in (7) and (8) are a useful promotional resource for universities. Research carried out at the university is given public attention and interested readers have the opportunity to search and access the Twitter accounts of the groups or individuals mentioned in order to discover more. The higher number of @mentions in SSH is to some extent linked to the

greater presence of a "Credit" move in the SSH subset, 28 in SSH tweets as against 19 STEMM tweets (see also section 4.1.2. above). In (9) credit is given to University of Edinburgh Law School and the prestigious funding it received from the Nuffield foundation is also mentioned.

(9) The report by @UoELawSchool funded by @NuffieldFound is published today [SHS_48]

Another difference between the two disciplinary subsets lies in the type of entity that is highlighted in the mentions (see Table 5).

When the university research group or proper name is mentioned alone (without an @ or a #mention) in SSH disciplines it is twice as likely to be the name of an actual researcher (30 occurrences versus 15 occurrences in STEMM), thus showcasing the researchers and their credentials, whereas in STEMM disciplines it is more likely to be the institutional identity of the researchers that is underlined (22 occurrences):

(10) *Margaret Rossiter,* the Marie Underhill Noll Emerita Professor of the History of Science in @CornellCAS, changed history and shed light on (…) [SSH_81]

(11) An interdisciplinary team of *three award-winning Yale researchers* aims to transform our understanding of the molecular events behind lupus. [STEMM_53]

4.2.2. Attitude markers

The investigation of attitude markers included adjectives, nouns, emoji and expressions indicating positive feelings. The total number of attitude markers is slightly higher in the STEMM subset: 71 vs 62. However, once again it is the overall distribution of the different types of evaluation that reveals the most interesting results.

We identified five main categories of evaluation: **Novelty (**e.g. *a new way*); **Importance** (e.g. *at the forefront, important*); **Expertise** (e.g. *detailed insights*); **Improvement** or contrast with previous research (e.g. *more sustainable*), appeal to **emotions** (e.g. *extraordinary cosmic phenomena)*. The two examples of attudinal emoji (found in one SSH tweet) appear to suggest emotion – in this case doubt – and importance respectively. Nobody, including the URT writers, knows how the pandemic will end and they underline the importance of the university podcast to readers in providing some answers.

(12) HOW DOES A #PANDEMIC END? We all want to know... ...and that's the question we put to historian of medicine @EricaCharters in our most recent episode of the #BigQuestions #podcast [SSH_9]

		SSH	STEMM
Total		62	71
a)	Novelty	28	18
b)	Importance	11	25
c)	Expertise	8	8
d)	Improvement	11	15
e)	Emotion	2	5
f)	Attitudinal emoji	2	0

Table 6. Number and type of evaluative expressions.

As Table 6 shows, novelty is the most used category of evaluation (28 occurrences) in the SSH URTs, followed by improvement and importance (11 occurrences each).

(13) *The study is the first* to look at the long-term effects of at the long-term effects of the @DailyMile [SSH_46]

(14) *New research finds* that people have consistently inaccurate impressions (…) [SSH_58]

The SSH URTs frequently emphasise the modern up-to-date nature of their research, with a possible underlying assumption that they are in advance of their competitors. This is rather different from the STEMM disciplines where importance has the highest score (25 occurrences).

(15) a confined impinging jet mixer — that has *revolutionized* drug manufacturing [STEMM_27]

(16) Our work with chip manufacturer Qualcomm made vital software 12% smaller, creating *world-leading technology* [STEMM_45]

One hypothesis to explain this difference is perhaps connected to the fact that it is difficult to evaluate or prove the importance of research in SSH when there are no quantifiable data or lab observations, for example, to refer to. It is easier to underline novelty, and the improvement or comparisons with previous research. An alternative hypothesis could be that SSH researchers are shyer about promoting the significance of their research. However, this is also linked to some extent to the question of hard evidence and the lack of empirical authority.

4.3. Engagement strategies

Table 7 below presents the main engagement features exploited in the URTs and compares their frequency in the two datasets.

	Number of occurrences in the SSH corpus	Number of occurrences in STEMM_CORPUS
Proximity creating resources (all)	**25**	11
Reader mentions	**12**	5
Questions relating to the reader's experience	4	3
Informal and humorous expressions	**9**	3
Attention-seeking resources (all)	**55**	27
Imperatives	**21**	16
Attention-seeking emojis	**26**	7
Attention-seeking use of syntax (!, …) and capital letters	**8**	4
Appeals to shared knowledge or interest (all)	48	**64**
Research questions	10	9
Semantic hashtags	29	**36**
Shared-knowledge emoji	0	0
Discipline-related humour	2	0
Didactic metaphors and comparisons	7	**19**

Table 7. Engagement features in SSH and STEMM URTs.

We show that engagement with the reader through proximity creating resources and attention-seeking resources are more important in SSH tweets where authors try harder to attract the reader's attention, generate interest and elicit action. Appeals to shared knowledge and interest are characteristic of both corpora but are especially frequent in STEMM.

4.3.1. Proximity-creating resources

Proximity-creating resources include the use of reader mention (reader pronoun "you"), questions relating to the reader's experience and informal and humorous expressions. Such resources are more frequent in the SSH corpus (25 occurrences) than in the STEMM corpus (11 occurrences).

Reader pronouns

Second person pronouns are more than twice as frequent in SSH than in STEMM, 12 occurrences versus 5 occurrences. This can be related to the greater number of inclusive "we" occurrences in SSH already noted (see section 4.2.1). The text producer appears intent on creating a bond with the reader with the "you" appearing to address a general audience rather than a disciplinary expert:

(16) Asking for help is hardly ever as bad as *you* imagine it will be [SSH_61]

Second person pronouns can also be combined with questions to involve the reader even more directly:

(18) Have *you* ever played with a baby and felt a sense of connection, even though they couldn't yet talk to *you*? [SSH_26]

Readers are invited to share their personal experience, thus creating a relationship of close proximity with the text producer. Xu et al. (2023) also note a high number of reader pronouns in the tweets of humanities scholars, although not in the tweets of social scientists. Their results are however difficult to compare with our own as their study includes four disciplinary domains and is based on the X accounts of the scholars themselves, and not on URTs.

Questions

Although the majority of questions in the tweets are types of research questions and "assume that the reader has an interest in the topic" (Luzón, 2023, p. 27),[4] a small number try to spark interest and to engage with the reader. They appeal to the reader's everyday experience or knowledge. Such strategies can be found in both corpora (4 in SSH and 3 in STEMM).

(19) Looking ahead to #ValentinesDay? [SSH_38]

Informal and humorous expressions

Informal words and expressions and humour are more frequent in SSH than in STEMM URTs (see Table 7). Informal expressions create proximity, minimise hierarchies between a knowledgeable author and their readership and contribute to the 'informalisation' or 'conversationalisation of public discourse' (Fairclough, 1993, p. 140), adding thus to the popularisation of the research.

(20) (…) success *can mess with you* [SSH_33]

(21) Bitcoin *guzzles more energy* a year than Sweden [STEMM_43]

There are also occasional glimpses of humour which contribute to establishing proximity and connivance with the reader. Innovative uses of languages and plays on words help to reach a wider audience and to reformulate a relatively formal content. For example (22), the "vocal shift"

operated by mothers is termed "motherese", a creative and humorous neologism based on the noun "mother" and the suffix "ese" and used to designate the new form of language under study. For example (23), the neologism "earables" is also a variation of another common word ("wearables") and used to indicate the topic of the research.

(22) #PrincetonU researchers have found a new way to quantify that vocal shift, or, *"motherese."* [SSH_25]

(23) *'Earables'*-the things we wear in our ears- have the potential to keep us healthy (…) [STEMM_20]

These expressions of humour do not require any specialised knowledge but only general knowledge and identification of linguistic creativity and variation. They make the reading of URTs entertaining and suggest an effort on the part of the authors(s), in SSH in particular, to avoid a formal tone and obscure content. However, humour remains marginal in our corpus. These findings corroborate those of Villares (2023) and Luzón (2023b) who note that humour is rarely used in conference-related and research group tweets.

4.3.2. Attention-seeking resources

Attention-seeking resources such as imperatives, attention-seeking emojis and syntax can be used to attract the reader's attention. We suggest that space limitations, the large number of tweets on X and the rapid rhythm of publication make these devices necessary in order to encourage the reader to read or click. There are, however, twice as many in the SSH corpus (55 occurrences) than in the STEMM corpus (27 occurrences).

Imperatives

Imperatives are used in a similar way in both corpora. They are nearly always used to introduce a link to an article, podcast or video and encourage the reader to learn more about a topic. The most frequent expressions are "Read more", "learn how/more" and "find out how/more" and they are sometimes associated with attention-seeking emoji and expressive punctuation. These imperatives suggest that many URTs are essentially aiming at disseminating longer reads (university article, general press articles, videos, podcasts, etc.) which are not condensable in a short tweet.

(24) *(Find out* how [SSH _14]

(25) *Learn how* the gut impacts our immune system (…) [STEMM_ 49]

SSH tweets contain more imperatives (21 occurrences in SSH URTs against 16 in STEMM URTs), suggesting that engagement with the reader and encouragement to navigate the different resources might be stronger in SSH.

Emoji

Our URTs in SSH also contain more emojis: 28 emojis were found in the SSH URTs while only 7 were found in the STEMM subset. This noteworthy difference, which should be tested and verified on a larger corpus, suggests once again that SSH URTs try harder to catch the reader's attention and to make the research attractive. The emojis used fall into two broad categories: some rare attitudinal emojis[5] and frequently-used attention-getting emojis, which "replace words with the same literal meaning (…) or represent a visual cue to catch the reader's attention" (Villares, 2023, p. 286) and which we will focus on here.

Of the 28 occurrences of emojis in the SSH corpus, 26 correspond to attention-seeking emojis which either point to a link or a resource or provide an illustration for a word mentioned in the tweet.

(26) 🐓 Chickens were originally tempted down from trees and into domestication by rice [SSH_1]

(27) Read the full article ➡ [SSH_47]

All seven occurrences of emojis in STEMM are attention-getting emoji. They are used in a similar way to those in SSH tweets, pointing to resources and illustrating the text.

(28) As astronomers from @CornellCAS analyzed data from the James Webb Space Telescope, they discovered a previously hidden galaxy (…).  [STEMM_89]

Attention-getting use of syntax and capital letters

Attention-seeking use of syntax and case is very low in both corpora, but slightly more frequent in SSH (8 tweets) than in STEMM (4 tweets). Exclamation marks, suspension points and capital letters all stimulate curiosity and urge the reader to read on.

(29) It wasn't all down to Katherine Parr as popularly believed… [SSH_13]

(30) Scientists have managed to power a microprocessor continuously for a year – using algae! [STEMM_17]

The word "new" is particularly prone to be emphasised by either capital letters or exclamation points, suggesting the catchy and attention-getting nature of several of these tweets.

(31) NEW VIDEO [STEMM_4]

Overall, these attention-seeking resources are more frequent in SSH, perhaps as already suggested, because readers react less to SSH URTs (with fewer retweets etc.: see Table 4) and authors therefore consciously or unconsciously try harder to draw the reader in. Promotional strategies are different in STEMM, where research-related content is more frequently used to attract the reader (see next section).

4.3.3. Appeals to shared knowledge or interest

The last category of resource that contributes to the author's engagement with the reader, appeals to shared knowledge or interest, is unevenly distributed between the two disciplinary corpora. Research questions are used in both subsets, whereas semantic hashtags, metaphors and comparisons are more frequent in STEMM (see Table 7). We also note the quasi-absence of some features in both datasets.

Research questions

Questions are one of the resources used to relate to the reader and engage dialogically (Hyland, 2005; Luzón, 2023b). The majority of the questions found in both corpora serve to present a research question to the reader and to appeal to potential shared knowledge and are open questions.

(32) What does the future of work look like for women? [SSH_64]

(33) Electroconvulsive therapy is an effective treatment for some people with mental illness, but how does "shock therapy" treat the brain? [STEMM_80]

While readers are unlikely to know details about women's future working conditions and "electroconvulsive therapy" or "shock therapy", they are

likely to know that genre might have an impact on working conditions and that "shock therapy" is likely to provide treatment through mechanical action. "Shock therapy", albeit being a semi-specialised term, is relatively transparent for the general public. Specialised knowledge is not necessary to decipher the tweets but shared general knowledge and interest are. Engagement rates through research questions are comparable in both corpora (10 SSH tweets, 9 STEMM tweets).

Semantic hashtags

Hashtags have several functions (Cislaru, 2015; Villares, 2022, 2023). What interests us here are semantic hashtags which refer to keywords relevant to the research carried out, such as #planets or #SignLanguage. Semantic hashtags are often viewed as "appeals to shared knowledge because writers marked down keywords and methodologies relevant to the research" (Villares, 2023, p. 286). As indicated in Table 7 there were more occurrences in the STEMM corpus. Keywords in both corpora can present very diverse levels of specialisation, with some keywords pertaining to general language (#vegan, #SocialMedia, #planets) and others to specialised language (#FusionEnergy, #probiotics, #BSL). Certain keywords require some level of specialised culture, in particular those referring to recent news (#COVID 19, #WarOnUkraine), places (#Stonehenge, #Gana), people (#Tudors, #Putin) or popular culture (#DoctorStrange).

Shared-knowledge emoji and discipline-related humour

We can note the relative absence of shared-knowledge emoji (Villares, 2023) and discipline-related humour (Luzón, 2023b), which confirm that URTs are not primarily addressed to disciplinary specialists.

Metaphors and comparisons

In both corpora, the metaphors and comparisons serve a didactic purpose, helping the reader visualise or understand a scientific idea, process or object. The SSH corpus contains far fewer metaphors and comparisons (7 in total). Their function seems mainly to be to help the reader to conceive abstract ideas:

> (34) "*Reliable information is to civic health what proper sanitation and potable water are to public health.*" [SSH_32]

Metaphors and comparisons in the STEMM corpus are considerably more frequent (19 in total). They are not exclusively conceptual but also visual, which means that they do not only aim to make abstract ideas or processes accessible but also to help the reader visualise certain phenomena.

(35) Organic polymers, which could be used in flexible electronics, usually have a *spaghetti-like* internal structure. [STEMM_11]

As in blogs (Luzón, 2013) and three-minute theses (Carter-Thomas & Rowley-Jolivet, 2020), the aim of URT writers seems to be to express the content in non-technical terms that the audience will understand and find relevant. Popularisation appears to be particularly an issue in STEMM, due to the importance of complex technical taxonomies and didactic metaphors are thus a useful resource.

5. Concluding remarks

This exploratory study has focused on the functions and forms of URTs and the ways the informational snippets contained in the tweets are designed to be appealing and of topical interest to a range of potential readers. URTs are not solely, nor indeed primarily, addressed to disciplinary specialists, as evidenced by the low degree of "specialisedness" of most of the clickable resources proposed (university magazine articles, websites, video recordings, etc.) as well as by the types of interpersonal relationship instigated, with few appeals to shared disciplinary knowledge. The readership appears to be fairly broad, consisting primarily of university personnel (current and prospective students, administrative staff and members of other departments), but also of interested members of the general public, thus confirming the principal missions of universities using X, as identified by Mogagi et al. (2021): to recruit, retain and report.

URTs appear to share a fairly stable mix of organisational, semiotic and linguistic features. Although multipurpose, the highly promotional nature of these short texts clearly remains a constant. Space restraints are obviously another. Authors need to bear in mind these constraints, whilst at the same time profiting from the linguistic and semiotic resources available. It is therefore interesting to see to what extent disciplinary considerations can also affect these choices. In terms of content, the main differences between the SSH and STEMM tweets appear to lie in the type of condensed moves

structure identified within the tweets. Our results reveal that STEMM tweets contain a greater number of traditional research moves such as "rationale" and "methods," whereas SSH tweets contain more "orientation" and "action" moves. A larger proportion of SSH tweets explain the context around the topic (orientation) and underline the need to read on (action), implying that more effort is made in SSH to win the reader over. This is perhaps necessary given that readers appear to retweet and more generally react less to SSH tweets than to STEMM tweets.

Our focus on the stance and engagement devices used in URTs has underlined the importance of interpersonal relationships in these short texts. The analysis of self-mentions illustrates in particular the importance attributed to promoting the teams or individuals responsible for the research presented, and also points to some potentially important disciplinary differences. The number of introductory @ and hashtag mentions is first higher in SSH than in STEMM. Another difference between the two disciplinary subsets lies in the type of entity highlighted in the mentions. In SSH disciplines it is twice as likely to be the name of an actual researcher, whereas in STEMM disciplines it more likely to be the name of the university that is underlined, thereby promoting to a greater degree the institutional identity of the researchers. Pronoun use also reveals some differences. The "we" pronoun in the SSH subset essentially has an inclusive value, with the "we" serving for example to create a bond with the reader. In the STEMM corpus, on the other hand, the great majority of pronouns have an exclusive value, underlining authorial authority. The analysis of attitude markers illustrates a similar tendency. STEMM authors are seemingly readier to underline the importance or impact of their work than their SSH counterparts, perhaps because of the difficulty of proving importance in SSH disciplines due to the lack of hard evidence and empirical authority.

Engagement strategies were likewise analysed in both corpora. Engagement with readers through proximity-creating resources, such as reader mentions, informal language and humour, is more frequent in SSH tweets. Authors appear to try harder to establish some type of bond or connivance than in STEMM. This contrasts with the more authoritarian nature of the stance adopted by text-producers in STEMM already noted. Attention-seeking resources – such as imperatives, emojis and capitalisation – are also more frequently exploited in the SSH corpus. Efforts are made to engage with readers and to encourage them to navigate the different resources. The third category of engagement resources examined, i.e. appeals to shared

knowledge or interest, is less frequently exploited in both sets. This is probably because URTs target a broad readership. Semantic hashtags and didactic comparisons and metaphors are however more frequently used in STEMM, illustrating the desire of STEMM authors to make their research (scientific concepts and processes) accessible to a general public.

Our study has provided insights into how URTs promote research. The focus on disciplinary differences has enabled us to pinpoint some potentially interesting differences between SSH and STEMM practices. The differences in authorial stance, which in turn appear to be related to various epistemological differences and questions of scientific evidence (cf. Zou & Hyland, 2020), deserve in particular further enquiry. Another potentially worthwhile avenue of research, that space has prevented us from dealing with here, is that of the authorship of URTs. Who writes URTs? We presume the process involves media specialists and disciplinary specialists working together, but it would perhaps be relevant to supplement the present analysis with some interviews with the protagonists. It would also be interesting to compare URTs with corresponding research group tweets in order to see how the content is adapted or modified from one sub-genre to the other.

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NOTES

[1] We use the word *tweet* to refer to *posts* in line with the terminology used in recent research on the subject (Luzón 2023a, 2023b; Villares 2023).

[2] https://www.topuniversities.com/university-rankings/world-university-rankings/2023

[3] These university articles are a genre which, to our knowledge, hasn't been studied yet.

[4] See section 4.3.3.

[5] See section 4.2. on stance.