

Olga Dontcheva-Navratilova*

Masaryk University, Czech Republic
navratilova@ped.muni.cz

PERSUASION IN MULTIMODAL DIGITAL GENRES: BUILDING CREDIBILITY IN VIDEO ABSTRACTS

Abstract

The emergence of the video abstract as a new digital genre of science communication has allowed researchers to increase their visibility and engage with larger audiences by employing a complex interplay of different semiotic modes. This paper studies strategies and multimodal resources for building credibility in a small corpus of 16 video abstracts on mathematics published online in the *Journal of Number Theory* (Elsevier). By adopting a multimodal discourse analysis (Kress, 2010) perspective and drawing on previous research on video abstracts (e.g., Coccetta, 2021; Liu, 2019, 2021) and persuasion in digital academic genres (e.g., Luzón, 2019; Valeiras-Jurado, 2020), this study explores persuasive strategies for enhancing credibility and the semiotic resources used for their realisation. The analysis considers six persuasive strategies (attention-getting, constructing an authorial persona, engagement, framing, logical reasoning and providing proof) while exploring how the written and spoken verbal modes interact with mathematical symbolism and non-verbal visuals. The results suggest that persuasive strategies used for building credibility vary across different types of video abstracts and differ from those used in printed abstracts.

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Key words

video abstract, multimodal discourse analysis, persuasive strategies, credibility, mathematics.

* Corresponding address: Olga Dontcheva-Navratilova, Department of English Language and Literature, Faculty of Education, Masaryk University, Poříčí 7, 60300 Brno, Czech Republic.

1. INTRODUCTION

The video abstract has emerged as a new digital genre of science communication allowing researchers to increase their visibility and engage with larger audiences in an online environment. In common with most academic genres, the video abstract has the broad communicative intention of convincing the audience to accept the author's view, opinions and claims. However, as a remediated genre (cf. Luzón & Pérez-Llantada, 2022), i.e., a genre which has been refashioned and changed as a result of migration to the web, the video abstract offers scientists the opportunity to go beyond the persuasive potential of the printed abstract by employing a personal and media-rich way of research presentation (cf. Reupert, 2017). As recent studies suggest, video abstracts may help increase the reads (Spicer, 2014), citation scores (Cocchetta, 2021: 305; Zong et al., 2019), and impact based on 'likes' on YouTube (Spicer, 2014: 4) of research articles. The possibility of engaging in discussion with the heterogeneous YouTube audience on the web has endowed published research with immediate interactivity, thus moving academic discourse "from the Information Age to the Relationship Age" (Cavalieri, 2020). However, video abstracts have not yet attracted much scholarly attention, probably because their use is not conventionalised, and their occurrence is associated primarily with the hard sciences. Previous research has examined the rhetorical structure (Cocchetta, 2021; Dontcheva-Navratilova, in press; Liu, 2019; Plastina, 2017) and use of metadiscourse in video abstracts (Cavalieri, 2020). These studies have revealed that as a result of their migration to the web, video abstracts show signs of genre hybridisation (Bhatia, 2004), as they blend features of the printed abstract and other oral genres, such as the conference presentation. Persuasion in this multimodal genre remains to be investigated. This paper undertakes to fill this gap by exploring how researchers present themselves and their work in video abstracts by employing a specific set of rhetorical processes, such as selection, arrangement, foregrounding and social reposition, thus recontextualising the printed abstract from a multimodal perspective (Bezemer & Kress, 2008).

The study of credibility in video abstracts in this paper aligns with a conceptualisation of persuasion as essentially interactive, context-dependent and audience-oriented (e.g., Dontcheva-Navratilova, 2020; O'Keefe, 2002; Perloff, 2010; Simons & Jones, 2011; Valeiras-Jurado, 2021; Virtanen & Halmari, 2005). The build-up of researcher credibility is seen as a dialogic process involving construction of the identity of the researcher as a person with authority and professional expertise (Ivanič, 1998: 88) complemented by projection of the courteous, friendly image of a "modest expert" (Thompson, 1997) and an adjustment of the reader's "network of consensual knowledge in order to accommodate [the scholar's] claims" (Hunston, 1994: 192). One means by which this can be mediated is the employment of rhetorical and language resources established in the discursive practice of a discourse community sharing a specific disciplinary and linguacultural background (Hyland, 2008; Swales, 1990).

This paper studies rhetorical strategies and multimodal resources for building credibility in a small-scale specialised corpus of video abstracts in the field of mathematics, which are published online in the *Journal of Number Theory* (Elsevier) and also available on YouTube. Drawing on previous research on persuasion in digital academic genres (e.g., Luzón, 2019; Valeiras-Jurado, 2020, 2021; Valeiras-Jurado et al., 2018) and adopting a multimodal discourse analysis perspective (Kress, 2010; Kress & van Leeuwen, 2021), this study thus explores how the spoken and written verbal modes interact with mathematical symbolism and non-verbal visuals (e.g., diagrams, images and video footages). Rhetorical strategies employed in video abstracts will be compared to such strategies typical of printed abstracts to highlight differences between the possibilities they offer for enhancing credibility. The study will address the following research questions:

RQ1: What rhetorical strategies are used in video abstracts to construct the credibility of researchers and their work?

RQ2: How do different verbal and non-verbal modes partake in enhancing credibility in video abstracts?

RQ3: How do the strategies used in printed and video abstracts differ?

2. DATA AND METHOD

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2.1. JNT video and printed abstracts corpora

The analysis of rhetorical strategies and language devices for constructing credibility is based on a corpus comprising 16 video abstracts and the corresponding printed abstracts of 16 research articles in mathematics published online in 2016 in the *Journal of Number Theory* (JNT). The choice of this journal was motivated by three factors: (1) the availability of the JNT video abstracts on the journal's webpage (Elsevier), (2) the non-professional character of the videos, which are made by the scientists themselves without the assistance of media producers, thus reflecting the authentic media, rhetorical and language choices of the scholars without any modification by media providers; and (3) the popularity of JNT video abstracts, as JNT was the Elsevier journal with the highest rate of average views per video abstract (1,519) in the period May 2008–May 2013 (Spicer, 2014). JNT requires concise and factual printed abstracts indicating the research purpose, principal results and major conclusions; the length of a printed abstract is limited to 150-200 words. Video abstracts, on the other hand, are optional and no requirements are specified concerning their content, form and length.

The pure mathematics orientation of JNT conditions the essentially multimodal character of research articles which comprise symbolic notations, equations and images (O'Halloran, 2015). The complexity associated with the processing of multimodal formulations and the linguistic expression of relational

processes by dense noun phrases, conjunctions and implicit logical connections (Schleppegrell, 2007: 139) explains why mathematicians in particular are prone to use alternative, relatively accessible ways of refashioning their research, including video abstracts, thus reaching a potentially wider audience. Spicer (2014) claims that an additional benefit of video abstracts is that the very process of creating a video abstract may help scholars understand their research in new ways. The size and composition of the corpus are summarised in Table 1. The corpus size is moderate, which reflects the limited availability of video abstracts on the JNT webpage and the need to work with a manageable corpus, since the semiotic resources that video abstracts use are numerous. Still, the corpus used in this investigation is similar in size to corpora used in previous qualitative studies into multimodal academic genres (e.g., Luzón, 2019; Valeiras-Jurado et al., 2018).

ABSTRACTS	YEAR	NUMBER	TOTAL SIZE	AVERAGE LENGTH
Printed	2016	16	1,401 words	87.6 words (36-134)
Video	2016	16	72 min	4.5 min (0.45-9.38)
Transcripts			10,464 words	654 words (103-1,598)

Table 1. Corpus size and composition

The JNT corpus comprises the video and printed abstracts of ten multi-authored and six single-authored research articles by mathematicians from various linguacultural backgrounds (mostly American and Chinese, but also French, Argentinian, Brazilian and South-African). The oral part of the video abstracts has been transcribed for the purposes of the analysis.

2.2. Analytical approach

The analysis of rhetorical strategies helping scholars to recontextualise the printed abstract from a multimodal perspective is approached through the lens of ‘proximity’ (Hyland, 2010; Luzón, 2019), understood as accommodation of the representation of the researchers and their work to the assumed knowledge and expectations of the lay or interested audience. The rhetorical construction of proximity has two aspects: proximity of membership, related to the construction of authority through the use of disciplinary conventions; and proximity of commitment, conveyed by taking a personal stance in respect of the issues at hand and the audience (Hyland, 2010: 117). I hypothesise that while proximity of membership will be primary in printed abstracts, in video abstracts, building up of proximity of commitment will be paramount to the enhancement of credibility and persuasion.

Drawing on previous research into persuasion in academic traditional and multimodal discourse (Dontcheva-Navratilova, 2020; Hyland, 2010; Luzón, 2013, 2019; Valeiras-Jurado, 2020) and based on the analysis of corpus data, I discerned six strategies contributing to the enhancement of credibility in JNT abstracts:

- 1) *Attention-getting* – raising the interest of the audience
- 2) *Constructing an authorial persona* – casting the author's voice into the text
- 3) *Engagement* – creating rapport with the audience
- 4) *Framing* – tailoring the information to the assumed knowledge of the audience
- 5) *Logical reasoning* – making explicit the chain of the argument
- 6) *Providing proof* – presenting calculations

The mode types scholars elect to employ may impact on the construction of credibility. Following Valeiras-Jurado and Bernad-Mechó (2022), the array of modes employed in multimodal 'ensembles', i.e., texts composed of more than one mode (Kress, 2010), such as the video abstract, may be grouped into two categories: 'embodied' modes controlled by the speaker, which may be further sub-divided into verbal and non-verbal modes; and 'filmic' modes, such as camera shots and angles. This study considers the following types of modes as discerned in JNT video abstracts:

- *verbal modes* – spoken and written.
- *non-verbal modes* – mathematical symbols and equations, mathematical images, non-verbal visuals (setting, actions and processes) and the author as protagonist (eye contact, facial expressions, gestures, body posture, clothes and grooming).
- *filmic modes* – type of shot, angle, *mise-en-scène*, cuts, music, visual prompts, sound effects and video effects, i.e., the choices made during the production of the videos (Valeiras-Jurado & Bernad-Mechó, 2022).

The embodied verbal and non-verbal modes are of primary importance in the self-made JNT video abstracts. The role of the filmic modes is confined primarily to decisions concerning the angle (e.g., frontal or lateral) and the type of shot (e.g., close-up, medium close-up) (Bowen, 2018).

Since the modes employed in the JNT video abstracts vary, they have been grouped in four presentation patterns (Dontcheva-Navratilova, in press; cf. Liu's, 2021, move units): (1) talking head or body, i.e., the author is present on screen in medium close-up or medium shot and speaks directly to the audience; (2) voice-over, i.e., the voice of the author is reading or commenting on a slideshow; (3) slideshow, i.e., a series of still images or pages of information (slides), which represent the abstract content; and (4) captions and subtitles, i.e., written texts included on screen to emphasise or explain information. The multimodal analysis in

this study differentiates between three types of JNT video abstracts (Table 2), identified on the basis of the combination of these presentation patterns (Dontcheva-Navratilova, in press).

TYPE	PRESENTATION PATTERN	No.
1 Lecturing	Talking head/body & caption	7
2 Conferential	Voice-over & slideshow (Talking head)	7
3 Conversational	Talking head/body	2

Table 2. Types of video abstracts

The *lecturing video abstract* combines a talking head or body and a caption. It shows the researcher standing in front of a blackboard/whiteboard with the text of the abstracts, talking to the audience. Lecturing abstracts occur seven times in the corpus and tend to be short, at between 45 seconds and 3 minutes in length.

The *conferential video abstract* displays a slideshow with text including mathematical symbolism complemented by a voice-over. In four cases, the slideshow is introduced by the brief appearance (up to 10 seconds) of a talking head representing the researcher. The corpus comprises seven conferential abstracts, whose length varies between 3 and 10 minutes.

The *conversational video abstract* features a talking body addressing the audience with no visual support from mathematical symbolism and equations. There are only 2 conversational abstracts in the corpus, and they are 3.20 and 8.15 minutes long, respectively.

The reasons for the existing differences between the three types of video abstracts seem to reflect primarily authorial choices; however, they may also be affected by cultural factors, as Chinese scholars show a strong preference for the lecturing type and European and American scholars for conferential abstracts. If approached from the perspective of Hofstede’s dimensions of national culture (Hofstede et al., 2010), the Chinese scholars’ choice of the lecture hall settings and the authoritative role of the lecturer may be related to the power-distance orientation of Chinese culture. In contrast, mathematicians situated in the European and North American contexts may be inclined to favour the more democratic conferential settings associated with higher degree of individuality and tolerance towards plurality of views and competing approaches. Conversational abstracts are rare and the decision to opt for this type of video abstract is likely to be purely idiosyncratic.

It is expected that realisations of strategies for the build-up of credibility will vary to a certain extent across the different types of video abstracts to reflect differences in presentation patterns and length.

The construction of credibility in video and printed abstracts may be affected by differences in their rhetorical structure. While both printed and video JNT

abstracts comprise four core moves, namely, *Introducing the problem*, *Theory: calculations*, *Providing proof* and *Concluding the argument*, video abstracts include two additional moves categorised as socialising subphases by Coccetta (2021). These highly interpersonal moves, which are also present in conference presentations (cf. Carter-Thomas & Rowley-Jolivet, 2003), are the *Opening* move, including greeting the audience and presenting the author and the paper, and the *Closing* move, consisting of thanking the audience. It is likely that these moves can contribute to the enhancement of credibility via persuasive strategies, which do not occur in printed abstracts.

The qualitative multimodal analysis of video abstracts was carried out manually. The first phase of the analysis consisted of watching all video abstracts carefully two times: first, identifying the set of persuasive strategies for enhancing credibility; then, coding the strategies. In the second phase of the analysis, the video abstracts and the printed abstracts were annotated to identify the contribution of the individual modes to the construction of credibility. The large variety of modes and indicators involved in the realisation of the six persuasive strategies required a restriction of the scope of this study to an analysis of selected modes (cf. Luzón, 2019; Paltridge, 2012); these include the spoken and written verbal modes and some elements of non-verbal and filmic modes comprising setting, actions, type of shot and the author as protagonist (eye contact, body posture, clothes and selected types of gestures).

The analysis of the verbal mode was carried out on the transcribed texts of the video abstracts and the texts of the printed abstracts. It combined manual coding and processing with the software tool Sketch Engine (Kilgarriff et al., 2004) used for the identification of occurrences of reader and speaker pronouns (*we*, *our*, *your*, *I*, *me*) and their collocates, conjunctions, evaluative items and set phrases (e.g., *Hello everybody*, *Thank you*). In addition, the analysis annotated the use of captions to highlight the researchers, their affiliation and the title of their work.

The analysis of the non-verbal modes focused on the author as protagonist and took into consideration eye contact, body posture and selected types of gestures. Gestures were annotated drawing on the functional taxonomy of gestures suggested by Bavelas et al. (1995) and Kendon (2004), applied also by Valeiras-Jurado et al. (2018). They comprise (1) gestures performing a referential function, such as topic gestures (iconic or metaphorical) representing sizes, directions or objects; (2) gestures performing an interpersonal function, e.g., greeting or shared information gestures; (3) gestures performing pragmatic functions, such as marking the discourse flow and transition points; and (4) gestures performing cohesive function, such as deictic gestures of pointing.

Finally, the analysis of filmic modes was restricted to the settings and the type of shot. The settings were coded as academic (lecture hall or office), and private (home or outdoor) and were further classified as indexing different levels of formality, typically corresponding to the clothing of the speaker. Only two types of

shot were identified – medium shots and medium close-ups, which typically do not change throughout the video abstract.

3. RESULTS AND DISCUSSION

In this section I first discuss how rhetorical strategies and their realisations are employed to build credibility in video abstracts. Then I compare them to rhetorical strategies for building credibility in printed abstracts to track changes due to recontextualisation.

3.1. Strategies for building credibility in video abstracts

Overall, the results of the analysis show that the first four strategies, i.e., attention-getting, constructing an authorial persona, engagement and framing, partake primarily (but not exclusively) of the rhetorical construction of proximity of commitment. The last two strategies, i.e., logical reasoning and providing proof, are oriented towards building proximity of membership. Providing proof may be seen as discipline-specific, as knowledge construction in pure mathematics is based on “substantiation of new results by proof and logical, mathematical reasoning” (Kuteeva & McGrath, 2015: 162).

3.1.1. Attention-getting

The first strategy, attention-getting, is used to establish contact with the audience. It aims to enhance the visibility of the researcher and attract the interest of the audience so as to entice them into watching the abstracts and consequently reading the research paper. It is typically present at the very beginning of a video abstract in the ‘Opening’ move, when the interpersonal framework (cf. Carter-Thomas & Rowley-Jolivet, 2003) is set. The semiotic resources that realise this strategy are primarily visual:

- talking head/body or voice-over greeting the audience
- visual representation of the researcher
- eye contact
- interpersonal gestures for greeting

Video abstracts personalise researchers by allowing them to reach the audience by their voice (in the case of conferential abstracts) and showing them visually on screen (in the case of lecturing, conversational and conferential video abstracts introduced by a talking head). Greeting formulas are present in ten out of the sixteen abstracts. They tend to be informal, as they are realised by *Hello* (7 instances) and

Hi (3 instances), thus indicating proximity of commitment by contributing to the image of the 'modest expert' willing to share knowledge with the audience, who are positioned as peers. In two cases the greeting includes direct address to the audience, i.e., *Hello everyone*, most likely an attempt to create a feeling of shared context of communication. In video abstracts with talking head or body, the interpersonal dimension is enhanced by establishing eye contact (the researcher is looking straight into the camera) and nodding to the audience in a sign of greeting. Hand gestures of greeting are rare, although in one of the conversational video abstracts, the scholar waves his hand to greet the viewers.

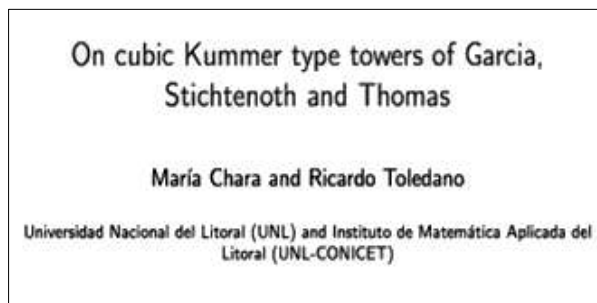
3.1.2. Constructing an authorial persona

One of the key strategies for enhancing credibility, constructing an authorial persona, may be seen as comprising two sub-strategies. The first, representing the researcher as a knowledgeable professional, is intended to achieve proximity of membership, while the second, representing the researcher as a friendly modest expert willing to share their knowledge with the audience, aims to indicate proximity of commitment. Several modes are employed for the realisation of these sub-strategies:

- talking head/body or voice-over introducing the researcher's own name and affiliation
- caption or title slide introducing the name(s) and affiliation of the researcher(s) and the title of the paper
- talking head/body or voice-over introducing the title of the paper
- reference to the journal in which the article is published
- explicit acknowledgement of others' collaboration
- self-reference by *I*
- diminutive names
- reference to self and the team by exclusive *we*
- body posture and clothes
- visual representation of academic or informal setting

The professional authority of the researcher is ascertained by the giving of his/her name and affiliation to an academic institution by a combination of primarily verbal modes: the speech of the researcher represented as a talking head or voice-over, superimposed captions, or title slide, which may also include the logo of the institution. Affiliation is typically indicated only by the written mode, as in Figure 1 and Example 1, and, probably due to space constraints, it is absent in lecturing abstracts, in which the text is displayed on a blackboard/whiteboard. The same combination of modes is employed to announce the title or the topic of the paper and to refer to the *Journal of Number Theory*, thus enabling scholars to associate themselves with the reputation of the high-quality scientific journal in which the

paper is published. In the case of co-authored papers, researcher expertise is highlighted by presenting the study as the joint work of a team or a collaboration with a senior researcher (2). The interplay of these multimodal resources increases the credibility of the researcher by contributing to the proximity of membership dimension.



Hi.
This is an abstract of this paper on cubic Kummer type towers of Garcia, Stichtenoth and Thomas by Maria Chara and myself, Ricardo Toledano.

Figure 1. Title slide of conferential VA_06

(1) Transcript of VA_06

(2) Hello, I am Hui Chen. This is a joint paper with professor Tianping. (VA_12)

Proximity of commitment is conveyed by a combination of verbal and visual resources comprising self-reference devices and choice of setting and clothes. In the opening moves, self-reference is typically expressed by exclusive *I* or *my*, which appear in eleven video abstracts in the corpus. The first-person singular pronoun highlights the presence of the researcher and gives prominence to the mathematician as agent of the research and possessor of the knowledge and expertise communicated by the study. At the same time, when used with the reader pronoun *you*, *I* invites the audience to participate in a dialogue with the presenting scholar and to highlight the willingness of the mathematician to explain his research, as in *I'm going to tell you about* (3). Example 3 also shows the scholar using a diminutive name (Andy for Andrew) to refer to himself, which reduces the distance between him and the audience and contributes to proximity of commitment. When describing the research and making claims, however, mathematicians tend to use exclusive *we* (4), which may be interpreted as referring to the research team, thus enhancing its authority (cf. Luzón, 2019); alternatively, the exclusive *we* may be interpreted as a conventional form of self-reference in pure mathematics, thus showing the author's awareness of disciplinary conventions.

(3) Hello, *I'm Andy Home* from the University of Kent in Canterbury, UK. *I'm going to tell you* about continued fraction expansion for certain Engel series (VA_11)

(4) But *we show* that this is not the case and in fact this estimate is altered. (VA_15)

The choice of setting and clothes contributes to the build-up of the identity of the mathematicians by indexing two different types of contexts. In lecturing video

abstracts, researchers typically stand in front of a board and are in formal dress, which together with the lecture hall setting enhances their authority and expertise. Conversational video abstracts employ a different strategy – they feature researchers in casual wear in their home, sitting on a sofa or chair, thus showing informality and reducing the power distance between the mathematician and the audience. The four conferential abstracts with talking head are split between these two strategies: two feature researchers in formal clothes sitting in their office, while the other two represent scholars in casual wear sitting in their home. The choice of setting seems to correlate not only with the type, but also with the length of the video abstract. Brief video abstracts, typically the lecturing ones, tend to rely on mathematical symbolism and concise presentation of content, while longer abstracts, which mostly belong to the conferential and conversational types, tend to be more descriptive, adopt a narrative voice and foreground the interpersonal dimension of discourse.

3.1.3. Engagement

The strategy of engagement involves ways in which the researcher overtly acknowledges the presence of the “reader-in-the-text” (Thompson, 2001) by including the audience as discourse participants, guiding them to interpretations and involving them in the argument (Hyland, 2005). Engagement with the audience is an essential aspect of academic persuasion, as it enables the scholar to build a rapport with the audience, create an in-group relationship and indicate politeness (Dontcheva-Navratilova, 2021), thus contributing to proximity of commitment. Engagement in video abstracts is created via realisations involving primarily verbal and some non-verbal modes:

- greeting and thanking the audience
- reader pronouns *you* and inclusive *we*
- the speaker as guide through the text
- cohesive and interpersonal gestures
- eye contact
- informality

As in conference presentations (cf. Valeiras-Jurado, 2020), the researcher typically opens the video abstract by greeting the audience (10 occurrences) and ends it by thanking the audience (9 occurrences); in both situations the scholar addresses the audience directly and looks straight into the camera establishing eye contact. By maintaining a direct and sustained gaze at the audience the researcher sends important attention signals to the viewer, and, as Lee (2023) points out, fosters an impression of her/himself as a competent speaker. The speech act of thanking conveys modesty and goodwill and explicitly ends the communication, typically with the phrase *thank you (for watching)*. Direct appeal to the audience is enhanced by the reader pronoun *you*, which also occurs when the mathematician invites

viewers to read the full paper, as in (5), where he tries to capture the interest of the audience by pointing out that details of proof are provided there.

(5) I invite *you* to read my article if *you* are interested in the details of the proof. (VA_13)

Arguably, the most powerful engagement resource for establishing in-group relations and claiming common knowledge with the audience is inclusive *we*, as it helps mathematicians to construct an active viewer (Kuteeva & McGrath, 2012; cf. Hyland, 2005) who is positioned as a peer researcher following the argument chain. For example, in (6) the use of the directive *let's* invites viewers to look at a diagram drawn by the researcher, who refers to the aim at hand as a goal shared with the audience (*what we are trying to achieve, our goal*). The inclusive function of *we* and *our* is stressed by contrast with *I*, used to refer to the mathematician.

(6) So *let's* look at this field diagram that *I've* drawn. *K* is at the bottom K_n is on the left and what *we* are trying to achieve is to show that this here is the correct Galois group. That's *our* goal. (VA_04)

Audience friendliness is indicated by explicit structuring of the text (e.g., *let's go to the slides, I've just listed, we start with...*) and marking of logical connections in the argument chain by conjunctives (*however, so, consequently*), as is typical of mathematical discourse (cf. O'Halloran, 2015). The role of helpful guide through the text is strengthened by cohesive and interpersonal gestures. In lecturing abstracts (often used by Chinese authors), the researcher more or less reads the text on the board using deictic gestures to indicate their progress (Figure 2); these deictic gestures facilitate comprehension, which might be problematised by the researcher's strong foreign accent. Cohesive gestures are also used when the scholar makes connections between mathematical formulas on the board; in a slideshow, this may be achieved by using the cursor as a pointing device.

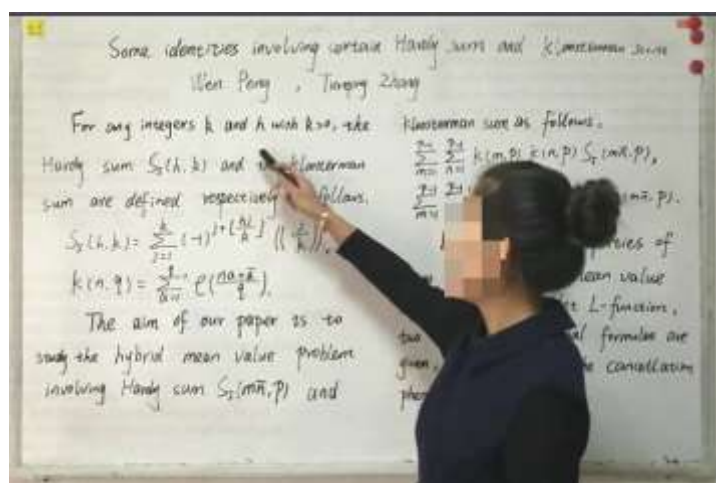


Figure 2. Deictic gestures in a lecturing abstract



Figure 3. Interpersonal gestures in a conferential abstract

Interpersonal gestures may regulate and direct interaction, e.g., when moving from the talking-head introduction to the slideshow (Figure 3), or when progressing via the talk in conversational abstracts. In addition, they may show attitude, especially in storytelling. In conversational and conferential abstracts with a talking head, social distance is reduced by the use of informal expressions (*quite a mouthful*, *pretty much*, *a little bit funny*), as in (7).

- (7) Now the title is *quite a mouthful*, so I'm going to start with the second half of the title about Bianca's generalized iteration conjecture since the statement of this conjecture can be explained to *pretty much* anybody who knows *a bit of* Galois theory. (VA_04)

3.1.4. Framing

The promotional purpose of the video abstract is to reach a wider audience and thus enhance the outreach of the research and researcher visibility. The strategy of framing to make highly specialised mathematical information more accessible to the audience strengthens the rhetorical construction of proximity of commitment. This is typically achieved by an interplay of verbal and non-verbal modes:

- defining key concepts
- storytelling
- explicit verbal signalling of links between arguments
- mathematical symbolism: notations, equations and diagrams
- bullet points highlighting key ideas
- voice-over commenting on the slides
- highlighting points of the message via intonation, drawing or gestures

Although the ‘lay’ audience of pure mathematics video abstracts is probably not very wide and includes primarily scientists working in related disciplines, university students and teachers of mathematics, this does not guarantee a sufficient network of consensual knowledge shared by the researcher and the audience. Consequently, proximity of commitment can be increased by tailoring the information presented in the video abstract to the assumed knowledge of the viewer. To achieve this, the researcher has to present the information as accessible, for instance by downplaying the amount of knowledge provided, e.g., *a little bit* in (8), and building on what the audience is likely to know by defining new concepts (9) and explicitly marking links between arguments and entities (cf. Hyland, 2010).

- (8) we will tell you *a little bit* about our paper ‘An Euler totient sum inequality’. (VA_02)
- (9) So we begin with some basic definitions. If a tower of function fields over the final field K is just a nested sequence of function fields, we say that the tower is admissible if each extension F_{i+1}/F_i is finite separable and of degree at least 2. (VA_07)

Bringing mathematical discourse closer to the audience is also achieved by reframing mathematical language as storytelling, complemented by everyday language and attitudinal expressions (*interesting*) seeking to establish emotional involvement with the audience (10). Storytelling typically introduces the audience to previous research on the topic to which the study presented in the video abstract is related.

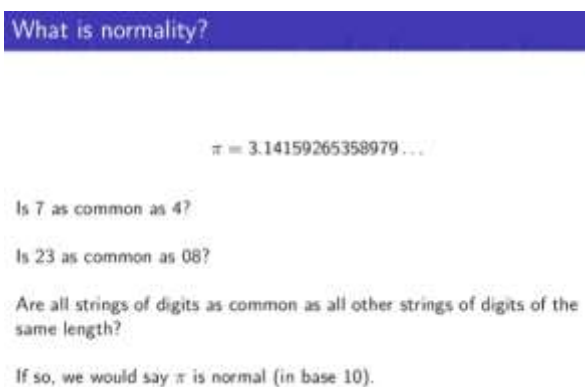
- (10) The story begins with an *interesting* formula discovered by Woods and Robbins in 1979 (VA_13)

In some cases, storytelling may take the form of personal narrative, so bringing the scientist closer to the audience by disclosing his personal experience and enthusiasm for the research at hand (11).

- (11) I was really fascinated by this. I thought it was really interesting and I really wanted to know at that point, well, is there some fundamental connection between L functions in the algebraic objects that are attached so there’s some really deep intimate connection there. (VA_10)

The interplay between verbal and non-verbal resources used for framing vary between the different types of abstracts. The framing element in the lecture type of abstract is minimal, as the scholar simply reads the text on the board, thus allowing the viewer to process simultaneously the oral and the written text (including mathematical notations and formulas), assisted by deictic gestures to facilitate understanding. By contrast, the written text on the slides in conferential abstracts differs considerably from the text of the voice-over. For example, in Figure 4 and Example 12, the information on the slide highlights the key points, while the voice-

over introduces the audience to the topic in a way which is easier to process. The voice first introduces the audience to the topic by referring to Wikipedia as a familiar, commonly available source of information and then gradually explains the definition of normality by taking the number π as an example, while using several linkers to show how the text unfolds (*to begin, we start with, now, as we look at*).



To begin, we need some definitions. There are currently over 20 definitions of 'normal' in mathematics just listed on Wikipedia at the time of this recording at least. We'll be interested in the definition of a normal number and *we start with* every mathematician's favourite number π , some of whose digits are listed here. *Now as we look at* the digits of π , one could ask a very basic question: do we see the number 7 as often as we see the number 4? *And* do we see the string of digits 2 3 as often as we see the string of digits 0 8? *If* every string of digits is as common as every other string of digits of the same length, *then* we say that π is normal in base 10.

Figure 4. Written text in conferential VA_05

(12) Transcript of VA_05

The complete absence of mathematical symbolism in conversational abstracts requires the most extensive framing work on the part of the mathematician, as the focus is shifted away from presentation of proof to highlighting the credibility of the researcher, who discusses motivating factors for the study and stresses the new knowledge it adds to the discipline (13).

(13) The *motivation for this work* was the *realization* that the positively shifted Mascheroni series are the dual sequence to Ramanujan sums of hyper harmonic numbers. (VA_09)

The last framing device used in the corpus is the highlighting of key points of the message by non-verbal means. This may be achieved by intonation or gestures pointing to, underlining or circling items on the board or on the slides simultaneously with the providing of information in spoken form.

3.1.5. Logical reasoning

The last two strategies serve to enhance proximity of membership. They represent the researcher as an experienced professional who is a provider of new knowledge and a master of disciplinary conventions. Logical sequences in mathematical

discourse are realised multimodally, i.e., verbally by logical conjunctions and conjuncts and visually by mathematical notations and images, which express relation or values or summarise assertions. The most frequent conjunctions expressing logical relations are *if...then* and *so* (14). In Figure 5, we see a slide with mathematical notations and a diagram; while the voice-over describes the diagram, the researcher adds lines and an arrow indicating relations and circles points that he wants to emphasise. The text in Example 14 represents the beginning of the explanation provided by the voice-over during the drawing of the diagram, including explicit verbal indicators of logical relations (*so, if, because*).

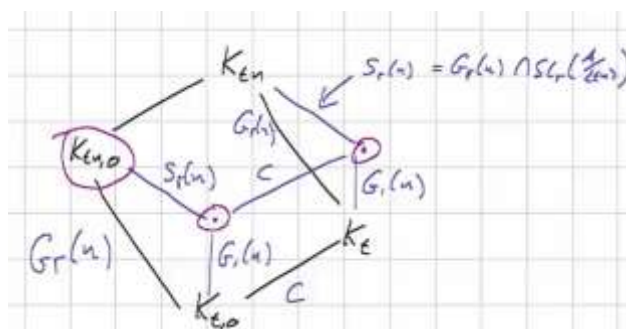


Figure 5. Drawing a diagram in a conferential slide (VA_04)

- (14) *So if* we denote by $K_{t,0}$ the function field of our Drinfeld moduli scheme over the rational function field F which is just K_t we can draw this diagram or field extensions. On the left hand side we have the exchange and $K_{t,n,0}$ over $K_{t,0}$ and *because* these are the function fields of the Drinfeld moduli scheme, this tells us the Galois group here is our favourite group $G_{r(n)}$ (VA_04)

This interplay between the verbal and the visual shows how pure mathematics transforms the world of physical happenings, events, things and relations into a logical discourse of argumentation (O’Halloran, 2015).

3.1.6. Providing proof

The uniqueness of mathematics as a scientific discipline resides in the fact that new results are substantiated by proof (Elwes, 2010, as cited in Kuteeva & McGrath, 2015), i.e., logical reasoning, which proves the validity of a theorem. As Kuteeva and McGrath (2015: 168) note, mathematics has “an added aesthetic dimension”, in that a well-constructed proof is seen as “having an inherent beauty”. Thus, the main contribution of the research to disciplinary knowledge is the provision of clear and succinct proof, and as such it enhances the credibility of the researcher by strengthening the proximity of the commitment dimension. As shown in (15), proof is typically represented by verbal modes (written and/or spoken) and mathematical notations.

- (15) In this paper, as a corollary, we prove that the sequence $\{2\alpha 5\beta p\gamma\}$ is d-complete for $p \in \{9, 21, 23, 27, 29, 31\}$. (VA_07)

However, in conversational abstracts, where mathematical notations cannot be used to present proof, the credibility of the scholar is constructed by addressing the motivation for their study and the innovations that their research brings to the field (16).

- (16) so one of the innovations of this paper is that not only do we duplicate all that classical theory from the plus side or a k_n^+ but we do so in a manner that's just as explicit as it was classically. (VA_10)

It can be argued that logical reasoning and providing proof are defining components of the epistemology of pure mathematics and are therefore key rhetorical strategies in any kind of mathematical discourse.

3.2. Strategies for building credibility in printed abstracts

Printed abstracts are typically considerably shorter than video abstracts (on the average 88 versus 654 words) and therefore must provide concise information about the research presented in the article. The analysis of JNT printed abstracts has yielded four strategies to enhance credibility: constructing an authorial persona, framing, logical reasoning, and providing proof. A sample abstract from the corpus will be used to illustrate the use of these strategies (Figure 6).

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3.2.1. Constructing an authorial persona

As in the video abstract, the printed abstract represents the researcher as a knowledgeable professional to construct proximity of membership. This is achieved by signalling the scholar's name and affiliation and the use of exclusive *we*, i.e., the dominant form of self-mention in the discourse of mathematics even in single-authored texts, which highlights the contribution of the author to knowledge-making (Figure 6). The new findings imparted to the readers (*we show a variety of new constructions of continued fraction normal numbers*) serve to boost the credibility of the researcher. However, unlike in the video abstract, the proximity of commitment dimension is somewhat backgrounded and the focus is laid on results extending disciplinary knowledge.

New normality constructions for continued fraction expansions

Joseph Vandehey

Boyd Graduate Studies Research Center, University of Georgia, Athens, 30607 United States

A B S T R A C T

Text. Adler, Keane, and Smorodinsky showed that if one concatenates the finite continued fraction expansions of the sequence of rationals

$$\frac{1}{2}, \frac{1}{3}, \frac{2}{3}, \frac{1}{4}, \frac{2}{4}, \frac{3}{4}, \frac{1}{5}, \dots$$

into an infinite continued fraction expansion, then this new number is normal with respect to the continued fraction expansion. We show a variety of new constructions of continued fraction normal numbers, including one generated by the subsequence of rationals with prime numerators and denominators:

$$\frac{2}{3}, \frac{2}{5}, \frac{3}{5}, \frac{2}{7}, \frac{3}{7}, \frac{5}{7}, \dots$$

Figure 6. Printed abstract (PA_05)

3.2.2. Framing

Since the printed abstracts appearing in JNT address a highly specialised expert audience, framing here is restricted to relating current research to previous studies on which the study is based. As the readers are familiar with the concepts, their definition is not necessary. As shown in Figure 6, the author contextualises his knowledge claims in relation to ratified disciplinary knowledge – the work of Adler, Keane and Smorodinsky. By so doing, he helps the reader locate the specific theme in mathematics which his paper addresses.

3.2.3. Logical reasoning

Logical reasoning in printed abstracts combines the verbal mode, realised by logical conjunctions and conjuncts, and mathematical notations. In this regard, they do not differ from video abstracts. However, the limited length of printed abstracts reduces the scope of employment of mathematical notations and equations and makes it impossible to provide a detailed description of the arguments chain, as often occurs in conferential abstracts (14). As shown in Figure 6, an *if...then* statement is used to present a premise illustrated by mathematical notation and the following conclusion pertaining to previous research. The contribution of the current research is presented as an extension of previous knowledge, the most significant finding being provided by mathematical notation at the very end of the abstract.

3.2.4. Providing proof

Similarly to logical reasoning, the strategy of providing proof is limited by the size of the printed abstract and expressed by the verbal mode and mathematical notations. The proof itself is typically not presented in the abstract. Contribution to disciplinary knowledge is indicated by pointing to the outcomes of the research and the use of evidential verbs (*show, prove*) indicating that the proof is provided in the research article. Mathematical notations are used to illustrate the findings, as shown in Figure 6, or to summarise the proof.

3.3. Comparison of strategies for building credibility in printed and video abstracts

A comparison of the strategies for building credibility in printed and video abstracts shows considerable differences pertaining to the variety of strategies used and their realisations. Apart from the non-availability of the spoken and visual modes in printed abstracts, the most important difference is the absence of the interpersonal strategies of attention-getting and engagement related to the build-up of a relationship with the audience and thus of proximity of commitment.

The other two strategies contributing to proximity of commitment, i.e., constructing an authorial persona and framing, are used less extensively in printed abstracts, as their realisation is restricted by the lack of the multimodal means offered by the video abstract and by the limited length of printed abstracts. In contrast with video abstracts, constructing an authorial persona in printed abstracts does not present the researcher stepping into the text by the personal pronoun *I*, which grants maximum visibility and involvement. Instead, printed abstracts are strictly formal and restrict self-reference to exclusive *we*, which is conventional in the discourse of pure mathematics.

Differences between printed and video abstracts are particularly striking when the strategy of framing is considered, which reflects the audiences that the abstracts address. The lack of definitions is probably the most obvious difference between lecturing abstracts and their printed counterparts, as the rest of the text is often identical. Conferential and conversational video abstracts differ more substantially from the corresponding printed abstracts as they also lack the informality and storytelling elements, which allow researchers to gradually introduce the audience to the topic at hand while making the condensed language of mathematical discourse more accessible by using elements of everyday language. We see this clearly by comparing (12), showing the transcript of the video abstract, with the printed abstract displayed in Figure 6. While in the video abstract the mathematician uses the strategy of engagement (inclusive *we* combined with rhetorical questions), provides definitions and explains the problem in everyday

words, the text of the printed abstract begins directly with a concise presentation of the assertion on which the study is based.

The differences in the realisations of the two strategies contributing decisively to the proximity of membership dimension, i.e., logical reasoning and providing proof, stem primarily from difference in length between the printed and video abstracts. While video abstracts provide a detailed description of premises and proof and include mathematical notations illustrating or summarising the main findings, in printed abstracts the brevity of the text requires extreme conciseness and the text employs only indispensable notations to represent new knowledge claims put forward by the researcher.

The conclusion that can be drawn from this comparison is that the construction of credibility in printed abstracts relies primarily on building up proximity of membership, thus presenting the researcher as an expert member of the disciplinary community. In contrast, the multimodal affordances of video abstracts allow the researcher to use a wider range of strategies, including those contributing more effectively to the establishment of proximity of commitment, to assert their credibility. These strategies increase the visibility of the scholar and help them engage with the audience while using framing strategies to make the language used and the message it imparts more accessible.

4. CONCLUSION

This study has explored the construction of credibility via the interplay of verbal and non-verbal modes in the digital genre of the video abstract. The results show that strategies for building credibility in video abstracts differ from those used in printed abstracts and vary to some extent across the three types of video abstract. Printed abstracts focus on enhancing proximity of membership by giving prominence to providing proof and logical reasoning, which may be associated with the logical persuasive appeal. Video abstracts put emphasis on proximity of commitment related to the strategies of attention-getting, engagement, framing and building an authorial persona, which pertain to the ethical and pathetic appeals. These differences in the strategies used to convey credibility between printed and video abstracts seem to reflect the affordances of the media used and the audience targeted by the abstracts. The multimodal character of the video abstract and the larger audience addressed by video abstracts encourage the scholars to opt for interpersonal strategies combining direct address to the audience, everyday language, explanations and narratives to make the content of the message more accessible. Variation across the three types of video abstracts seems to stem from the setting, presence/absence of the researcher on screen and length of the video abstract, which tend to impact the selected framing strategies, degree of personalisation and engagement with the audience.

To conclude, the findings of this study suggest that video abstracts have a prominent promotional function aimed at building researcher credibility by foregrounding the ethical and pathetic persuasive modes. The persuasive potential of video abstracts is enhanced by multimodality and the use of rhetorical strategies and metadiscourse devices focused on the build-up of the interpersonal dimension of discourse. The results of this study should not be generalised, as it has examined qualitatively a small corpus of video abstracts in a single discipline. Further research on a larger amount of data representing different disciplines and using specialised software, which would allow qualitative and quantitative analyses of a wider set of indicators, should verify the findings of this investigation. Still, I hope that this study contributes to a better understanding of the potential of the video abstract to promote scientists' work and reach wider audiences.

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OLGA DONTCHEVA-NAVRATILOVA is Associate Professor of English Linguistics at the Department of English Language and Literature, Faculty of Education, Masaryk University, Brno, Czech Republic. Her research interests include English for academic and specific purposes and political discourse with a focus on evaluation, coherence and persuasion strategies. She has published the books *Analysing Genre: The Colony Text of UNESCO Resolutions* (2009), *Coherence in Political Speeches* (2011) and co-authored *Persuasion in Specialised Discourse* (2020). She is co-editor of the journal *Discourse and Interaction*.