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A Proposed Theoretical Framework for the Analysis of Research Articles

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Abstract

This research is taken from a thesis that examines the rhetoric of accounts of methodology in English and Arabic research articles (henceforth RAs) (Tawalbeh, 2019). Genre analysts have focused on using Swales' move analysis approach to investigate the discourse units of the sections conventionally found in an RA: introduction, methods results and discussion. This research suggests a wider perspective for analysing RA sections. It argues for the desirability of employing both top-down and bottom-up processing to make more sense of the texts analysed. It also suggests employing the perspective of tacit knowledge to identify the assumed shared knowledge between writers and readers of RAs. The use of these different approaches may be helpful in making a detailed analysis, the results of which may benefit beginner academic writers.

Keywords: Top-Down, Bottom-Up, Tacit knowledge, Systemic functional approach, ESP framework

1. Introduction

Many researchers have investigated various sections of English research articles (henceforth RAs): introduction section (swales, 1981), methods section (Nwogu, 1997; Zhang and Wannaruk, 2016) and results, discussion and conclusion sections (Ruiying and Allison, 2003). The most seminal work was conducted by Swales (1981) in an attempt to represent the rhetorical structure of RA introductions. His analysis shows that there are certain moves and steps which represent the introduction section. He has classified these moves and steps based on the communicative purposes of text segments. Swales (2004, p. 228) defines 'move' as 'a discoursal or rhetorical unit that performs a coherent communicative function in a written or

spoken discourse'. Swales' idea of using rhetorical moves in genre analysis was also used by Bhatia (2013), who considers move as a tool serving 'a typical communicative intention which is always subservient to the overall communicative purpose of the genre' (Bhatia, 2013, p.75).

Swales analysed 48 RA introductions, 16 of them were selected from the field of Physics, 16 from Social Sciences and 16 from Biology/Medicine. He found that there are four moves forming most of the introductions of these disciplines: 'Establishing the Field, Summarising Previous Research, Preparing for Present Research and Introducing Present Research' (Swales, 1981, p. 22a). Swales' description of moves was criticised by Crookes (1986) for the difficulty of separating the first two moves. Thus, Swales (1990) solved this problematic issue by combining these two moves under one move called 'establishing a territory'. The second move in his edited structure is 'establishing a niche' and the third is 'occupying the niche'. He called this structure 'Create a Research Space (CARS) model', as seen in table one below.

Table 1. Swales' 'CARS (1990, p.141) model'

Move 1 Establishing a territory	
Step 1 Claiming centrality	
and/or	
Step 2 Making topic generalization(s)	
and/or	
Step 3 Reviewing items of previous research	
	↓ Declining rhetorical effort
Move 2 Establishing a niche	
Step 1A Counter-claiming	
or	
Step 1 B Indicating a gap	
or	
Step 1 C Question-raising	
or	
Step 1 D Continuing a tradition	
	↓ Weakening knowledge claims
Move 3 Occupying the niche	
Step 1A Outlining purposes	
or	
Step 1B Announcing present research	
Step 2 Announcing principal findings	
Step 3 Indicating RA structure	
	↓ Increasing explicitness

Swales then modified this model in 2004 by mainly changing the steps of the moves. Steps 1 and 2 became one step named as 'topic generalizations of increasing specificity'. Step 3 'Reviewing items of previous research' can be used within the three moves. The first three

steps in move 2 were combined into one step which is 'indicating a gap' that conveys a function similar to the three steps. Step 1D in move 2 was replaced by a new clearer step which is 'adding to what is known'. A new optional step was also added to move 2 which is 'presenting positive justifications'. Finally, Move 3 was renamed as 'presenting the present work'. This move consists of seven steps as clarified in the following table.

Table 2. Swales' 'CARS (2004, p. 230,232) modified model'

Move 1 Establishing a territory (citations required)
via
Topic generalizations of increasing specificity
Move 2 Establishing a niche (citations possible)
via
Step 1A Indicating a gap
or
Step 1B Adding to what is known
Step 2 (optional) Presenting positive justifications
Move 3 Presenting the present work (citations possible)
via
Step 1 (obligatory) Announcing present research descriptively and/or purposively
Step 2* (optional) Presenting RQs or hypotheses
Step 3 (optional) Definitional clarifications
Step 4 (optional) Summarizing methods
Step 5 (PISF**) Announcing principal outcomes
Step 6 (PISF) Stating the value of the present research
Step 7 (PISF) Outlining the structure of the paper
*Steps 2-4 are not only optional but less fixed in their order of occurrence than the others
** Probable in some fields, but unlikely in others

The introduction section has been given a lot of attention by many researchers compared with other RA sections. For example, Briones (2012), Kanoksilapatham (2012), Lakic (2010) and Samraj (2002) applied Swales 'CARS model' to RA introductions to analyse the moves and steps of this section. They show that, in spite of the similarities between the rhetorical structures of the RA introductions they analysed, and Swales 'CARS model', there are disciplinary variations which appeared in the generic structure of this section.

Swales' analysis offers a significant example of how move analysis has been applied to RA introductions and extended to other RA sections. For example, Brett (1994) analysed 20 RAs in Sociology using Swales 'CARS model' and focused on the communicative functions of the results section. Basturkmen (2012) investigated the moves and steps of the discussion sections in Dentistry RAs. Lim (2006) collected 20 RAs in the discipline of Management for analysis of the communicative moves and steps representing the methods section. However, the genre analysis conducted by researchers has only covered, to the best of my knowledge,

the moves and steps with their realisations using Swales' (1981-2004) move approach. Therefore, this research aims to propose a theoretical framework that can help make a detailed analysis of the RA sections using different approaches and techniques.

2. A Proposed Theoretical Framework

The genre analysis of RAs can be conducted in term of two important approaches: the approach of English for Specific Purposes (henceforth ESP) as in the work of Swales (1981-2004) and Bhatia (2013) and the systemic functional approach (henceforth SF). In the SF approach, genre is analysed in terms of what Martin (1992) calls schematic structure which he uses to refer to text structure. Schematic structure is defined by Bruce (2008, p.16) as 'The stages or steps that are conventionally followed in the typical organization of the content of a genre'. Bruce summarises that genre analysis in SF can be conducted according to the schematic structure and lexico-grammatical features which correlate with the steps of the schematic structure. This method can be followed by examining the lexico-grammatical features in terms of the transitivity analysis and by describing how these features realise the organisational rhetorical structures of the RA sections.

Halliday (1985) demonstrates that the lexico-grammar system includes the components of the ideational meaning; participants, processes and possibly circumstances, all of which are assigned semantic labels. Halliday explains that there are three main process types realised by verb groups and each process has its own participants realised by noun groups. The different types of processes with their participants form the transitivity system. The first process is the material (doing/happening) and it involves the following participants: 1- an actor who performs an action; 2- a goal affected by the action; 3- a recipient, who receives something and 4- a client, for whom something is done. The second process is a mental one (sensing) and it includes two participants: a conscious one (senser) performs the mental process and what is perceived, thought, or felt (phenomenon). The third process is the relational process (being/having) and it is of two types: 1- The attributive process has one participant (carrier) and it is assigned an attribute. 2- The identifying process has a participant (token) and it represents another one (value). These two processes can also be possessive ones, in which one participant is a possessor that owns something (possessed). The circumstances are adjuncts or prepositional phrases that are optionally attached to the process. Halliday adds that there are other types of processes such as: 1- The behavioural process, which comes between material and mental processes, 2- The verbal process has a participant (sayer) saying something (verbiage) to another (receiver) and 3- The existential process indicates that something exists called existent.

Similar to the SF approach, Bruce clarifies that the ESP framework examines the organisational stages of the text content (moves and steps) and their linguistic realisations. Within this framework, the major contribution in genre-specific domain has been offered by Swales. For him, a genre is identified basically in terms of the communicative purpose it carries. He does not refer only to communicative purpose in his move-step analysis, but also to the linguistic exponents used to realise a step. Some other researchers have a stance similar to Swales. Firstly, Bhatia (2013) clarifies how the introduction and abstract sections share the

same context but they are considered as different genres because they have different communicative purposes. He also analysed genres occurring in different contexts; introductions of a dissertation and of a laboratory report. He maintains that they are considered as sub-genres of the academic introductions genre because they have similar communicative purposes. Secondly, Biber (1988) indicates that genre, as opposed to 'text type', is identified according to external factors concerning writers' purpose. 'Text type' makes reference to the linguistic form as a basis to determine similarity between texts. Therefore, 'text type' is needed to identify communicative purpose as there are linguistic features which can tell what a text intends to achieve.

2.1 Top-Down and Bottom-Up

Swales' 'Move analysis' approach works as a top-down process by breaking the higher units of discourse into smaller ones. However, it is not enough to use only this process in the analysis as it is possible that this process may miss some discourse features. Therefore, it is worthwhile to look at the smaller elements of these features and then to see what they do in the text. One useful way to do this is by using bottom-up processing. Jeffries and McIntyre (2010) distinguish between 'bottom-up processing' and 'top-down processing' and clarify their importance for readers to understand a text. The first relies on using textual elements to make meaning while the second refers to the use of prior knowledge of the world to help comprehend a text.

Bottom-up processing was the term used by the psychologist Gibson (1966) in his study of perception. According to Gibson, perception is formed when the senses detect and convey to the brain information about the world. The senses are activated by being exposed to stimuli from the surrounding environment, which is the source of all stimuli and the source of sufficient detail about the stimuli. Gibson (1972) asserts that perception is direct. It depends on detecting sensory information and does not require employing past experiences or memories of the past. Moreover, Riener (2019) describes bottom-up as a process that begins with the reflected light from objects and ends with using eyes and brain to recognise those objects. He adds that people perceive visual information using a series of independent modules. The first includes joining edges and colours into an object after they have been distinguished. The second is responsible for comparing the object with other shapes in long-term memory to be able to recognise it. The last module assigns a linguistic label to the object. It can be understood that bottom-up is a process that begins with experiencing incoming data (stimulus) in the bottom level and ends with perception at the highest level.

Bottom-up processing is described in specifically visual terms by Palmer (1999). The bottom level includes depicting the retinal image which passes through subsequent interpretations via the visual pathways at higher levels. Palmer points out that the input of this process is lower-level representations and the output is higher-level representations. Similarly, Norman (1976) uses the phrase bottom-up to describe a sequence of processes that starts out from the incoming data and is developed in an increasingly sophisticated analysis. The incoming data, according to Norman, is at the bottom level of the analysis which proceeds in successive

layers until they reach the top level wherein the final recognition of the data occurs. Therefore, the concept of bottom-up processing is also described as a data driven process.

The objection to the concept of bottom-up processing as a way of making sense of the world is that it does not take account of expectations (Norman, 1976 p. 41). It could, in fact, be argued that the idea of starting any process without some expectations, and often without some previous experience, simply does not conform to reality. The mention above of increasingly 'higher-levels' seems to imply some already-existing cognitive organisation, which is at least partly formed by our past experiences. People are not blank sheets of paper onto which images can be simply impressed. To put this another way, perception, like everything else, always takes place in a context. This context (which includes our personal context i.e. past experience) gives us expectations which we use to make inferences about what it is that we are seeing. From this point of view, Gregory (1970) proposed an alternative (top-down) hypothesis about how people perceive things. According to Gregory, perception is indirect and depends on employing past experience and previously stored knowledge in the brain to interpret a stimulus from the surrounding environment and to make inferences about what we see. Similarly, Riener (2019) summarises that top-down process relies on expectations and knowledge in recognising objects. In this aspect, lower processes such as shape perception are influenced by long term memory. This top-down process, as Norman (1976, p.41) clarifies, depends on conceptualisation of incoming data and involves analysis of the context to make sense of the world.

All this theorising about processes was concerned chiefly with visual perception. Reading an academic article is visual too but it has a great deal of context. For example, the knowledge of the reader that s/he is reading an academic article about a certain topic leads to various expectations, as does his/her knowledge of a particular writing system in a particular language. Such knowledge generates expectations concerning grammar, punctuation, spelling, content and style of writing which can help the reader/viewer to make sense of the marks on the flat surface (i.e. writing) and to interpret them in a way that enables him/her to comprehend what s/he reads/sees. The reader/viewer can see the marks on the surface as not only an object, but also as a message to understand and comment on. Therefore, perceiving these kinds of marks has lots of context and it is different from perceiving an object such as a flower. That is why it makes sense to start the analysis from a top-down perspective. However, the limitation of top-down is that it can miss (i.e. not 'see') phenomena which, as they do not fit easily into top-down expectations, are new to the perceiver and so have never been conceptualised by him/her. While top-down is a better reflection of how people make sense of the world, scholarly analysis needs bottom-up as well, as a way of finding new ways of looking at the world, in this case, academic texts.

In light of the above considerations, the analysis may start with top-down; that is, it can be framed and organised according to a framework that can serve as a representation of what likely readers would expect to find in an RA section intended to be analysed. The analyst then can employ bottom-up. Both processes are essential for the processing of information and for making more sense of the data (Norman, 1976). Bottom-up processing is useful for conducting fine-grained analysis of the data. It may perform tasks that the top-down process

may not do in discovering features that are not part of the framework that a study may start with.

Bottom-up processing can help in moving in organised steps from one phase to another higher phase to compose a complete detailed image of the data. It can investigate the texts by focusing in its first phase on relatively small elements of a text such as verbs and their tenses and then phrases and clauses and the lexico grammatical features employed therein. But notice that even the analysis of such small elements as the word involves some top-down processing as the concept of a word is an expectation and we use our past experience to recognise words. The second phase can involve examining the function introduced by such elements to realise a sub-step or a step and finding a match between the lexico grammatical features and these sub-steps and steps. In another higher phase, the overall purpose for a group of steps representing a move can be deduced. In the top final level of the process, the series of moves with their constituent elements can be gathered into groups to represent the whole image of the RA section.

2.2 Tacit Knowledge

In order to help identify the assumed shared knowledge between writers and readers, the concept of tacit knowledge has been found useful. This concept was first considered by Polanyi (1983) in terms of the notion that 'we can know more than we can tell' (p. 4). Polanyi's example of this is how we can recognise someone's face among a million other faces, but we cannot spell out how we recognise it. This observation can perhaps be more obvious if we consider how it is possible to guess where a person comes from by his/her face. As a result of culture-specific norms, people from a particular place do the same kinds of things with their facial muscles. This in turn can play a role in shaping their face. People sometimes talk confidently about an Irish face or a French face, but there appears to be no racial basis for this distinction so it could be the muscles, of which there are so many it would be impossible to spell out the information received about all of them. However, as Bruce and Young (2012) point out, there are some qualities about human face that can be easily articulated such as sex, age and skin colour (Bruce and Young also mention the debatable concept of 'race'). It can be said, then, that there is some information about the human face which *can* be articulated.

Polanyi contends that tacit knowledge is acquired by the active shaping of experience and it cannot be articulated. Polanyi's discussion of tacit knowledge as untellable fits with the origin of this concept in the Latin 'tacitus' which means silence (Zappavigna, 2013). Zappavigna points out that one of the synonyms of tacit is ineffable. Ineffability, as she summarises, is used as a criterion to distinguish tacit knowledge from explicit knowledge. Zappavigna observes that there are two positions regarding the notion of tacit knowledge: the strong position denies the possibility of its articulation in any linguistic form while the weak position maintains that it is merely difficult to put such knowledge into words. There is an analogy to be drawn here between these two positions and the two positions that have been taken on the Sapir-Whorf hypothesis. This hypothesis has two versions: the strong version states that language determines thought while the weak one states that language merely

affects thought (Connor, 2002). The strong version can be interpreted as meaning that there is no thought without language, which therefore runs directly counter to the strong position of tacit knowledge, which separates linguistic articulation from knowledge. The weaker versions of the two conceptions are, however, compatible. The weak position on tacit knowledge allows for the possibility, albeit sometimes very difficult, of articulating all knowledge, while the weak position on the Sapir-Whorf hypothesis recognises that what gets articulated can have an effect on thought, and therefore knowledge. In both cases, a relation between language and thought/knowledge – but not a deterministic one – is maintained.

The idea that it is sometimes absolutely impossible to articulate what one knows threatens the relation between knowledge and language and can indicate, as Zappavigna (2013) points out, that knowledge is separated from language. Gascoigne and Thornton (2013, p.5) also observe that considering tacit knowledge as not tellable confirms the principle of inarticulacy: 'there can be knowledge that cannot be articulated'. Gascoigne and Thornton argue that the impossibility of articulating tacit knowledge may affect its status as knowledge because it does not make sense that there is something known if knowledge is untellable.

This discussion can be illuminated by considering the work of linguists. It can be said that Polanyi's conceptualisation of tacit knowledge as not tellable ignores the role of linguists in making tacit knowledge visible and in uncovering implicit meaning in discourse (Zappavigna, 2013). Zappavigna demonstrates that our knowledge of language is an example of tacit knowledge that has been made explicit in grammars and textbooks. This is an example of representing tacit knowledge explicitly by linguists. There are different approaches as to how direct these representations of our linguistic knowledge are. Only Chomskyan linguistics purports to represent it directly; that is, it purports to actually tell exactly what it is that we human beings know linguistically (i.e. what our brains actually know) (Sampson, 1980). Other approaches (e.g. Halliday and SFG) simply attempt a useful way of organising information we know so it becomes tellable and accessible to readers. These two different approaches to linguistic description were contrasted by Householder (1952) as 'God's truth' versus 'hocus pocus'. In the former, the linguists' role is to find out the structure of human linguistic competence and to describe it clearly while the 'hocus pocus' position considers a language to be an incoherent mass of data and linguists perform the task of arranging, organising and imposing a sort of intelligible structure on this mass (Householder, 1952). The former approach makes a stronger case for the tellability of tacit knowledge but even the latter succeeds in putting into words knowledge that has previously been unarticulated.

Another example on how tacit knowledge has been made explicit is given by Rice (2015) in terms of the ability of articulating knowledge about physical environment without being experts. Rice interviewed university students who developed specific experiences about the design of their university campus. They described this design in terms of that of a prison. Thus, she observed that those students' experiences helped them produced tacit knowledge that had not been articulated using the technical vocabulary of disciplinary specialists, but it was articulated in a particular discourse. The two examples mentioned above can help deal with the shortcoming of the theorisation of tacit knowledge: the claim of the impossibility of putting it into words. It can be said that there is still an ability for giving explicit information

about what people tacitly know. Therefore, the weak position can be adopted as a point of departure to study what information is made explicit – and what is not made explicit – by RA writers.

Tacit knowledge can offer an important contribution to identify referents relying on the functional relation between two entities. Polanyi (1983, p. 10) illustrates this relation as follows: 'we know the first term only by relying on our awareness of it for attending to the second'. He describes the first entity as proximal of which our knowledge may not be tellable and from which we attend, and the second as distal which we attend to. Polanyi clarifies that particulars in the proximal entity appear in isolation while they appear as a comprehensive unit in the distal entity (for a collection of Polanyi's essays, see Grene, 1969). He adds that looking at the particulars in isolation does not yield comprehension and they are meaningless while seeing the coherent unit which these particulars constitute makes them meaningful and raises our awareness of them. To further demonstrate the from-to relation, Polanyi claims that tacit knowledge has a power of integration that can integrate a set of sounds (proximal) to an entity (distal) after they have been converted tacitly into the name of that entity. Making sense of the sounds is achieved by attending from them to the entity which shapes their meaning. Attending from particulars to the comprehensive entity of which they are part is a process of interiorising that endows these particulars with meaning.

The process of attending from the proximal to the distal entity can be useful in the analysis to help identifying the referents of nouns and have better understanding of different terms used by the RA writers. This, in addition to the tellability principle of information discussed above, can help show what information may be needed and help identify what the writer assumes is known to readers and can form part of a shared knowledge. In addition, the use of the bottom-up allows referring to the given linguistic choices in the accounts of methodology to determine how referents are identified and who the writer assumes the reader is. Another way to look at the linguistic features is by making reference to some practices of the 'linguistic model of naming' designed by Jeffries (2010, p.18). One of these practices includes the selection of a noun to identify a referent and another is to look at the modifiers accompanying a noun to give a clearer identification of that referent.

2.3 Textual Intervention

The technique 'textual intervention' designed by Pope (1995) can also be employed to find out what effect on the participants (i.e. the author and those engaged in the text) a change in the text can create. Pope's work can help show how such participants in the data are put in the steps using his classification of the 'agent position: personal; interpersonal and depersonalised' (Pope, 1995, p.49-50). The first of these is 'addresser-centred' as it relies on the 'first-person' such as I and we. The second is 'addressee-centred' referring to the 'second person' such as you and your. The last one is 'message centred' and it refers to the 'third-person' such as s/he, they and it.

3. Conclusion

This research reviews how the RAs were analysed using the well-known top-down process initiated by Swales (1981-2004), namely, the move analysis approach. The present research suggests that the rhetorical structure of RA sections can be analysed using this approach in combination with bottom-up processing. It is possible to examine the function of text segments by recognising their communicative purposes and more importantly by identifying the linguistic features first and showing what steps and moves these features represent. Bottom-up processing can be useful for making detailed analysis which may help discover new steps or moves.

Bottom-up processing in addition to employing tacit knowledge can help identify the referents of nouns and noun phrases to be able to identify the assumed shared knowledge between writers and readers. This kind of analysis may be useful for examining RAs written in different languages to present a picture about cultural divergence. It may show what it is that readers may need to understand. It would, presumably, be useful to draw writers' attention to the need to consider what information needs to be given to readers while writing their texts -and what does not. They need to check if what they consider as shared with readers is really shared with them; otherwise, communication fails to occur. Writers should be aware of the notion of shared knowledge to decide on the amount of information required for successful communication.

The proposed framework in this research also suggests the use of the lexico-grammar system for analysing the realisations of the moves and steps representing RA sections. This system helps identifying the ideational meaning which in turn shows which semantic label is used to realise a step and what types of processes are used to realise one step. Therefore, beginner writers can choose from the available options offered in realising the same step. This system can also help in describing the roles of the participants (i.e. the authors and the subjects of the RAs to be analysed) and their relation to the activity described.

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