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Encoding, decoding, packing and unpacking via agnation: Reformulating general knowledge into disciplinary concepts for teaching English academic writing

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ABSTRACT

In assessing student writing, instructors typically look for evidence that a writer has grasped concepts from the field and is using them appropriately. Texts may demonstrate this by linking discipline-specific knowledge to the everyday world, either translating common knowledge into classroom concepts, or from them. This procedure is particularly important in Economics, a real-world discipline. However, the language resources employed for this process are not generally an explicit part of the English for Specific Academic Purposes (ESAP) curriculum. This paper argues that an effective ESAP writing course should teach how language facilitates this translation process via agnation. This paper first explores the evolution of the approach to agnate relations, then applies the concept as either packing (placing common phenomena into technical terms) or unpacking (explaining technical terms through common phenomena). It then gives the results of applying this method in a classroom setting: the course "Writing for Disciplinary Studies" for Chinese Economics students studying in English. It was found that students' writing scored higher accuracy and clarity marks when they had been explicitly instructed in these agnate relations and how to employ them in writing, but work could be done to make this process more student-friendly.

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1. Introduction: agnation and ESAP

Writing in a second or other language is a challenging endeavour, and the teaching of it is likewise a difficult task. Not only does a writing instructor have to design and implement an approach to the teaching of particulars of language (and in many cases, outright peculiarities thereof), but also she or he may have to contend with students who are neophytes in the fields for which they are being prepared. We suggest in this paper that language instruction for writers who are new to a discipline include explicit direction in patterns of agnation particular to the packing or unpacking of semantic information, shunting from everyday to technical or vice versa.

Our approach to agnation is informed by an earlier study by [Liu and Irwin](#) (under review) which performed semantic and lexicogrammatical analyses across code glosses of reformulation (i.e., *in other words*) found in a corpus of student papers from undergraduate courses in Economics. The results of that study were that the most successful writing linked disciplinary

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concepts to real-world correlates either in a pattern of “packing” (in which the explanation was taken from the local context and placed into the Economics terms, though certainly not always in a lexicogramatically straightforward manner) or “unpacking” (in which the disciplinary concept was placed into a student-centred explanation, likewise often linguistically circuitous). It is also possible to take a common phenomenon (as in the classroom example, a “cartel”) and give it an economic explanation (“a form of oligopoly”).

In what will hopefully become clear though the explanation of agnation that follows, we viewed the shunting across stratal boundaries (from lexicogrammatical to semantic, with elements of registerial field-driven motivation) to be roughly analogous to the observations made in terms of the Token-Value relationship of the identifying clause, of which a major purpose is to determine the valence of an explicatory process. Essentially, if a clause moves from Token to Value, it decodes the concept, and if it is placing Value into a Token, it encodes the concept. As an example, take the following clauses:

Decoding = Economics (Token) is the social science dealing with wealth (Value).

Encoding = The social science dealing with wealth (Value) is Economics (Token).

Halliday and Matthiessen (2014) explicitly link both explication and relation to the concept of agnation: “Explaining something consists not in stating how it is structured but in showing how it is related to other things: its pattern of systemic relationships, or agnateness” (p. 49).

Agnation, from the anthropological idea of patriarchal relation, was introduced as a linguistic concept by Gleason (1965):

Pairs of sentences with the same major vocabulary items, but with different structures (generally shown by differences in arrangement, in accompanying function words, or other structure markers) are agnate if the relation in structure is regular and systematic, that is, if it can be stated in terms of general rules. (p. 202).

Gleason presents clauses in the active and passive voice (as well as other patterns such as cleft sentences and polar interrogatives) as agnates as long as they contain the same process and participants. In systemic functional linguistic (SFL) terms, then, as long as the same paradigmatic units are present, the differing syntagmatic arrangements may be considered agnates.

Halliday (1985: Chapter 10) acknowledges this foundational view of agnation, and then expands it to include the concept of grammatical metaphor. This perspective has been carried through to the newest edition of *Halliday's Introduction to Functional Grammar* (Halliday & Matthiessen, 2014), where Tables 10–4 (p. 670), which examines expansion across the clause complex, clause and group levels, is described in the following way:

From a grammatical point of view, the [expansion type] environments set out ... are, of course, all different. But seen from above, from the vantage point of semantics, they are all agnate ways of construing expansion. Collectively they thus construe expansion as a semantic system. This means that for any given type of expansion we want to express, we have at our disposal a range of resources. (p. 669).

Importantly, then, SFL attributes to the concept of agnate forms not only a grammatical, but also a semantic basis (as opposed to Gleason (1965), a primarily structural approach).

Martin and Matthiessen (1991) expand the typological points of view of agnation from being represented by a single strand of a system network such that “agnation can also be captured by going *outside* the system network of a given grammatical unit, either by moving across ranks (within the same stratum) or by shunting between strata (across strata)” (349). As an example, there is a link between the following sentences, which we could define as being on the semantic stratum, but not the grammatical one *per se* (since the grammar is constrained by the sentence boundary):

This paper will be discussing **Involuntary economic interaction**. In other words, **you sometimes have to buy things even if you don't want to**.

Thus possible dimensions for representing agnation are those of metafunctional simultaneity, rank, and strata; Halliday's (1985) acknowledgement of grammatical metaphor as a kind of agnation is deemed “multiple agnation” because it is not a new level, but rather “is a way of using existing resources more than once” (350). Because of this phenomenon, linguists can perceive functional patterns as being dispersed via semantics such that different lexicogrammatical patterning can be employed to mean in similar ways, which may also be considered a form of agnation.

Based on this perspective, agnation has therefore been expanded in the current nomenclature to take into account not only how typologies can construe a direct paradigmatic relation as per Gleason's original account (1965), but also one in which “agnation can be represented in terms of degree: the more agnate categories are, the closer they are in space; and the less agnate categories are, the further apart they are” (Matthiessen, Teruya, & Lam, 2010, p. 258, “Topology”). As well as meaning being imbued in the overall system of language, meaning is picked up in logogenetic patterning of individual texts, in which similar meanings can be construed through proximal relations of – in the focus of this paper, at least – comparison between disciplinary concepts and more common, everyday phenomena. Agnates “are not synonymous: agnation always embodies both similarity and difference” (Halliday & Matthiessen, 2014, p. 673); and in our observation of the constructions of meaning in student papers, it is the synthesis of the different fields (technical and everyday) to explain particular concepts which is a possible measure of successful work, at least at this level and in this ESAP environment.

The main focus of the present research, then, is guided by the following questions:

1. Does an explicit knowledge of agnation patterns in packing and unpacking disciplinary concepts improve student ESAP writing outcomes, and if so,
2. How can this knowledge best be delivered to students in the classroom?

2. Methodology

This paper takes a particular approach to the complicated issue of discipline-specific writing by setting up a quasi-experimental classroom design in which the writing of two groups of predominantly Chinese students are compared. The two classes were randomly assigned by the college academic affairs office. According to the college policy, all Year 1 students recruited are at the second tier according to their performances in the Chinese national entrance exam of higher education.

Of the two “Writing for Disciplinary Studies” classes, one was designated the experimental group and the other a control. Both groups were instructed using the pre-existing syllabus, but the experimental group was given specific instruction on how to pack and unpack disciplinary concepts. This was done by providing additional instruction comprising three 50-min classes on the grammatical phenomena of coding and decoding processes in the Token/Value Identifier/Identified relationships in the relational: identifying clause, followed by packing and unpacking information, and then suggestions for employing these resources in the class assignment.

The design of these classroom materials followed a Vygotskian Zone of Proximal Development approach (Vygotsky, 1978); first, the scaffolding for the writing concepts of packing and unpacking, coding and decoding were provided, before the students were required to begin writing. As part of the writing process, the topic and approach for the essay were presented to the class so that feedback could be given, and finally students were on their own for the writing itself. To give a brief idea of the additional materials, we will provide three examples from the 24 slides the students were given. The first, Fig. 1, is from the talk on “Packing and Unpacking,” in which students had the concepts explained and then were given various examples from their readings:

Here the students were presented with a way to consider how their own knowledge could be used in order to present the disciplinary concept using the particular adjunct “in other words.” The following slide, “Unpacking,” was presented as the inverse of the above phenomenon (arrows simply reversed). While *packing* as depicted above replaces a general explanation with a disciplinary explanation, *unpacking* converts a condensed disciplinary explanation into a more general explanation. Both of these concepts were illustrated in the subsequent slides with a number of examples drawn from the readings and from student papers.

This class was followed with a talk about “Pathway of Thinking,” as per Fig. 2, which was designed to lead students into the conceptual categories of disciplinary explication and where these might be applied in essay writing:

Here the goal is to demonstrate to the students where the grammatical concepts of “encoding” and “decoding” meet the semantic concepts of “packing” and “unpacking,” and they were then presented with corresponding examples drawn from MICUSP (Michigan Corpus of Upper-Level Student Papers). As is shown in the example following the diagram, the author at first decodes the thing “a cartel” into an explanation with less Economic jargon to enable the general audience to understand it. Then, she or he packs this concept across the clauses into a more disciplinary explanation, essentially using “in other words”, to encode the concept into a disciplinary knowledge map. We can thus see that via this agnation pattern, the author

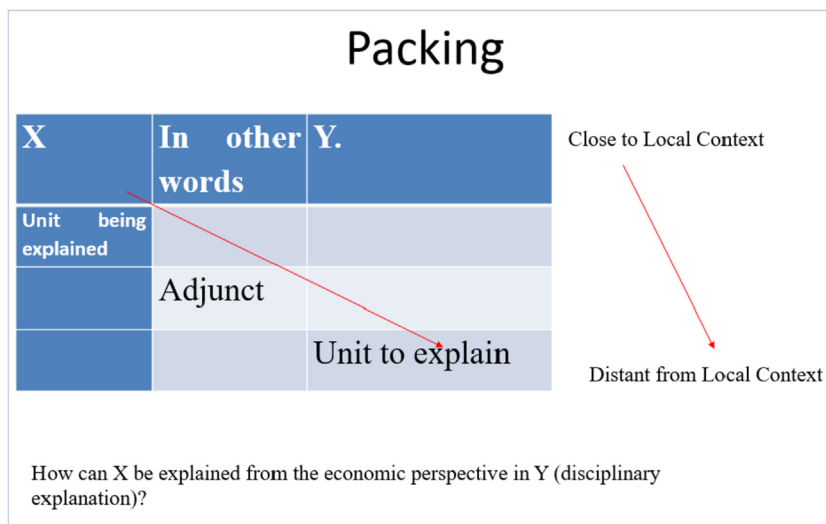


Fig. 1. Model of “Packing” information.

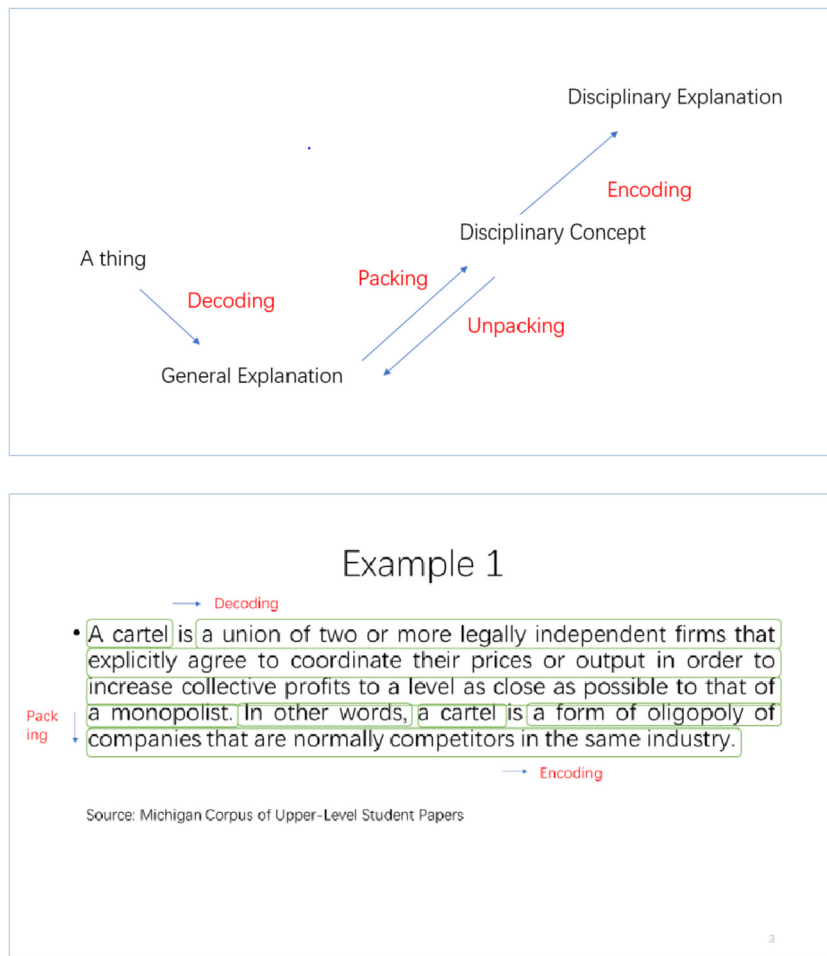


Fig. 2. Pathway of thinking.

attributes a general observation of the social phenomenon “cartel” with a more disciplinary explanation. The students in the experimental class were thus given reasonably explicit ways in which to frame a response in the language using the kinds of patterns found useful for the task of demonstrating praxis, while the control group was only given the pre-existing instruction.

For the assignment, the students from both groups were required to read an article entitled “People Gain from Voluntary Economic Interaction” extracted from the textbook (Sloman & Wride, 2009, p. 23) and then to submit an essay using the article to explain real-life cases, preferably drawn from their own experience. Both of the cohorts were taught four units, viz. Disciplinary Knowledge and Language (how to read an academic article), Tracking Disciplinary Knowledge in Language (how to cite sources), Presenting Disciplinary Knowledge in Language (how to encode the information from a source into an essay), and Increasing the Precision and Power of Language (how to do proofreading). Again, the only major difference in the instruction given to the two groups is that the experimental group received the extra training on the packing and unpacking skills. For ethical reasons, the extra training was also provided to the control group after the assignment was completed.

One researcher functioned as the course instructor and the assessor of students' anonymised assignments, while the other carried out the quantitative analysis of the data. Both were responsible for qualitative analysis. The students' evaluation of the course was conducted anonymously through an online scoring system administered by the Academic Affairs Office of the college. There were several measures taken to maintain the reliability of the research. First, as the course was a pre-existing one, the students were unaware of the specific writing techniques under study. Second, the students' essays were all submitted through Sakai (an online learning platform) where the assignments from both sections were mixed. The assessor could not therefore distinguish which essay was from which class. Third, the essays were anonymised before grading. Fourth, the rubric for grading was developed in previous iterations of this and similar writing courses and has been used for two years. It is an adapted version from the rubric of TOEFL writing task 1 (Educational Testing Service, 2006, pp. 253–254).

The essays were all marked using the class rubric, and the scores along the various assessment categories were tested for significance. We then took a closer look at the essays which did employ successful patterns of packing and unpacking

disciplinary concepts – both in the experimental and control groups – for suggestions as to what the explicit instruction might have contributed to the students writing outcomes.

3. Quantitative results

Initially, the quantitative results were not encouraging; there was no statistical significance in the means of the final marks between the two groups. The experimental group did achieve a higher mean mark (11.80/20) compared to the control group (10.47/20), but these can be seen as a potentially due to chance, as Table 1 *t*-test (two-tailed, two-sample unequal variance) results demonstrate:

The results are therefore that the control ($M = 10.47$, $SD = 2.99$) and the experimental ($M = 11.80$, $SD = 2.38$), $t(98) = 1.51$, $p \geq .05$, $CI95 = -3.11, 0.45$, did not demonstrate significant differences, and we cannot reject the null hypothesis that there is no difference in overall marks between these groups.

However, the rubric for the assignment includes four categories, evaluating “Response to Source Literature,” “Accuracy and Clarity,” “Coherence” and “Mechanics.” Although there is certainly overlap in these categories, the papers are essentially evaluated in terms of how well they deal with the course readings, how well they present these in the language, whether the paper follows standard essay format, and if the referencing has been done properly, respectively. By drilling down somewhat into these individual categories, it is clear that the experimental group differs from the control group most strongly in terms of the evaluation of “Accuracy and Clarity,” and as Table 2 indicates, this category can be considered significant:

Thus we can state that among the undergraduate students in the course “Writing for Disciplinary Studies” who participated in this assignment ($N = 36$), there was a statistically significant difference between the two groups in terms of the evaluation of “Accuracy and Clarity” in their papers, the control ($M = 11.63$, $SD = 4.34$) and the experimental ($M = 14.21$, $SD = 2.15$), $t(98) = 2.32$, $p \leq .05$, $CI95 = -4.83, -0.33$. Therefore, we reject the null hypothesis that there is no difference in the average results within “Accuracy and Clarity” between the control and experimental groups.

Since the students’ essays were significantly different in the evaluation of ways in which ideas were presented in writing, we proceeded with qualitative analysis to examine whether the experimental group might have been more successful thanks to being instructed in ways of packing and unpacking discipline-specific concepts as per the agnation patterns discussed previously.

4. Qualitative results

There were some important differences in the two groups in terms of both how theoretical concepts were being treated, and the ways in which they were communicated with the reader. The groups differed in the overall number of strategies being employed to link concepts with either the real world or another theoretical realm; these strategies were labelled “Comparing” (with another theory), “Relating” (an example to the concept), “Exemplifying” (the concept), and “Specifying” (the feature). Note that the same paper might employ all strategies, and in fact many did employ more than one. Another caveat is that just because a paper employed a certain strategy does not mean that it did so effectively.

The following is a more detailed illustration of these strategies with examples:

a) Comparing with another theory

As is shown in [1], the student has attempted to explain the concept *economic interaction* using *game theory*. There is first a justification of the explanation, then a translation into a concept, and finally an evaluation of the comparison:

[1] Game theory, the standard analytical tool of [1] economics. Often, economic interaction is an activity that benefits both parties. This win-win situation is called positive sum game.

Note that the student did compare to another economic theory; however, there is no development of in-depth understanding of the concept through a packing/unpacking strategy.

b) Relating an example to the concept and Exemplifying the concept

Table 1

Comparison of control and experimental group final marks.

Group	n	mean	SD	t	df	p	95% confidence interval
Control	19	10.47	2.99	–	–	–	–
Experimental	19	11.80	2.38	–	–	–	–
Total	38	11.14	2.69	1.51	36	0.139	–3.11 to 0.45

Table 2

Comparison of control and experimental “accuracy and clarity” marks.

Group	n	mean	SD	t	df	p	95% confidence interval
Control	19	11.63	4.34	—	—	—	—
Experimental	19	14.21	2.15	—	—	—	—
Total	38	12.92	3.25	2.32	36	0.026	−4.83 to −0.33

The strategy used in [2] is Relating an example to the concept and the strategy used in [3] is Exemplifying the concept. Both rely on examples to demonstrate understanding but are different in their reasoning processes. The former provides the example before relating it to a concept, while the latter gives the concept and then exemplifies it. In [2], the student coins an example of government and farmer relationships in urbanisation and then states that this is a case of *involuntary compulsory economic interaction*. In [3], the student admits that the concepts *economic interaction* and *the difference between voluntary and involuntary economic interaction* are difficult to understand, then uses the case of China losing its sovereignty in The Treaty of Xin-chou to understand them:

- [2] The farmer's land is requisitioned and transformed into state-owned land by the government and used for construction. Then the farmer can get a sum of money from the government. This is involuntary compulsory economic interaction.
- [3] The first question we'd like to ask after reading this article is probably that—what is economic interaction, then we went to another one—what is the difference between voluntary and involuntary economic interaction. Maybe it's a little bit hard for us to get the key point from the official explanation, but we can learn from several simple examples. For instance, There was the most numerous unequal treaty in modern Chinese history called The Treaty of Xin-chou, with the most serious loss of sovereignty.

In both of these segments, the students analysed analogical features between the examples and the concepts, but did not develop more in-depth understandings of the concepts through packing/unpacking strategies.

c) Specifying the feature

This strategy provides more in-depth exploration of the concepts, with the examples below looking at *involuntary economic interaction* and *voluntary interaction*. In [4], the concept is first explained specifically, then more generally as one side gaining over the other. In [5], there is an explicit explanation of the concept *economic interaction* then an evaluation of it.

- [4] Involuntary economic interaction may be like this, we have to buy something and we have no choice. In other words, these involuntary economic interactions are not willing in both side and always present one side gains but the other loses.
- [5] Economic interaction is to satisfy needs. In economic activities, everyone, every family and every country does not exist alone. Economic interaction allows each person to do what he or she is good at and trade more kinds of things at lower cost through his or her labor.

The strategy used in [4] engages in both packing and unpacking, and the strategy used in [5] is unpacking. They both enable the students to develop more in-depth thoughts on the concepts in their writing.

Fig. 3 summarizes the numbers (though not effectiveness) of the different strategies used by each group.

The major differences between the groups in this realm is that both exemplified the field-specific phenomena at roughly the same rates, while the control group relied more heavily on relating and comparing to do so. Conversely, the experimental group relied more heavily on Specifying the feature, with only one paper in the control group attempting to do so.

There are some differences in terms of the efforts of writers initially to include packing and unpacking in their papers; the control group did this without explicit instruction 2 and 5 times respectively (perhaps showing that unpacking in particular is an inherent feature of reacting to discipline-specific writing, particularly when exemplifying) while the experimental group managed 5 and 7 examples respectively. There was therefore not a huge jump in these numbers, but it was one that we postulate attributed to the statistically significant results in the marks discussed earlier.

One student managed to use both of these techniques in the same paper, so we will use that one to illustrate the technique (using precisely the student's words and means of expression; anything perceived as errors either technical or theoretical are in the original). In the first case, this essay unpacks the notion of “Voluntary economic interaction” as follows: “always makes both sides gaining. Like a kind of equal trading.” It then goes on to pack the notion of “Involuntary Economic interaction” as follows: “Economic interaction between people can take a number of different forms. In each case there is a mutual gain. If there wasn't, the interaction would not take place. But sometimes it looked like an unequal trading, we call it Involuntary interaction.”

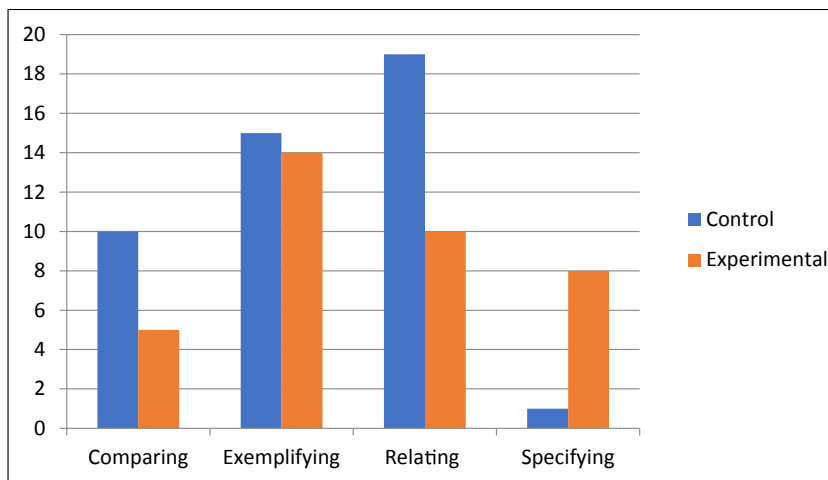


Fig. 3. Comparison of semantic features between groups.

A closer look at the quality of the packing and unpacking between cohorts suggests that the experimental group is doing so at a more sophisticated level, and therefore in general explaining the concepts better (though not consistently or unanimately). The members of the control group who attempt to do so employ a more circular means of expression, where lexical items on either side of the equation tend to remain the same, and in doing so have not reformulated across semantic realms.

According to the pre-existing syllabus, the students must do presentations before they submit their essays. For triangulation, the researchers also collected speech texts from the students in the experimental group to identify their improvements.

For example, here are two comparable semantic units constructed by the same student in the experimental group. The first is an example from her speech text; the second is the subsequent example from her essay (also cited in [4] above) demonstrating successful application of packing and unpacking in explaining the concept of involuntary economic interaction.

From her speech text:

- [6] Involuntary economic interaction is different from voluntary economic interaction. People gain from voluntary economic interaction. It is a 'win-win situation'. This is sometimes called a positive sum game: an interaction where there is a positive net gain (Wride, 2009). Involuntary economic interaction always presents one side gains but the other loses.

From her essay:

- [7] Involuntary economic interaction may be like this, we have to buy something and we have no choice. In other words, these involuntary economic interactions are not willing in both side and always present one side gains but the other loses.

While it may seem that in the speech text the student is more successful, particularly given the citation, the instructor verifies that the semantic work being done is that the student compares the concept to its antonym but does not further develop the meaning; further, the approach is taken directly from the textbook and is therefore unoriginal.

The essay integrates improvements, particularly where it relates the concept (albeit somewhat vaguely) to her own life where there is no choice in purchasing and then summarizes the concept, effectively packing a real-world situation into an economic term.

5. Discussion

One postulate is that the scaffolding provided by the demonstrations of agnate relations via relational identifying clauses to code and decode information at the clause level allows students to extrapolate similar patterns at the discourse level, thus enabling them to better pack and unpack information as per the expectations of the discipline. In essence, getting students to think about what they are trying to achieve on the "Pathway of Thinking" as above and presenting them with a means to do so in English allows them to not only start doing so at the clause level but also to structure larger units of language across sentences for the same purposes.

Encouragingly, the students who were provided with this sort of instruction as a first step were then brought further along in their ability to express themselves: the data for this paper does not reflect the achievements of the end of the course, where some of the students took advantage of feedback and further rewrote this same work using our analysis as formative suggestions. The work which went further in employing the agnation patterns we have developed improved even more, such that we have presented suggestions for the inclusion of this instruction to colleagues looking at similar learning outcomes.

Also encouraging news was that the Student Evaluations for both sections of the course were outstanding, with 92% Strongly Agreeing that “The materials (e.g. lecture notes, PPTs, readings and/or other handouts) provided by the instructor were useful to enhance my knowledge of the course.” As mentioned in the Methodology section, both groups had received instruction in the agnation patterns by the end of the course, and so we believe at least some of this high result in student satisfaction was from the adjusted materials and explicit instruction and materials.

6. Conclusion

The present research shows some success in the outcomes of employing this instruction for the student groups in question (as per Research Question 1). Perhaps predictably given the small numbers involved, the only place of statistically significant difference in the assessment outcomes occurred in the category in which the phenomenon was explicitly taught, and this was not enough in this case to produce a statistically significant difference in the overall marks.

Addressing Research Question 2, we suggest that the materials for instruction could be developed further. The understanding of coding and decoding lexicogrammatical relations is a difficult process for even experienced grammarians, let alone first-year undergraduate students in a foreign language environment concentrating on the discipline of economics. The materials, then, could be redesigned to simplify this concept, while concentrating on the more semantic realm of packing and unpacking information. For example, instead of trying to teach the grammatical concept of relational identifying clauses with their intersection of Identifier/Identified and Token/Value in terms of the vectors of coding and decoding, students would instead just be presented with the idea of either unpacking a disciplinary term into the less technical realm or packing common knowledge into the academic realm.

Although space does not permit a full discussion, we would like to acknowledge the excellent work in semantics taking place in Legitimation Code Theory in which there are intersections with the notions of disciplinarity, knowledge-building, and discourses in which *semantic density* and *semantic gravity* are placed in juxtaposition to create the semantic plane (see, for example, [Maton \(2011\)](#)). The types of agnation pattern we explore in this paper could be productively examined from that perspective as well.

It is also worth mentioning that this course received higher satisfaction ratings than it had in the previous semester. The ratings were between 4.84 and 4.97 on a 5-point scale in the version with the additional trainings of agnation patterns, but had been between 4.77 and 4.87 prior. Given the initial success of this project, we believe that it is worth integrating the explicit teaching of agnation patterns of packing and unpacking information into the ESAP writing curriculum.

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