A systemic functional perspective on automated writing evaluation: Formative feedback on causal discourse

by

Aysel Saricaoglu

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Major: Applied Linguistics and Technology

Program of Study Committee:
Carol Chapelle, Co-Major Professor
Evgeny Chukharev-Hudilainen, Co-Major Professor
Tammy Slater
David Oakey
David Russell
Tera Jordan

Iowa State University

Ames, Iowa

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"I can no other answer make but thanks, and thanks, and ever thanks."

Shakespeare

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Ve elbette ki babaanneme: "Toktor olacasun da insan mi iyilestirecesun?"

ABSTRACT

Making explanations is a very important communicative function in academic literacy; several disciplines including science are dominated by causal explanations (Mohan & Slater, 2004; Slater, 2004; Wellington & Osborne, 2001). For academic success, students need to write about causes and effects well with the help of their instructors, which means that formative assessment of causal discourse is necessary (Slater & Mohan, 2010). However, manual evaluation of causal discourse is time-consuming and impractical for writing instructors. For this reason, automated evaluation of causal discourse, which current automated writing evaluation (AWE) systems cannot perform, is required. Addressing these needs, this dissertation aimed to develop an automated causal discourse evaluation tool (ACDET) and empirically evaluate learners' causal discourse development with ACDET in academic writing classes.

ACDET was developed using three approaches: a functional linguistic approach, a hybrid natural language processing approach combining rule-based and statistical approaches, and a pedagogical approach. The linguistic approach helped identify causal discourse features by analyzing a small corpus of texts about causes and effects of economic events. ACDET detects seven types of causal discourse features and generates formative feedback based on them: causal conjunctions, causal adverbs, causal prepositions, causal verbs, causal adjectives, and causal nouns. The natural language processing approach allowed for assigning part-of-speech tags to sentences and words and creating hand-coded rules for the detection of causal discourse features. The pedagogical approach determined feedback features of ACDET, and it was informed by the theoretical perspectives of the Interaction Hypothesis and Systemic Functional Linguistics and findings of research on causal discourse development.

Causal discourse development with ACDET was empirically evaluated through a qualitative study in which four research questions investigated two criteria of computer-assisted

language learning evaluation framework: language learning potential (i.e., focus on causal discourse form, interactional modifications, and causal discourse development) and focus on causal meaning. Participants of the study were 32 English as a second language learners who were students in two academic writing classes. Data consisted of pre- and post-tests, ACDET's text-level feedback reports, cause-and-effect assignment drafts, screen capturing recordings, semi-structured interviews, and questionnaires.

The findings indicate language learning potential of ACDET: ACDET drew learners' attention to causal discourse form and created opportunities for interactional modifications, however, resulted in limited causal discourse development. Findings also reveal that ACDET drew learners' attention to causal meaning.

This study represents an important attempt in the field of AWE to analyze meaning in written discourse automatically and provide causal discourse specific feedback. The fact that empirical evaluation of ACDET was based on process-oriented data revealing how students used ACDET in class is noteworthy. The findings of this study have important implications for the refinement of ACDET, the development of AWE systems, and research on causal discourse development.

CHAPTER 1

INTRODUCTION

Our interest in understanding the events around us makes us look for explanations and ask why they happen (Psillos, 2002). We sometimes interfere with those events, change the way they happen, and create effects. Then, we talk about them and we connect the causes and effects. Although some researchers (e.g., Altenberg, 1984) consider causal explanations to be more common in spoken language than in written language, causal explanations dominate the written language of science (Wellington & Osborne, 2001). Science is only one of the many academic disciplines in which causal explanations play an important role. Mohan and Slater (2004) believe that causal explanations go beyond science and "are part of academic literacy generally" (pp. 255-256). The examples that Slater (2004) gives illustrate this point well; "English literature classes, for example, require students to explain the motivation of characters in works of literature. Discussions in social studies revolve around the examination of effects and consequences of various events in history" (p. 1).

The major role of causal explanations in academic literacy requires students to be able to speak and write about causal relations for academic success at every level of school. Slater and Mohan (2010) argue that teachers can help learners construct more sophisticated causal explanations through formative assessment. Formative assessment is "related to teaching and learning" and it is concerned with giving learners "locally focused, continuous feedback" on their writing (Leki, Cumming, & Silva, 2008, p. 82). In contrast to course grades, formative assessment is the assessment of learning that creates feedback, with an aim of helping students improve their work (Coffin, Curry, Goodman, Hewings, Lillis, & Swann, 2003; Irons, 2008). In order to learn how to write about causal explanations in a more sophisticated way, as Slater and

Mohan (2010) suggest, English as a second language (ESL) learners need feedback on their writing:

> If teachers are consistently and reflectively assessing student explanations, focusing on aspects that students are having trouble with, they can provide successful assessment-learning cycles for teaching the forms and meanings of causal explanations. The developmental path of cause…offers teachers a way to do this assessment and teaching. (Slater & Mohan, 2010, p. 267)

According to Slater and Mohan (2010), the causal developmental path can guide the formative assessment of causal explanations. The causal developmental path is characterized by a shift from causal conjunctions (e.g., *because, since*) to causal verbs (e.g., *lead to, affect*), and causal nouns (e.g., *reason, influence*) in learners' oral and written language (Halliday & Martin, 1993; Mohan & Beckett, 2003; Slater, 2004). Formative feedback on learners' causal discourse needs to help students traverse the path to causal verbs and nouns. Despite its fundamental role for academic literacy, providing learners such feedback is challenging for writing instructors. This chapter discusses instructors' obstacles in providing formative assessment of learners' written causal discourse and addresses the gap in literature on automated formative evaluation of written causal discourse. It presents the purposes of the study, explains the significance of the study, and describes the outline of the study.

Statement of the Problem

Because ESL learners' express causal explanations using limited grammatical constructions and vocabulary, teaching causal discourse explicitly is important for developing their academic literacy (Slater, 2004). Students are taught how to write about causes and effects in academic writing classes. In their cause-and-effect chapters, ESL writing textbooks (e.g.,

Engaging Writing 2 by Fitzpatrick, 2011) present a wide range of causal vocabulary such as nouns (e.g., *reason, factor, effect*), verbs (e.g., *result in, affect, lead to*), conjunctions (e.g., *because, since, as*), prepositions (e.g., *due to, because of, as a result of*), and transition words (e.g., *therefore, consequently, as a result*). However, the sentence-level orientation and isolated presentation of causal discourse vocabulary is criticized by functional linguists, who claim that the teaching of causal discourse should be informed by research on children's development of causal language (Christie & Derewianka, 2008; Mohan & Beckett, 2003; Slater, 2004).

Throughout their causal language development, learners demonstrate a shift from conjunctions to verbs and nouns (Halliday & Martin, 1993). At the early stages of causal language development, learners use conjunctions to express causal relations (e.g., *because*); later on, learners also choose verbs to indicate causality (e.g., *cause*); and finally, they add nominalizations to their repertoires for expressing causal meaning (e.g., *the cause*) (Mohan & Beckett, 2003). Halliday (1994) refers to this development as a shift from more congruent to less congruent expression of meaning. The less congruent is also referred to as "grammatically metaphorical." Halliday's important concept of grammatical metaphor is used to describe many different facets of language development. In learning their native languages, children start developing their grammar with congruent expressions. "Man clean car" exemplifies a child's congruent language (Halliday, 2003, p. 20). In this example, the meaning is expressed with a clause: man is the doer (subject) and he does the cleaning. The action of cleaning is expressed with a verb that follows the subject. The meaning which is expressed with a clause, including the subject followed by the doing in the word order, is referred to as a congruent pattern, and congruent patterns are characteristic of children's early language (Halliday, 2003).

As children develop, their language moves from more to less congruent as they grow the capacity for using grammatical metaphor and, therefore, expand the resources for creating meaning (Halliday, 2003). Grammatical metaphor allows language users to reconstrue meaning, as "a meaning that was originally construed by one kind of wording comes to be construed by another" (Halliday, 2003, p. 21). The change in wording is accomplished by "a substitution of one grammatical class, or one grammatical structure, by another" (Halliday & Martin, 1993, p. 79). In time, children's wording might change from "man clean car" to "the cleaning of the car" (Halliday, 2003, p. 21). The focus shifts from the doer as the subject of the clause to the doing and the doing becomes a noun. The meaning is expressed with different words and different wording results in being able to express things differently. To take another example, the change in the wording of the congruent sentence from "She spoke recently concerning poverty" to "Her recent speech concerned poverty" (Halliday & Martin, 1993, p. 79) also demonstrates a change in congruence and makes the latter construction grammatically metaphoric. The clause "she spoke recently" included the doer (she) and the doing (spoke) while the nominalization "her recent speech" shifted the focus from the doer to the action accomplished.

In causal discourse, conjunctions represent the congruent expressions of causal relations while prepositional phrases, verbs, and nouns represent non-congruent expressions (Mohan & Beckett, 2003). For example, the sentence "My plane was late so I had to run across the terminal" would be the most congruent way of explaining the situation, because the cause is expressed first, the effect, second, and the two are connected by the causal marker "so." The development of causal language reflects the transition from congruent expressions to less/non-congruent expressions. A less congruent or more grammatically metaphorical way of explaining the running would be "The late plane caused my running." As stated by Mohan and Beckett

(2003), “the development of causal meaning moves from the more congruent ‘so’ to the less congruent ‘the cause’ ” (p. 426). In the causal developmental path, the causal relation is nominalized in the following way:

a happens; so *x* happens

because *a* happens, *x* happens

that *a* happens causes *x* to happen

happening *a* causes happening *b*

happening *a* is the cause of happening *b*

(Halliday & Martin, 1993, p. 66)

Slater and Mohan (2010) claim that the path from “so” to “the cause” drawn by Halliday and Martin (1993) can inform the formative assessment of causal discourse. Such development-based assessment would seemingly be exactly what learners need in order to improve their academic literacy. However, it is not practical for instructors to actually mark essays in a manner that takes this path into account systematically. Performing manual evaluations of students’ drafts, identifying causal discourse features, and giving formative feedback based on the causal developmental path would be a very time-consuming task. Providing automated formative feedback, instead of manual feedback, may help writing instructors overcome issues of practicality raised by the suggestion of formative assessment of students’ use of causal language.

A potential way of addressing the issue of instructors’ provision of detailed feedback may be through the use of automated writing evaluation (AWE) programs. AWE programs have been responding to the needs of writing instructors to evaluate students’ drafts efficiently. “AWE programs…are designed to foster learner autonomy by performing error diagnosis of learner input, generating individualized feedback, and offering self-access resources such as dictionaries,

thesauri, editing tools, and student portfolios" (Chen & Cheng, 2008, p. 97). Since their entrance into the field of L2 writing, AWE programs have been investigated in terms of their effectiveness to help learners' improve their writing. Several studies have demonstrated positive findings in this regard (e.g., Chodorow, Gamon, & Tetrault, 2010; Ebyary, & Windeatt, 2010; Grimes & Warschauer, 2010; Rock, 2007; Wang, 2013; Wang, Shang, & Briody, 2013). However, those findings are limited to AWE programs' effectiveness in improving learners' grammatical and mechanical correctness. This is due to the fact that AWE tools are able to evaluate micro-level aspects of writing (i.e., grammar, mechanics, and usage), while disregarding analyses of macro-level aspects (i.e., content, organization, and development). Even though *Criterion*, a widely used AWE program, generates feedback on essay discourse elements (e.g., thesis statements and topic sentences), its discourse feedback is generic and does not address the content of discourse elements (Hegelheimer & Lee, 2013).

Providing learners with feedback on their grammar and mechanics through AWE programs and ignoring their content and discourse is not fair to learners when they are learning how to write in English. Writing is done with a communicative purpose (Hamp-Lyons & Kroll, 1997; Hayes, 1996), and how that communicative purpose is achieved through linguistic resources is as important as grammar and mechanics. As pointed out by Burstein and Marcu (2003), "[t]here are many factors that contribute to overall improvement of developing writers. These factors include, for example, refined sentence structure, a variety of appropriate word usage, and strong organizational structure" (p. 200). The capacity of AWE tools needs to be improved beyond evaluation of grammatical and mechanical errors and expanded to the evaluation of how students express meaning. This study addresses this need, in particular, for the evaluation of causal explanations by developing an AWE tool which can automatically evaluate

learners' causal writing and offer discourse-specific feedback in line with theory and research on causal discourse development.

Empirical evaluation of causal discourse development of learners using a tool that provides automated formative assessment of causal discourse is necessary. Research studies on AWE implementations for improving learners' writing skills have yielded results that have increased understanding of several aspects of AWE tools. Most researchers have compared automated scores with scores given by humans (e.g., Chodorow & Burstein, 2004; Elliot & Mikulas, 2004) and have investigated improvement in writing by analyzing learners' written products (e.g., Attali, 2004; Chodorow & Leacock, 2000; Rock, 2007; Warschauer & Grimes, 2008). Such studies "have been criticized for their methodological limitations and mainly for their primary focus on outcomes, excluding the educational process involved" (Cotos, 2010, p. 70). Warschauer and Ware (2006) describe such research studies as product research that focuses on the learning outcomes as a result of using an AWE tool. Process research, on the other hand, is research that addresses how an AWE tool is used in the learning and teaching process. There is also process/product research that focuses on the interaction between the use of an AWE tool in the learning and teaching process and the learning outcomes as a result of that process. Such research "can provide a more contextualized picture of the effects of automated evaluation and feedback" (Cotos, 2010, p. 70).

Evaluating AWE tools within classroom contexts by collecting observable data from learners' use of the tools would allow for a better understanding of factors leading to improvement or lack of improvement in learners' written products. Second language acquisition (SLA) perspectives might provide the basis of such evaluations because of the long tradition of process research in the study of SLA. For example, some SLA researchers hypothesize the need

for interaction and feedback in the learning process. The role of interaction and feedback in SLA has been well described in the Interaction Hypothesis (IH). The IH suggests that language development occurs as a result of interacting with others (Gass & Mackey, 2007; Hatch, 1978; Long, 1983). Ellis (1999) defines interaction as two types of activity: "the interpersonal activity that arises during face-to-face communication" and "the intrapersonal activity involved in mental processing" (p. 3). Chapelle (2003) adds another type of activity to Ellis's (1999) definition of interaction: "the activity between person and computer" (p. 56). Applying the IH perspectives to this third type of interaction, Chapelle (2003) hypothesizes that the interaction between person and computer can promote language development through providing suitable linguistic input, drawing students' attention to language, and offering feedback to help them use language. In this study, interaction refers to the activity between learners and the automated causal discourse evaluation tool (ACDET).

SLA researchers such as Gass (1997), Long (1996), and Pica (1994) hypothesize that interaction is helpful for enhancing SLA when it provides learners with access to linguistic input suitable for their level, draws their attention to linguistic form, creates opportunities for linguistic output and interactional modifications, and gives feedback on learners' output. In this study, interactional modifications refer to learners' interruptions of their interaction with ACDET in order to receive help to improve their causal discourse through features of ACDET.

SLA researchers have developed detailed research methodologies for conducting investigation of interactions. If these concepts and practices from SLA research were applied to process-oriented research of AWE, one would look for evidence of acquisition in learners' interactions with the AWE tools during the completion of the written tasks rather than focusing solely on outcomes. Building upon SLA perspectives, Chapelle (2001) proposes criteria for

evaluating interactions between learners and computers as language learning potential, learner fit, meaning focus, impact, authenticity, and practicality. Evidence of each criterion would provide an illustration of how effective AWE tools are in interacting with learners and enhancing their language development. This study addresses the language learning potential and meaning focus criteria for evaluating the interaction between learners and ACDET. Language learning potential of ACDET refers to its capacity to draw learners' attention to causal discourse form, to create opportunities for interactional modifications and causal discourse modifications that are appropriate for the causal developmental path. Meaning focus of ACDET refers to its capacity to draw learners' attention to causal meaning. This dissertation study aims to evaluate ACDET empirically based on these two criteria in addition to addressing the problems and needs aforementioned.

Purpose of the Study

Considering the importance of causal discourse in academic literacy, the heavy workload of manual evaluation of causal discourse and feedback provision, and the inability of existing AWE tools to evaluate causal discourse and provide causal discourse-specific feedback, the objectives of this study were twofold. First, the study aimed to develop an automated causal discourse evaluation tool (ACDET). Second, it intended to evaluate ACDET empirically as a formative assessment tool to help learners improve their causal discourse in two academic writing classes.

Significance of the Study

This study calls attention to the importance of causal explanations in academic literacy and addresses the need for formative assessment of learners' causal explanations. It further fills the gap in the causal discourse literature by studying learners' causal discourse development in

written language in classroom settings. It makes important contributions to the fields of academic writing by offering writing instructors a reliable supplementary tool that they can use in their cause-and-effect units or any other instructors who would like to assess their students' causal explanations.

This study also contributes to the advancement of the field of AWE with the development of a program for identifying and providing feedback on students' causal expressions in their writing, ACDET, and the demonstration of a model of how to analyze language expressing certain meanings and provide meaning-based feedback. It advances the AWE field by shifting the focus of AWE tools from mechanical and grammatical correctness aspects of language toward content and developmental aspects of language.

This study also contributes to the research on AWE by conducting an AWE evaluation through a product/process approach, as suggested by Warschauer and Ware (2006), in which both the learning process and learning outcomes are addressed. This study conducts the empirical evaluation of learning with ACDET based upon two evaluation principles proposed by Chapelle (2001) bridging between SLA perspectives and AWE evaluation.

Outline of the Dissertation

This dissertation is organized into five chapters. The current chapter introduces the problems and gaps in existing work which were the sources of motivation for conducting the research and development project: namely, the need for formative assessment of learners' causal explanations and the lack of AWE tools that evaluate causal discourse. Chapter 2 presents the theoretical perspectives that informed this study: Systemic Functional Linguistics (SFL) and the Interaction Hypothesis (IH). It introduces causal discourse with regard to how causal explanations are made in written English, how researchers have categorized causal discourse

features, and how causal discourse features are categorized in this study. Chapter 2 also addresses form-focused instruction and the teaching and learning of causal discourse and explores how formative assessment and automated feedback can be beneficial for teaching and learning how to express causal explanations. It reviews current AWE tools and discusses how these tools are evaluated in the existing literature. The chapter then presents the evaluation of ACDET in this study by presenting the research questions under investigation. Chapter 3 covers details about the development of ACDET and the methodology of the study including the research design, setting, participants, data collection materials and instruments, procedures, and data analysis for each research question. Chapter 4 reports and discusses the findings from the data analyses for each of the research questions. Chapter 5 concludes the study in four parts: summary of the overall findings, identification of the study limitations, presentation of implications and recommendations, and suggestion of directions for future research.

CHAPTER 2

BACKGROUND TO THE STUDY

Our lives are connected by a thousand invisible threads, and along these sympathetic fibers, our actions run as causes and return to us as results.

Herman Melville

To be able to understand why events happen is one of the basic needs of humans. We spend every single day of our lives wondering about the causes of events. Mothers wonder why their kids are late; computer programmers wonder why teachers cannot get the best benefit out of automated writing evaluation (AWE) tools; researchers wonder why computer systems cannot conduct discourse-level evaluations of writing; writing instructors wonder why students cannot write about cause-and-effect relationships well in their academic papers; and students wonder why they receive a lot of negative feedback on their cause-and-effect essays. Our whole life is encompassed by "why" questions with us looking for explanations in order to make sense of what is happening – in life, in science, and in classrooms.

Since science advances with explanations of phenomena, expressing cause-and-effect relations plays a significant role in the academic world, especially in academic writing. Scientific explanations are emphasized in elementary and secondary education curricula through science classes. However, students of higher education, whose majority of assignments require them to write about cause-and-effect relations, do not have opportunities to learn how to improve their cause-and-effect language skills. Non-native English speaking students who have to take academic writing classes might be asked to write cause-and-effect essays if they are included in the course syllabus. Yet, even in writing classes in which students produce cause-and-effect essays, not enough attention is paid to cause-and-effect language.

Despite the centrality of causal explanations in the academic world, the teaching and learning of causal language has long been ignored in the field of language education. The limited existing research on causal language includes descriptive studies which have explored expressions of causal relations in written English (e.g., Flowerdew, 1998; Xuelan & Kennedy, 1992) and studies which have looked into learners' causal language development in oral discourse (e.g., Mohan & Beckett, 2003; Slater, 2004). However, we know very little about formative assessment of learners' causal language, which is the focus of this study.

As pointed out by Slater (2004), ESL learners construct causal explanations depending on a very limited number of grammatical constructions and vocabulary, which indicates the necessity of explicit teaching of causal discourse. It is also necessary to conduct formative assessment of learners' causal discourse learning, as suggested by Slater and Mohan (2010) who argue that the assessment needs to be done based on the "developmental path of cause" (p. 267). However, evaluating every student's draft in terms of causal explanations and providing feedback that is appropriate for the individual's developmental path can be a very time-consuming task for instructors. This process needs to be automated. There are some AWE tools which are commonly used for formative assessment in writing classes (e.g., *Criterion*, *MyAccess!*). However, they do not evaluate causal discourse and do not provide causal discourse-specific feedback. To date, there is no evidence about how the use of an AWE tool can support learners' causal discourse development and can lead to positive learning outcomes. This study aims to fill this gap by developing and testing the first automated causal discourse evaluation tool (ACDET) in ESL academic writing classes. ACDET analyzes written texts and detects causal discourse features. Based on the amount of causal discourse form in the texts, it provides formative feedback for improving the way that students express causal meaning.

The purpose of this chapter is to provide background to this study. First, the chapter presents the theoretical perspectives which informed the investigation in this study: Systemic Functional Linguistics and the Interaction Hypothesis. Second, the chapter introduces causal discourse and features that are used in written causal discourse. Third, it describes form-focused instruction and discusses the teaching and learning of causal discourse. Fourth, the chapter points to the importance of formative assessment of causal discourse. Fifth, it reviews automated writing evaluation (AWE) and the state-of-the-art AWE tools and how the tools are evaluated in existing research. Finally, the chapter introduces the approach to empirical evaluation of ACDET in this study and concludes with the presentation of the research questions.

Theoretical Perspectives

This study relied on the theory of Systemic Functional Linguistics (SFL) and the Interaction Hypothesis (IH) for second language learning and was designed to help ESL learners improve their causal language with the help of automated formative feedback. The study was conducted in two ESL academic writing classrooms during students' completion of two cause- and effect-assignments. The objectives of these assignments were to get learners to discuss causes and effects of specific economic events. For this communicative purpose, SFL was chosen as the theory of language since SFL had proven useful in previous research for the description and study of the linguistic features appropriate for talking about causes and effects. In order to improve learners' causal discourse, the aim was for them to interact with ACDET, focus on causal discourse form and meaning during their interactions, and improve their causal discourse using ACDET feedback. Therefore, the research and development in this study needed to be informed by a linguistic theory encompassing development and use of causal language in addition to a theory of how people learn a second language through interaction and feedback.

Theory of language. This study is concerned with causal discourse development: how to help students express causal meaning in written language in a way that pushes them to advance according to the causal developmental path with the help of automated formative feedback. Systemic Functional Linguistics (SFL), as a functional theory of language in which language is viewed as "a system that creates meaning" (Halliday, 2009, p. 60), is widely used by researchers investigating how learners develop in their ability to create meaning with language.

SFL views both language and language learning as functional. This functional designation means that language is used for a meaning-making function; it is a resource for making meanings (Halliday, 1994). Language is a semiotic system "that creates meaning" when it is "activated in social contexts" (Halliday, 2009) p.60). Meanings are made in different ways in different cultures, and people make different linguistic choices depending on what social purposes they have. According to Halliday (1994), language as a semiotic system has three major functions: to talk about our experience, which he refers to as ideational function; to interact with others, which he refers to as interpersonal function; and to create cohesive and coherence texts, which he refers to as textual function.

Rather than looking at developments in syntax and structure alone, SFL focuses on the relationship between meanings and linguistic forms that realize those meanings in context (Christie & Derewianka, 2008; Coffin & Donohue, 2012). Language creates meaning in context and context is what helps language users understand the meaning (Halliday, 1971). Social situations in which meaning is made with linguistic resources are the focus in SFL, rather than a description of grammatical and syntactical rules (Coffin, 2006). For instance, a history classroom or other events centered on the field of history creates particular social situations which have a specific discourse in terms of text organization and lexico-grammatical patterns that make it

different from other classrooms or events associated with other fields (Coffin, 2006). Similarly, economy is a field that appears in social situations which are dominated by language about causes and effects of economic events. When writing about the causes and effects of economic events, learners need to use certain lexico-grammatical patterns that express causal relations. Hyland (2003) states that "particular language forms perform certain communicative functions and that students can be taught the functions most relevant to their needs. Functions are the means for achieving the ends (or purposes) of writing" (p. 6).

The relationship between meaning and form is well illustrated by Mohan (1989). In his Knowledge Framework (KF), Mohan describes six semantic text patterns, or knowledge structures, including classification, description, principles, sequence, evaluation, and choice (Slater & Gleason, 2011). For instance, the Principles thinking skills are to explain, draw conclusions, and apply causes and effects. Mohan believes that when learners write in a semantic pattern (e.g., cause and effect) in a particular context (e.g., discussing the causes and effects of a natural disaster or an economic event), they should be taught the linguistic features (e.g., causal verbs, causal conjunctions) that are related to that semantic pattern. How texts with certain communicative purposes are organized with appropriate linguistic features is demonstrated in Table 2.1.

Table 2.1

Text Patterns, Communicative Purposes, Linguistic Features, and Examples

Semantic Patterns of Texts	Communicative Purposes	Linguistic Features	Language Examples
Classification	To classify, group, sort, categorize, define	Being verbs Additive conjunctions Part-whole lexis: verbs and nouns Passive	be, have and kinds, categories, organize, sort are classified
Principles (corresponds to cause and effect discourse mode)	To explain, draw conclusions, apply causes, effects	Action verbs Consequential conjunctions and adverbials Cause-effect lexis: verbs and nouns Passive	 since, because, consequently, if-clauses effect, produce, bring about is caused by
Evaluation (corresponds to argumentation discourse mode)	To evaluate, rank, judge, criticize	Thinking verbs Comparative conjunctions Evaluative lexis: verbs, nouns, and adjectives	believe, consider likewise, however approve, value, boring, good
Description (corresponds to compare and contrast discourse mode)	To identify, label, describe, locate, compare, contrast	Being verbs Additive conjunction Attributive lexis: adjectives Comparison-contrast language	be, have and big, green the same as, like, different from
Sequence (corresponds to narration discourse mode)	To arrange events in order, note changes over time	Action verbs Temporal conjunction and adverbials Sequential lexis: verbs and nouns	 firstly, as, when-clauses beginning, conclude, summarize
Choice	To select, make decisions, propose alternatives, solve problems, form opinions	Sensing verbs Alternative conjunctions Appositional choice lexis: verbs and nouns	like, want or select, prefer, choice, option

Note. Adapted from Slater and Gleason (2011, p. 10).

The organization of texts in order to achieve particular communicative purposes creates genres. Martin and Rose (2008) define genre as "a recurrent configuration of meanings" which "enact the social practices of a given culture" (p. 6). They categorize genres into five families as stories, histories, reports, explanations, and procedures. In SFL, genre, particularly the genre of explanations as is explored in this study, is presented at the level of context of culture. At this level, genres perform communicative purposes within cultures. At the level of context of situation, the subject matter of the communication (field), the roles of the communicators and the relationship between them (tenor), and the mode of their communication (mode) are shaped as register. According to these three register components in the context of situation, linguistic resources are selected for communication. The contextual variables in the context of situation answer three questions: "what is going on?" (field); "who is involved?" (tenor); and "what role is language playing?" (mode) (Christie & Derewianka, 2008, p. 7). Corresponding to these contextual variables, there are three metafunctions of language. The ideational metafunction is realized by the linguistic resources that tell our experience; the interpersonal metafunction by linguistic resources that interact with others; and the textual metafunction by linguistic resources that make texts coherent and cohesive (Christie & Derewianka, 2008). The following figure presents the functional view of language in this study with reference to the SFL concepts introduced:

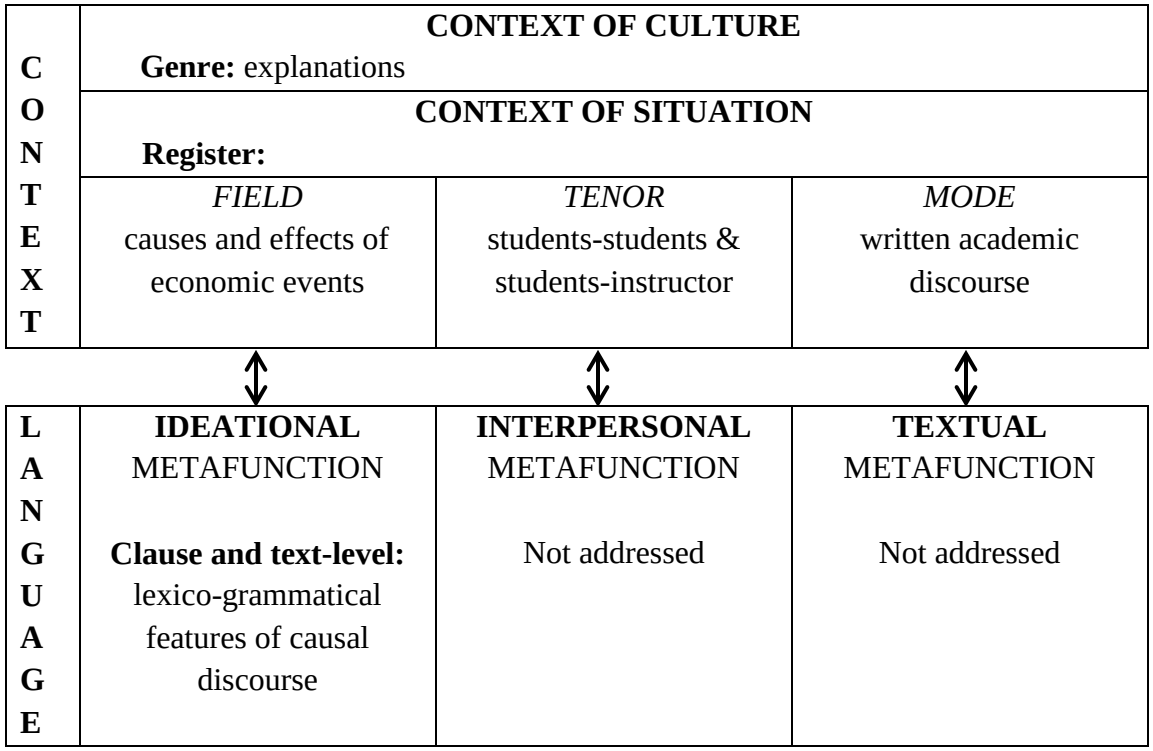

Figure 2.1. Genre, register resources, and ideational metafunction in this study

Figure 2.1 shows the theoretical positioning of this study as focusing on the genre of explanations in the context of culture. In the context of situation, the register, it involves causes and effects of economic events (field), students and the instructor (tenor), and written academic discourse (mode). For making explanations about the causes and effects of economic events in written discourse, this study addresses the ideational metafunction as the resource for creating meaning, specifically, causal discourse features for expressing causal meaning.

Theories of language learning. Two theories of language learning guided the investigation of causal discourse development with automated formative feedback: the Interaction Hypothesis and SFL.

The Interaction Hypothesis. Since the 1980s, SLA researchers have argued that exposure to input is not enough for L2 learners to master their L2 as it happens in native language

acquisition (e.g., Long, 1983). Learners need to interact with others (i.e., native speakers, students, and the instructor) who, according to the Interaction Hypothesis (IH), enhance learners' L2 development (Gass, 1997; Long, 1996). As stated by Ellis (2008), "[i]nteraction provides learners with input containing the data they need for acquisition. It also affords opportunities to experiment through production and to receive feedback on these attempts, thereby making the 'facts' of the L2 salient" (p. 205). Interaction means the communicational activity between people or the activity in one's mind during mental processing (Ellis, 1999).

The IH hypothesizes that second language acquisition (SLA) is enhanced by interactions between people. Through interacting with others, learners get access to comprehensible input, pay attention to linguistic form, have a chance to produce output, and receive feedback on their output (Gass, 1997; Mackey, 2007; Pica, 1994). Interactionists have shown that input includes linguistic forms that are unknown to L2 learners and should be modified for comprehensibility. Modifying input by simplifying it or elaborating on it helps interlocutors better understand each other, and when learners have the opportunity to understand meaning through the use of the language form, they may learn. In the interactionist view, interaction should also create opportunities for learners to produce output. With an attempt to avoid or solve communication problems, interlocutors interrupt their interaction to ask for clarifications, check for confirmation of understanding, correct errors or provide or receive feedback to be able to continue the interaction (Ellis, 2008). Such interruptions during the interaction are referred to as interactional modifications (Ellis, 2008). SLA researchers believe that such interactional modifications provide valuable feedback that helps learners notice the problems in their output and give them a chance to make output modifications to continue communicating. Modifying their output

promotes learners' focus on linguistic forms, an aspect which is essential for SLA (Schmidt, 1995).

With technological advancements, people interact not only with other people, but also with computers. Taking the interactions between people and computers into account, Chapelle (2003) expanded the definition of interaction made by Ellis (1999) as the interpersonal or intrapersonal activity to "the activity between person and computer" (p. 56). By applying the perspectives of IH to the interaction between people and computers, Chapelle (1998) describes how this interaction may also enhance language development. She suggests that key linguistic input can be made salient through highlighting them in colors or presenting them in a different mode, and the input can be modified by repeating them or simplifying them. Learners' output can be marked to draw learners' attention to the errors in their output so that they can have a chance to recognize the gap between what they have produced and the target forms then, ultimately, correct their errors. Feedback can be offered on learners' output, and opportunities can be created for interactional modifications through interactive sequences and help options. Since this study investigated learners' causal discourse development through interactions with a computer program, ACDET, IH informed the teaching and learning of causal discourse. In this study, interaction is defined as the activity between learners and ACDET. In this activity, learners revise their cause-and-effect papers to improve their causal discourse through ACDET feedback. Interactional modifications refer to the interruptions in their writing processes that they make when they receive sentence-level and text-level feedback or use dictionaries or the causal discourse help page while completing revising their causal discourse.

Systemic Functional Linguistics (SFL). In developing causal discourse, according to Halliday and Martin (1993), learners follow a path of development which starts with their use of

conjunctions, continues with the addition of causal verbs to their repertoires, and is complete when they use nouns to express causality, as well. Halliday and Martin (1993, p. 66) illustrate this path with the following examples:

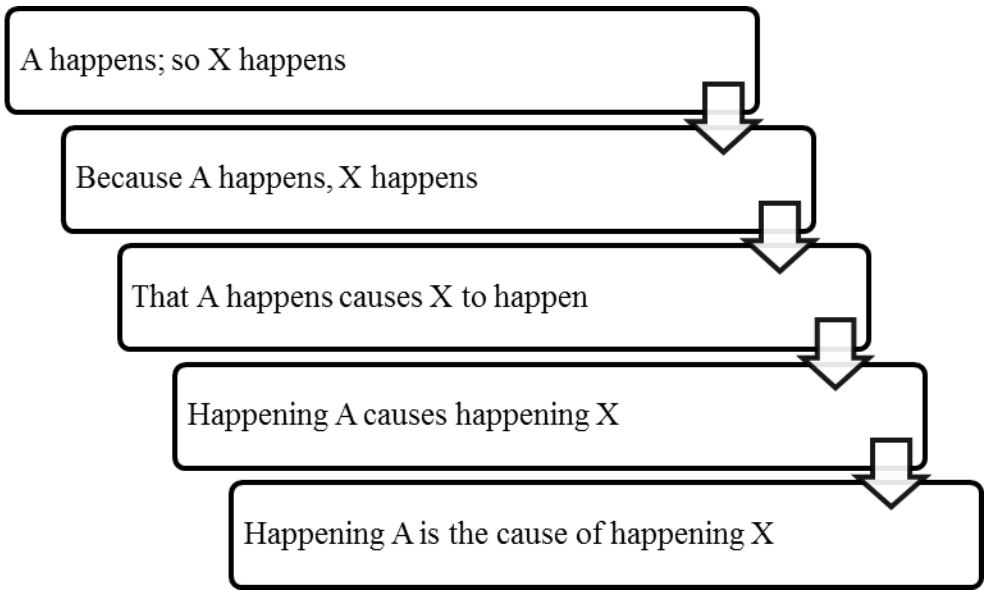

Figure 2.2. The developmental path of causal discourse by Halliday and Martin (1993, p. 66)

At the beginning of the causal developmental path in Figure 2.2, causal meaning is expressed with the conjunction “so”: “A happens; so X happens.” In this example, “A happens” and “so X happens” are independent clauses. They both have a subject (A and X) followed by a verb (happens), and the first clause is the cause of the second. The two are transparently connected by "so." In the second example, “because” combines these two clauses in “Because A happens, X happens” in which “A happens” is the dependent clause. The clauses still have the subject and the verb in them, but the meaning of the whole proposition is less transparent, or congruent, because the causal marker does not connect the two. In the middle of the developmental path, the dependent clause “A happens” is changed into a noun clause and becomes the subject of the main clause: “That A happens causes X to happen.” Later, the noun

clause is nominalized into “happening” as “Happening A causes happening X.” At the end of the developmental path, the verb “cause” is also nominalized: “Happening A is the cause of happening X.”

The reconstruction of meaning in different ways lies at the heart of the causal developmental path. This reconstruction of meaning through different linguistic expressions is defined as grammatical metaphor (Halliday, 1985; Hood, 2008). Grammatical metaphor “is a key mechanism by which the resources for the making of meaning in a language can be greatly expanded” (Thompson, 2010, p. 27). It is the first “indicator of language development as students move from childhood into adolescence and beyond” (Christie & Derewianka, 2008, p. 24). Below are two examples by Christie and Derewianka (2008) and Halliday (1985) pointing to the grammatical metaphor in expressing meaning in adult language compared to child language:

Child language: The basket spins rapidly

Adult language: The rapid spinning of the basket (Christie & Derewianka, 2008, p. 24)

Child language: Mary saw something wonderful

Adult language: A wonderful sight met Mary’s eyes (Halliday, 1985, p. 322)

The sentences “the basket spins rapidly” and “Mary saw something wonderful” are congruent realizations of meaning as opposed to the grammatically metaphorical ones “the rapid spinning of the basket” and “a wonderful sight met Mary’s eyes.” Congruent expressions are characterized by the clausal pattern of a subject followed by a verb. In “the basket spins rapidly,” “the basket” is the subject and “spins” is the verb which expresses the action. On the other hand, in grammatical metaphor, the action is construed through nominalization: “the rapid spinning of the basket.” “[N]ominalizing is the single most powerful resource for creating grammatical metaphor” (Halliday, 1994, p. 353).

Considering children's language development from congruent to grammatically metaphorical realizations of meaning, Mohan and Beckett (2003) define causal discourse development as a shift "from the more congruent 'so' to the less congruent 'the cause' " (p. 426). The congruent expressions of causal explanations include conjunctions and dependent clauses while non-congruent expressions consist of prepositional phrases, adverbial groups, verbs, and nominal groups. "The Greeks defeated the Persians because the Greek navy was strong" is a more congruent expression of causality with two clauses and a conjunction than the less congruent expression of "The naval strength of Greeks led to the Greek defeat of the Persians" with two causal nominalizations and a causative process (Christie & Derewianka, 2008, p. 128). Use of non-congruent expressions, according to Halliday and Martin (1993), is a sign of development not only in causal discourse, but also in the expression of different types of meanings in English.

The developmental path of causal discourse has been found in empirical research by researchers who have investigated learners' use of causal discourse through time (e.g., Christie & Derewianka, 2008; Mohan & Beckett, 2003; Slater, 2004). A summary of the studies on the developmental path of causal is presented in Table 2.2.

Table 2.2

Summary of the Studies on Causal Discourse Development

Study	Focus of Investigation	Causal Discourse Developmental Path
Mohan & Beckett (2003)	The grammatical scaffolding of ESL learners' oral causal discourse	A move from congruent expressions of causal explanations to non-congruent expressions
Slater (2004)	Oral causal discourse of ESL and non-ESL students at primary and high schools	An increase in lexical density and metaphorical constructions and a decrease in causal conjunctions
Christie & Derewianka (2008)	Written causal discourse of students from early childhood to late adolescence	Congruent causal explanations in early childhood and grammatical metaphor in adolescence

Mohan and Beckett (2003) conducted a functional analysis of learners' development of academic language with a focus on causal explanations. They analyzed the grammatical scaffolding of a teacher and three ESL learners by looking at the recast sequences. During the interactions, the teacher provided "improvement" recasts which aimed to help learners move from congruent (e.g., conjunctions) to less congruent causal features (e.g., verbs and/or nouns). The excerpt below demonstrates how the teacher recasts a student's causal discourse in a less congruent form:

> 1. S: (a) To stop the brain's aging, *we can use our bodies and heads.* (b) Like walking make the circulation of blood better. (c) If we supply nutrition to our brain cells, we can prevent the destroy of the cells. (d) It is said that the more we use our heads, the better our brain get. (e) The painting, knitting clothes, and keeping our diary make use of prevention of our brain

2. T: [RECAST] So, we can prevent our brain from getting weak *by being mentally and physically active?*

3. S: (a) Ah? . . . **Mentally and physically active**?

(b)What's that?

4. T: It's using our brain and doing things with our hands and legs, like thinking, painting, and walking.

5. S: (a) Yes. (b) We can keep our brain *function active* if we do that. (Mohan & Beckett, 2003, p. 428)

As a result of their analysis, Mohan and Beckett (2003) found that it was difficult for the ESL learners to use less congruent causal expressions. For example, in the excerpt above, the student's utterances include examples of physical and mental activities. Instead of making several clauses as the student does in (a), (b), (c), (d) and (e) above, the teacher suggests a less congruent expression as in 2.T. The student asks for clarification and tries to use a less congruent expression. Mohan and Beckett's (2003) study showed that although learners' statements were mostly inaccurate semantically and grammatically, they were able to make non-congruent causal statements at the end of the recast sequences, indicating development in this area.

Slater (2004) investigated how ESL and non-ESL students at primary and high school constructed causal explanations orally. According to her findings, learners' oral causal explanations demonstrated a developmental path which moved "from the less to the more grammatically metaphorical language" (Slater, 2004, p. 347). She observed that high school students tried to use aspects of grammatical metaphor. However, primary school students "did not exhibit many examples of grammatical metaphor" (p. 348).

Christie and Derewianka (2008) analyzed written explanations of students at different ages and demonstrated how causal explanations differed from early childhood to late adolescence (see Table 2.3). The causal explanations of the boy who was at the age of 7/8 were "entirely congruent" (p. 197). She construed causal meaning using independent clauses with subjects and verbs as in "People pick the fruit in cherry pickers." At the age of 11/12, a boy used conjunctions and his sentences consisted of both independent and dependent clauses: "the Sun is not completely blocked because the outer atmosphere of the Sun flashes." The causal explanations of older students at the ages of 12/17 demonstrated nominalizations: "The first step in fertilization is pollination" or "this lack of plants may be one of the sources of the lack of stability in the creek bank and the large amount of erosion." According to Christie and Derewianka (2008), the causal explanations of older students show their "mature ability to reason using the resources of grammatical metaphor" (p. 128).

Table 2.3

Students' Sexes, Ages, Classes, and Examples of Written Causal Explanations

Sex	Age	Class	Examples of Written Causal Explanations
Girl	7/8	Science	People pick the fruit in cherry pickers. After that the fruit gets put into big crates. Then it is taken to the cannery. Next it is tipped into a big bin at the cannery. (p. 197)
Boy	11/12	Science	A solar eclipse occurs when the moon moves in front of the Earth and blocks the Sun, but the Sun is not completely blocked because the outer atmosphere of the Sun flashes and can still be seen and that is called the Corona. (p. 198)
Girl	12/13	Science	The first step in fertilization is pollination. When the pollen sacs [that are contained in the anthers] are ripe the anther breaks open and sets the pollen free. Then, birds, insects or wind carry the pollen to another flower of the same species. (p.200)
Girl	14/15	History	Women's lives and roles in Australian society were irreversibly changed and impacted upon by WWII. As is said by Darlington, many women demanded to be more directly involved in the War effort than they had been allowed in previous wars. (p. 130)
Boy	15/16	Science	With fewer plants and trees in the area around the creek, the soil would suffer dreadfully, and this lack of plants may be one of the sources of the lack of stability in the creek bank and the large amount of erosion. (p. 203).
Girl	16/17	History	The victory of the Greeks over the Persians in the Second Persian War during 480-479 BC came about due to many factors. Three vital factors [determining the victory of the Greeks] were leadership, naval strength, and unity. (p. 127)

Given the results of the studies on learners' causal discourse development, a shift from congruent expressions of causal meaning to less congruent or grammatically metaphoric expressions appears to be central in the causal discourse developmental path. Slater (2004) also observed an increase in learners' lexical density of oral discourse. According to the definition by Christie and Derewianka (2008), lexical density refers to the ratio of the number of lexical items (nouns, verbs, adjectives, and adverbs) to the number of both lexical and grammatical items

(articles, prepositions, pronouns, auxiliary verbs, conjunctions, and demonstratives). Halliday (2009), on the other hand, defines lexical density as "the quantity of lexicalized information packed into a given unit in the grammar" (p. 75). Halliday identifies the grammar unit as the clause -- the main clause -- but not the clause that is embedded into the main clause. Opposed to measuring lexical density by the simple proportion of lexical items to the grammatical items in a text, Halliday (2009) suggests counting lexical items per clause as a more accurate measure of lexical density. Similar to grammatical metaphor, lexical density is not only an indicator of causal discourse development, but also of language development in general (Colombi, 2002). "High lexical density is a feature of written (as opposed to spoken) language" (Halliday, 2009, p. 75).

Even though the second indicator of causal language development is referred to as "lexical density," the term "lexical" does not mean that there is a clear division between lexis and grammar. In SFL, lexis and grammar are not separate components (Halliday & Matthiessen, 1999). Lexicogrammar "accounts through syntax, morphology, and lexis for the wording structure and patterning of a text" (Morley, 2000, p. 7). It is the level at which meaning is realized in the word form. The term "lexical density" in this study involves both lexis and grammar, and it means the density of lexicogrammatical features.

Based on theoretical perspectives of SFL on causal discourse development (Halliday, 1985, 1994, 2009; Halliday & Martin, 1993) and the findings of the research studies (Christie & Derewianka, 2008; Mohan & Beckett, 2003; Slater, 2004), causal discourse development in this study is defined as a shift in learners' causal discourse from congruent expressions of causal meaning to less congruent expressions, the latter being grammatical metaphor. The developmental path of causal discourse development demonstrates a decrease in causal

conjunctions and an increase in causal verbs and nouns and also in lexical density. The following section presents how causal relations are expressed in written English, how causal discourse features are categorized in existing research, and how causal discourse features are categorized in this study in helping learners shift from congruent expressions of causal meaning to grammatical metaphor.

Causal Discourse

The need to explain and understand natural phenomena and events brought about the concept of causation (Evans, 1993). Humans try to structure their social experience through perceiving, describing, and writing about causal relations between events (Stefanowitsch, 2001). What we read, watch or listen to in our daily lives is heavily based on explanations of events: their causes and their consequences and the logical relations between events. The quotes in Table 2.4 represent authentic written samples from widely read/listened to/watched newspapers and TV channels demonstrating the need for humans to understand every aspect in life.

Table 2.4

Sources and Sections of Example Quotes with Causal Discourse Features

Source	Section	Quotes
The New York Times	Science	A warming planet means less ice coverage of the Arctic Sea, leaving the bears with less time and less ice for hunting seals. They depend on seals for their survival. (Gorman, 2014)
The Guardian	Business	One housing industry insider said there has already been an impact on the housing market, with signs that the market for homes worth more than £600,000 – the top end of the market in Scotland – is drying up. (Collison, Treanor, & Jones, 2014)
Psychology Today	Psychology	There are countless factors that distinguish in-groups from out-groups: dress, language, customs, music, hairstyle, height, the shape of the eyes, the length of the nose. (Kluger, 2014)
BBC	History	Their actions not only changed the way that Army commanders and ordinary soldiers thought about them, it also defined a new role for chaplains in the British Army. (Pym, 2014)
CNN	Health	"Our hope is that if we could identify patients who are developing the disease early, it would give us a much better opportunity to intervene with treatments, and it's much more likely for those treatments to be effective," says Dr. Keith Black, chairman of neurosurgery at Cedars-Sinai Medical Center. (Tinker, 2014)

Knowledge of the meaning of causality is important to interpret its role in human discourse. The history of the definition of causality goes back to Plato for whom every change happens as a result of a cause (Hulswit, 2002). According to contemporary definitions, causality is a relationship between two variables in which the first variable, the independent one, causes a

change in the second variable, the dependent one (Patzer, 1996). While Evans (1993) uses the terms causation and causality interchangeably, Hulswit (2002) distinguishes causality from causation; while causation refers to "the production of an effect by a cause," causality refers to "the relation between cause and effect" (pp. 171-172).

MacMillan dictionary defines causation as "the process of causing something to happen or exist." The same definition is found also in the Merriam-Webster dictionary which gives a second definition for causation: "the relationship between an event or situation and a possible reason or cause." The definition of causation is very similar to the definition of causality in the Merriam-Webster dictionary: "the relationship between something that happens or exists and the thing that causes it" or "the idea that something can cause another thing to happen or exist." Adopting the definitions of causation and causality by the Merriam-Webster dictionary, I use the two terms interchangeably in this study.

Since causal relations have a crucial role in general knowledge (Lakoff & Johnson, 1999), writers' ability to express causality in writing is also fundamental. This ability requires the knowledge of causal discourse features which are the linguistic structures that express causal meaning and causal relationship between events (Chukharev-Hudilainen & Saricaoglu, 2014). In writing, causality is expressed either implicitly or explicitly (Stefanowitsch, 2001). The following sentence is an example of an expression of implicit causation:

> Last month the vet gave us the bad news: There was a tumor the size of a golf ball near her heart. She died within a month. (Stefanowitsch, 2001, p.25)

The causal relation between events in the sentences above is interpreted based on the reader's general knowledge of the events. On the other hand, explicit expressions of causality include certain linguistic forms that imply causal relationships/meaning. The implicit causality in the

sentence above can be changed to explicit causality with the addition of a causal discourse marker (*cause*) as the following:

> Last month the vet gave us the bad news: There was a tumor the size of a golf ball near her heart, which caused her to die within a month.

The focus of this study is explicit expressions of causality, which I refer to as causal discourse features in this work. Studies on causality in English demonstrate different categorizations of causality features by different researchers, although the specific causal discourse markers are mostly the same across studies. Xuelan and Kennedy (1992) divide causality expressions into two main categories as "explicit causatives" and "non-explicit causatives." Their explicit causatives consist of eight types of causatives including conjunctions, complex prepositions, prepositions, adverbs, adjective phrases, nouns, verb phrases and verbs. Examples of each causative type are presented in Table 2.5.

Table 2.5

Explicit and Implicit Causal Discourse Features and Examples/Explanations by Xuelan & Kennedy (1992)

	Causal Discourse Features	Examples/Explanations
Explicit	Causative conjunctions	because, for, so that
	Complex causative prepositions	as a result of, due to, on account of
	Causative prepositions	from, under, through
	Causative adverbs	why, so, therefore
	Causative adjective phrases	consequent on, consequential to, responsible for
	Causative nouns	reason, effect, outcome
	Causative verb phrases	arise from, give rise to, bring on
	Causative verbs	bring, produce, create
Implicit	Implicit causative verbs	make, destroy, simplify
	Elliptical syntactic patterns	V-ing, V-ed, to V, Adjective phrase, noun phrase
	Juxtaposition	Within sentence & beyond sentence

Xuelan and Kennedy's (1992) non-explicit causatives include three types as implicit causative verbs, elliptical syntactic patterns, and juxtaposition. Implicit causative verbs such as "destroy" or "simplify" are verbs which "cannot be replaced directly with explicit causative verbs such as 'cause', 'produce', and 'result from' " (p. 65), but which include the meaning of cause somebody/something (to) do/make/become something/adjective. Elliptical syntactic patterns of causatives include Verb-ing phrase, Verb-ed phrase, to-Verb phrase, Adjective phrase, and Noun phrase. These patterns replace adverbial clauses to create implicit expressions of causality. For example, the explicit causative "Because it was Christmas, the library was closed" is changed with a Verb-ing phrase to make it implicit as "Being Christmas, the library was closed" (Xuelan & Kennedy, 1992, p. 65). Juxtaposition refers to the implicit expression of causation: expressing causality without any linguistic signals. Juxtaposition can be either at the

sentence level between phrases or clauses or at the text level between sentences (Xuelan & Kennedy, 1992).

A different categorization of causal discourse features is given by Khoo, Chan, and Niu (2002). Khoo et al. categorize explicit causality expressions into five main groups: causal links, causative verbs, resultative constructions, conditionals, and causative adverbs, adjectives, and prepositions. Examples of each group can be seen in Table 2.6.

Table 2.6

Causal Discourse Features and Examples by Khoo, Chan, & Niu (2002)

Causal Discourse Features	Examples
Causal links	Adverbial links: hence, therefore Prepositional links: because of, on account of Subordination links: because, since Clause-integrated links: that's why, the result was
Causative verbs	break, kill
Resultative constructions	Paint + color, cry one's eyes blind
Conditionals	If
Causative adverbs, adjectives, and prepositions	Amusingly, fatal, by

According to the categorization of causal discourse features by Lorenz (1999), causal relations can be expressed through conjunctions, adverbs, prepositions, verbs, and nouns (see Table 2.7 for examples).

Table 2.7

Causal Discourse Features and Examples by Lorenz (1999)

Causal Discourse Features	Examples
Conjunctions	Standard simplex: because, as Well-established composite: seeing as, in that Resultative phrasals: that is why, which is why
Adverbs	so, thus, accordingly
Prepositions	because of, owing to
Verbs	lead to, evoke
Nouns	reason, consequence

A more recent categorization of causal discourse features is offered by Miki (2013) who distinguished causative devices from resultative devise based on whether the linguistic features expressed causes or effects. Causatives consist of seven categories: nouns, conjunctives, complex prepositions, preposition, verbs, adjectival phrases, and others. Resultatives contain five categories as nouns, conjunctives, complex prepositions, adverbials, and verbs (see Table 2.8 for examples from each category).

Table 2.8

Causative and Resultative Features and Examples by Miki (2013)

Causatives	Examples	Resultatives	Examples
Nouns	reason, cause	Nouns	consequence, outcome
Conjunctives	as, because	Conjunctives	so that
Complex prepositions	because of, in view of	Complex prepositions	as a result of
Preposition	given	Adverbials	as a consequence, therefore
Verbs	bring (about), produce	Verbs	arise from, result from
Adjectival phrases	responsible for		
Others	that/this why		

As seen in the tables above, there is no consensus on how to categorize causal discourse features. This is problematic in certain ways when it comes to conducting linguistic analyses

based on such existing categorizations and teaching learners causal discourse features. For example, it is not clear in Xuelan and Kennedy's (1992) study why the authors considered verbs such as "make" or "destroy" as implicit causal discourse features even though the meanings of these verbs are obviously causal. The Merriam-Webster dictionary defines destroy as "to cause (something) to end or no longer exist: to cause the destruction of something: to damage (something) so badly that it cannot be repaired)."

A similar lack of clarity is also true for causal discourse features categorized by Khoo, Chan, and Niu (2002). While subordinating conjunctions are included in the causal links category, it is unclear why "if" has been categorized separately as a conditional even though it is also conjunction. We also do not know why adverbs, adjectives, and prepositions have been grouped together within the same category. Such issues would make it difficult to use causal discourse features as categorized by Khoo et al. (2002) in classroom settings and would create difficulties for ESL learners. When compared, the explicit categorizations by Xuelan and Kennedy (1992) and Lorenz (1999) are most similar. Both Xuelan and Kennedy (1992) and Lorenz (1999) list causal discourse features in categories as conjunctions, prepositions, adverbs, nouns, and verbs. Different from Lorenz (1999), Xuelan and Kennedy's list (1992) also contains adjectives and it is more detailed in that it separates prepositions and prepositional phrases into different categories as well as verbs and verb phrases.

In order to make the categorizations of causal discourse features less confusing for ESL students, in this study, a new categorization of causal discourse features was developed (see Table 2.9). The categories were named by the terms that ESL students in the context of this study were familiar with since they already learned nouns, verbs, adjectives, adverbs, prepositions, and different types of conjunctions in their academic writing classes. Understanding the meta-

language used in the formative feedback learners received was considered to be very important to help them develop their causal discourse.

Table 2.9

Causal Discourse Features and Examples in this Study

Causal Discourse Features	Examples
Conjunctions*	so, for, if, so that
Adverbs	in response, for this reason, fatally
Prepositions	through, as a consequence of
Verbs	freeze, result from
Adjectives	beneficial, exhaustive
Nouns	influence, reason
Others	that/this is why…, so/such…that…

*Conjunctions include both coordinating causal conjunctions and subordinating causal conjunctions

In this study, causal discourse features were categorized into seven groups: conjunctions, adverbs, prepositions, verbs, adjectives, nouns, and other features. In this categorization schema, both words and phrases from the same category were grouped together. For example, both the preposition "through" and the prepositional phrase "as a consequence of" were grouped together in the causal prepositions category, which is also the same for conjunctive adverbs, verbs, adjectives, and nouns. This categorization and terminology was intended to be transparent to the students for whom instruction was provided to help in advancing their use of causal discourse.

Automated causal discourse analyzers. A few researchers have attempted to extract causal discourse features automatically from written texts. They have employed three approaches to developing their automated causal discourse analyzers: knowledge-based, linguistic-based, and supervised (see Table 2.10). A knowledge-based system includes a database of expert knowledge (Akerkar & Sajja, 2010). The expert knowledge includes examples of causal discourse features that are targeted, and the analyzer uses those examples as its knowledge about

the target features in texts for detection purposes (Teahan, 2010). On the other hand, a linguistic-based system employs linguistic patterns to capture syntactic structures, textual forms, and relations (Segura-Bedmar, Martinez, & de Pablo-Sanchez, 2011). In contrast to knowledge-based systems, linguistic-based systems rely on manually constructed rules (e.g., an adjective precedes a noun) (Shaalan, 2010). In order to analyze causal discourse, the target causal discourse features are manually introduced to the analyzer through hand-coded linguistic rules. This approach is advantageous in that it leads to more accurate analyses and information extraction. In a supervised system, large training sets are used in which target units are hand-coded (Ponzetto & Navigli, 2010). The training set includes texts with the target causal features tagged. These features are annotated manually so that the system can learn from the annotated set for detecting causal discourse features in other texts.

Table 2.10 presents a summary of previously developed automated causal discourse analyzers. It details which approach the developers used, which genres were analyzed in evaluating the performance of the analyzers, what the purposes of the analyzers were, which specific causal discourse features the analyzers detected, and what precision and recall results were found. Precision and recall are two evaluation measures in automatic information extraction. Precision refers to the ratio of relevant information that an analyzer retrieves to all the information (both relevant and irrelevant) it retrieves; recall, on the other hand, is the ratio of relevant information that an analyzer retrieves to all relevant information in the database (Cowie & Wilks, 2000; Jackson & Moulinier, 2007; Manning & Schütze, 1999).

Table 2.10

Developers, Approaches, Genres, Purpose, Discourse Features, and Precision and Recall Results in Previous Automated Causal Discourse Analyzers

Developers	Approaches	Genres	Purposes	Discourse Features	Precision & Recall Results
Kaplan & Berry-Rogghe (1991)	Knowledge-based & Linguistic-based	Expository texts	To extract causal verbs and connectives from expository texts	Verbs Connectives	Precision= Not reported Recall= Not reported
Khoo, Kornfilt, Oddy, and Myaeng (1998)	Linguistic-based	Newspaper texts	To extract causal verbs and links from newspaper texts	Causal links Causative verbs	Precision=25% Recall= 68%
Girju (2003)	Linguistic-based & Inductive (supervised) learning	Newspaper texts	To extract causal questions from LA Times texts	Verbs Questions	Precision=73.91% Recall=88.69%

One of the earliest attempts at automated analysis of causal discourse features was made by Kaplan and Berry-Rogghe (1991) who developed a hybrid knowledge- and linguistic-based causal analyzer as part of a program that would acquire knowledge from expository texts. Kaplan and Berry-Rogghe's (1991) causal analyzer extracted verbs and connectives such as "if," "and," and "because." No information is available about precision and recall results. Second, the causal discourse analyzer developed by Khoo, Kornfilt, Oddy, and Myaeng (1998) depended on a linguistic-based approach: linguistic patterns of five categories including causal links, causative verbs, resultative constructions, conditionals, and causative adverbs and adjectives to retrieve cause-effect relations from newspaper texts. Their program extracted 68% of causal relations from the corpus (recall); however, only 25% of the extracted features were correctly extracted

(precision). Another program was developed by the linguist Girju (2003) who specifically worked on verbs and questions. Her program was based on a hybrid linguistic and supervised approach, and it extracted 89% of the causal relations from the corpus (recall). Out of the extracted relations, 73.91% were correctly extracted (precision).

Among the three automated analyzers briefly reviewed, Girju's causal discourse analyzer had the highest performance level. However, her causal discourse analyzer, as well as the analyzers of Kaplan and Berry-Rogghe (1991) and Khoo et al. (1998), identifies only a very few causal discourse features. As discussed in the previous section, a high number of causal discourse features can be used to construct causal meaning (Slater, 2004). It is necessary to build an automatic causal discourse analyzer based on those causal discourse features for the sake of better teaching and learning of causal discourse in academic language development. Such a causal discourse analyzer needs to be developed and further improved as an AWE tool that can be used for the teaching and learning of causal discourse.

Form-focused Instruction

In contrast to the studies which described learners' causal discourse development by looking at their oral or written language (e.g., Christie & Derewianka, 2008; Slater, 2004), this dissertation was an intervention study that took place in an instructed second language learning setting. Instruction, according to Ellis (1990), is an intervention in the process of language development. Instruction in this study refers to the attempts to intervene in the process of learners' causal discourse development. The type of instruction in this study is form-focused instruction (FFI). As Spada (1997) describes, FFI means the pedagogy attempts to "draw the learner's attention to language form" (p. 73). FFI in this study refers to the pedagogical efforts to

draw learners' attention to causal discourse form. Form includes both causal discourse forms and the meaning that the forms convey.

FFI can be either implicit or explicit. Explicit FFI refers to intentional, explicit learning and implicit FFI refers to implicit, incidental learning (Ellis, 2008). In implicit learning, learners internalize linguistic form without awareness. Awareness of learners, on the other hand, is an important part of explicit learning. In her review of research on the effects of FFI in SLA, Spada (1997) concluded that "FFI is beneficial to SLA" (p. 82). In their research synthesis and meta-analysis of 49 studies on the effectiveness of FFI, Norris and Ortega (2000) reported that FFI interventions are effective in second language development, explicit FFI leading to greater effects than implicit FFI. This study is an explicit FFI study in which the aim was to enhance learners' causal discourse development by drawing their attention causal discourse form and meaning.

Teaching and Learning Causal Discourse

In academic writing classes, causal discourse is generally taught based on the textbooks and their cause-and-effect chapters. Most cause-and-effect chapters begin with defining a cause-and-effect essay. *From Great Paragraphs to Great Essays* (Folse, Solomon, & Clabeaux, 2010) introduces the communicative purpose of cause-and-effect as the following: "A cause-effect essay …shows the effects of a thing or event, or it explains the causes of a thing or event. Cause-effect essays …explain why things happen (causes) and what happens as a result (effects)" (p. 129). According to *Nonfiction Writing*, cause-and-effect is explained as the following: "A cause-and-effect essay explains how certain events or situations (causes) lead to certain results (effects). A cause is why something happens. An effect is what happens as a result of something"

(Klobuchar & Zahler, 2011, p. 27). A similar definition is provided in *Bridges to Better Writing* (Nazario, Borchers, & Lewis, 2013):

> In writing about causes and effects, your job is to explain how one thing leads to another. You can write about almost any condition or event in terms of causes or effects. Some causes make it happen; after it happens, it is an effect or a result of that cause; and then, in turn, it may cause other conditions or events. (p. 197).

In addition to the functional purpose of causal discourse, ESL writing textbooks explain the language of cause-and-effect. For instance, *Blueprint for Writing: Building Essays* (Mathis, 2013) states at the beginning of cause-and-effect chapter that the chapter will help students "to use transitions that emphasize cause and effect" (p. 239). Moreover, cause-and-effect units provide lists of linguistic features that can be used to express causal relations (see Table 2.11).

Table 2.11

L2 Writing Books and Causal Discourse Features

L2 Writing Books	Causal Discourse Features	
A Writer's Workbook (Smoke, 2005, p. 172)	As a result Consequently For this reason Due to Therefore	Because Since The reason why The reason that
COMP (VanderMey, Meyer, Rys, & Sebranek, 2013, p. 174)	Accordingly As a result Because Consequently For this purpose For this reason Hence Just as	Since So Such as Thereby Therefore Thus
From Great Paragraphs to Great Essays (Folse, Solomon, & Clabeaux, 2010, p. 139)	Within a sentence: Because of + noun Because + S + V Another (cause/effect/reason) Owing to + noun Due to + noun S + V, so S + V S + V so (that) S + V	Between sentences: As a result, S + V Therefore, S + V Because of this, S + V
Writing Academic English (Oshima & Hogue, 2006, pp. 101-102)	Cause signal words Coordinators: for Subordinators: because, since, as Others: to result from, to be the result of, due to, because of, the effect of, the consequence of, as a result of, as a consequence of	Effect signal words Transition words and phrases: as a result, as a consequence, therefore, thus, consequently, hence Coordinators: so Others: to result in, to cause, to have an effect on, to affect, the cause of, the reason for, thereby
Engaging Writing 2 (Fitzpatrick, 2011, pp. 105-110)	Nouns: cause, reason, factor, result, effect Verbs: cause, result in, lead to, affect Followed by a cause: Coordinating conjunction: for Subordinating conjunctions: because, since, as Prepositions: due to, because of, as a result of	Followed by an effect: Verbs: cause, result in, lead to Transition words: therefore, consequently, as a result Coordinating conjunction: so

Table 2.11 is a good illustration of how writing textbooks differ in teaching causal discourse features. Some textbooks list the lexical items without specifying their grammatical category (e.g., *A Writer's Workbook, COMP, From Great Paragraphs to Great Essays*). A few textbooks, such as *Writing Academic English,* present the linguistic features under grammatical categories. They appear to emphasize prepositional phrases, subordinating conjunctions, and transitional words. For causal discourse development, learners need to learn how to construct causal meaning though a richer range of lexico-grammatical features. Explicit teaching of causal discourse needs to draw on how learners develop constructions of causal explanations. Slater and Mohan (2010) suggest that the developmental path of causal discourse should inform the teaching and learning cycle and formative assessment of learners' causal discourse.

Formative Assessment of Causal Discourse

"The word assessment comes from the Latin root *assidere*, which means to sit beside another," wrote Greenstein (2010), "Our best assessment experiences are usually the ones that reflect the word's roots most closely; they are the times a teacher sits beside us to gather information about our progress" (pp.1-2). With "best assessment," Greenstein (2010) refers to formative assessment. Leki, Cumming, and Silva (2008) describe formative assessment of L2 writing with the following remarks:

> Formative assessments of students' writing are integral to L2 pedagogy. Instructors routinely evaluate students' writing in order to know what to teach students individually (for diagnostic purposes) or collectively (to inform their curriculum or lesson planning). Teachers also want to know how well students might have done in their writing assignments, and they are obliged to evaluate and report on students' progress and achievements. Students, in turn, expect

> feedback from their instructors in order to know how well they have succeeded in their writing or task requirements and what they should try to learn or improve in their writing. (p. 82)

In order to have positive influences on student learning, formative feedback needs to have certain characteristics. Shute (2007) lists such characteristics as cognitive mechanisms, specificity, verification and elaboration, complexity, goal orientation and motivation, scaffolding, and timing based on extensive research on formative feedback (also see Cotos, 2010). Shute (2007) offers guidelines for how to provide feedback in a list of 31 items. Some examples of the guidelines that address these characteristics are presented in Table 2.12.

Table 2.12

Feedback Characteristics and Guidelines for Formative Feedback by Shute (2007, pp. 30-33)

Feedback Characteristics	Guidelines
Cognitive mechanisms	Provide elaborated feedback to enhance learning. Present elaborated feedback in manageable units.
Specificity	Be specific and clear with feedback messages. For learners with low learning orientation (or high performance orientation), give specific feedback.
Verification and elaboration	For high-achieving learners, verification feedback may be sufficient. For low-achieving learners, use correct response and some kind of elaboration feedback.
Complexity	Keep feedback as simple as possible but no simpler (based on learner needs and instructional constraints). Reduce uncertainty between performance and goals.
Goal orientation and motivation	Promote a learning goal orientation via feedback. Do not present feedback that discourages the learner or threatens the learner's self-esteem. Provide feedback after learners have attempted a solution. Use praise sparingly, if at all.
Scaffolding	For low-achieving learners, use scaffolding. Avoid using progressive hints that always terminate with the correct answer.
Timing	Design timing of feedback to align with desired outcome. For difficult tasks, use immediate feedback. For relatively simple tasks, use delayed feedback. For retention of procedural or conceptual knowledge, use immediate feedback. To promote transfer of learning, consider using delayed feedback. For high-achieving learners, consider using delayed feedback. For low-achieving learners, use immediate feedback.

Even though the timing guidelines that Shute (2007) proposes suggest immediate feedback for difficult tasks or low-achieving learners, commenting on student writing is time-consuming. Thanks to the growth of educational technologies, AWE tools offer cost effective ways of providing feedback: "The sheer number of hours commenting on student papers is reduced dramatically when instructors can rely on automated electronic feedback systems" (Ware & Warschauer, 2006, p. 108).

Automated Writing Evaluation (AWE)

Automated writing evaluation (AWE) tools are built based on artificial intelligence, natural language processing, and statistical techniques which enable them to accomplish evaluations of written texts in a much shorter time than manual evaluations (Grimes & Warschauer, 2010). Since they reduce human labor to a great extent, AWE tools have played a significant role in formative assessment, the "assessment *for* learning" (Bennett, 2011, p. 8), by providing repeated formative feedback to help learners improve their writing. The main features of well-known AWE tools are summarized in Table 2.13.

Table 2.13

AWE Tools, Decade of Appearance, Developer, Genre of Essays Processed, and Types of Feedback

AWE Tools	Decade of Appearance	Developer	Genre of Essays	Types of Feedback
Writer's Workbench	1980s	Bell Laboratories	Essays	Punctuation Word use Spelling Text abstractness Grammatical parts of speech Text readability
MY Access!	2000s	Vantage Learning	Essays: Narrative Informative Persuasive	Focus and meaning Organization Content and development Language use, voice and style Mechanics and conventions
WriteToLearn	2000s	Pearson's Knowledge Technologies	Essays & Summaries: Narrative Informational Argumentative	Ideas Organization Conventions Sentence fluency Word choice Voice Spelling Grammar Redundancy
Criterion	2000s	Educational Testing Service	Essays: Persuasive Informative Narrative Expository Issue Argumentative	Grammar Usage Mechanics Style Organization Development
RWT	2010s	Iowa State University	Research articles: Introduction Methods Results Discussion & Conclusion	Moves (rhetorical communicative structures) Steps (rhetorical functions)

Note. Based on Chen and Cheng (2008), Dikli (2006), and Warschauer & Ware (2006).

As seen in Table 2.13, most AWE tools focus on various genres of essays except the Research Writing Tutor (RWT), which analyzes research articles. RWT analyzes Introduction, Methodology, Results, and Discussion/Conclusions sections of learners' research articles and provides individualized color-coded and numerical sentence-level feedback (Cotos & Huffman, 2013; Ramaswamy, 2012). Because the focus of RWT is research articles, it is not discussed any further in this study since the research article is not among the genres that undergraduate level non-native speakers learn in academic writing courses.

The feedback that the AWE tools *MY Access!*, *WriteToLearn*, and *Criterion* offer is described by the developers as addressing both micro-level aspects of language including punctuation, spelling, mechanics, grammar, and usage, and macro-level aspects such as organization, content, and development (see Table 2.13). However, the feedback that these tools generate for the macro-level aspects of language is more generic than the feedback for micro-level aspects. For example, *Criterion*, as one of the state-of-the-art AWE tools, evaluates learner writing in terms of several aspects such as grammar, usage, mechanics, style, organization, and development (Burstein, Chodorow, & Leacock, 2003). However, its organization and development feedback does not address the content of the essay discourse elements. In their chapter *The Role of Technology in Teaching and Researching Writing*, Hegelheimer and Lee (2013) shared *Criterion*'s generic feedback on discourse elements: "Is this part of the essay your thesis? The purpose of a thesis is to organize, predict, control, and define your essay. Look in the Writer's Handbook for ways to improve your thesis. (*Criterion* feedback)" (p. 293). *Criterion* does not evaluate the thesis statement content-wise. AWE feedback has been found to be helpful especially in grammar and mechanics (e.g., Chodorow, Gamon, & Tetrault, 2010; Ebyary & Windeatt, 2010; Fang, 2010; Grimes & Warschauer, 2010; Kellogg, Whiteford, & Quinlan,

2010; Lai, 2010; Rock, 2007; Wang, 2013; Wang, Shang, & Briody, 2013). However, content and organization feedback by AWE tools is limited and is not as helpful as its feedback on grammar or mechanics (Hegelheimer & Lee, 2013).

Conducting formative assessment using AWE tools only for micro-level textual aspects (e.g., grammar, mechanics, usage, etc.) is "against the very social and interactive nature of writing" (Hegelheimer & Lee, 2013, p.293). The main purpose of writing is to communicate (Hayes, 1996). Writing "takes place within a context, that accomplishes a particular purpose, and that is appropriately shaped for its intended audience" (Hamp-Lyons & Kroll, 1997, p. 8). Learning how to construct meaning is equally important for language learning. As an important dimension of L2 writing ability, discourse features need to be involved in the evaluation of writing tasks as well as language accuracy (Cumming, Kantor, Powers, Santos, & Taylor, 2000; Hinkel, 2002, 2004).

Causal explanations are among the discourse features that need to be assessed in L2 writing. In their survey of eight U.S. universities about assignment requirements, Hale, Taylor, Bridgeman, Carson, Kroll, and Kantor (1996) found causal explanations to be a commonly required genre: the second most commonly required. However, no existing AWE system is able to evaluate causal discourse. There is clearly a need for the development of an AWE system that can analyze learner writing and provide formative feedback in light of the theory and research findings on the causal developmental path. As discussed in the earlier sections, a few researchers have attempted to develop automated causal discourse analyzers, but these analyzers held limitations in terms of analyzing causal discourse.

Evaluation of AWE tools. Researchers have investigated two main aspects of AWE tools: effects of AWE on writing improvement and student attitudes/perceptions towards AWE tools (see Table 2.14 for a summary of four AWE studies). One common method for exploring effects of AWE on learners' writing improvement is to compare student essays before and after AWE use in terms of particular features of writing such as grammatical accuracy, mechanical accuracy, length of essay, and analytic or holistic scores. Rock (2007) explored the impact of *Criterion* on ninth-grade students' writing skills over a period of four weeks through student essays (n = 5088), student surveys (n = 1312), and teacher surveys (n = 25). The author compared analytic and holistic scores given to essays written at the end of the study by learners in the treatment group, who used *Criterion,* and learners in the comparison group, who did not use *Criterion*. During the study, students in the treatment group received *Criterion* feedback on the essays they wrote in class while students in the comparison group received only the typical feedback in the form of handwritten comments. The differences between the treatment and comparison group students' analytic and holistic scores were attributed to *Criterion.* As a result of the analyses, Rock (2007) found that students who used *Criterion* had higher analytic scores on the essays they wrote at the end of the study period than those in the comparison group. However, holistic scores of the two groups were not statistically significant. The significant impact of *Criterion* was found to be on the mechanical aspects of student essays. Rock's (2007) study was a product research study focusing on the written products and learning outcomes as a result of using the AWE tool (Warschauer & Ware, 2006). The author did not look into how learners used *Criterion;* therefore, Rock's (2007) study did not yield information about whether or not *Criterion* created conditions that were necessary for SLA.

Table 2.14

Researchers, Focus of Investigation, Data Sources, Design, and Findings of Four AWE Studies

Researchers	Focus of Investigation	Data Sources	Design	Findings
Rock (2007)	The impact of short-term use on writing skills	-Student essays (n=5088) -Teacher surveys (n=25) -Student surveys (n=1312)	-Treatment group: use of *Criterion* several times a week over a one month period -Control group: No use of *Criterion*	Higher analytic scores of mechanical aspects of essays
Ebyary & Windeatt (2010)	-Student attitudes -Changes in students' writing processes -Changes in students' writing products	-Questionnaires (n=549) -Student essays (n=88) -Interviews (n=27)	Treatment: use of *Criterion* over 8 weeks	-Positive attitudes towards *Criterion* feedback -No changes in students' pre-writing strategies -Changes in students' revision habits (revised more with *Criterion*) -Improved scores over the four essays for most students
Wang (2013)	-The effect on writing improvement -Verification of writing improvement by human raters -Relationship between writing improvement and student attitudes	-Questionnaires (n=53) -Student essays (n=735) -Pre- and post-tests (n=53)	Treatment: use of Criterion throughout the semester	-Longer essays -Higher machine scores -Improvement in post-tests rated by humans -No relationship between writing improvement and student attitudes
Li, Feng, & Saricaoglu (2015)	Short-term and long-term effects on grammatical accuracy	-Criterion error counts (for first and second drafts in three papers of 135 students) -Interviews (n=53)	Treatment: use of Criterion throughout the semester	-Significant reduction of grammatical errors from first draft to the final (short-term effect) -Significant reduction of errors only in run-on sentence errors across papers (long-term effect) -Positive learner perceptions of grammar feedback

In another study on *Criterion*, Ebyary and Windeatt (2010) looked for evidence of change in student attitudes, writing processes, and written products. They collected data though pre-treatment questionnaires (n = 549), interviews (n = 27), focus groups (n = 40), first and revised drafts of 24 students (number of drafts was not reported), and post-treatment questionnaires (n = 24). Twenty four students were trained in using *Criterion* and were asked to write about four topics at home and revise their drafts using *Criterion* feedback. Students were given eight weeks to complete the four writing tasks. Ebyary and Windeatt (2010) found positive changes in students' attitudes towards automated feedback after using *Criterion*. Regarding the changes in students' writing processes, *Criterion* did not lead to any changes in the use of pre-writing tools in *Criterion*, but did encourage learners to revise their drafts, which they did not do before using *Criterion*. Ebyary and Windeatt (2010) also observed both error reduction in learners' second drafts of essays and higher scores showing that students responded to *Criterion* feedback. Even though Ebyary and Windeatt (2010) looked into the writing processes of learners, they concentrated on whether or not students used pre-writing tools or did revisions, but not the details in how learners used *Criterion*.

Wang (2013) looked into the effect of *Criterion* feedback on 53 college students' writing throughout a semester by analyzing attitude surveys (n = 49), essays analyzed by *Criterion* (n = 735), and pre- and post-test essays. In Wang's study, students wrote five essays and submitted three drafts for each essay. The author found significant effects of *Criterion* on students' essay length and scores given by both *Criterion* and human raters. Wang (2013) also observed positive correlations between students' writing improvement scored by *Criterion* and their attitudes toward *Criterion*; however, the correlations were statistically significant only in one essay.

In a more recent study, Li, Feng, and Saricaoglu (2015) explored short-term (within a paper) and long-term (across papers) effects of *Criterion* feedback on 135 ESL students' grammar accuracy. Li et al. compared *Criterion* error counts of students' drafts before and after AWE use for short-term effects in each paper. The authors compared error counts of first drafts of each paper for long-term effects and also conducted interviews with 53 students in order to gain insights into learner perceptions of *Criterion* feedback. Li et al. found that *Criterion* feedback significantly reduced learners' grammatical errors within a paper (short-term effects). However, across papers, there was a significant reduction only in the number of run-on sentence errors (long-term effects). Overall, students perceived *Criterion* feedback positively.

AWE studies such as the ones mentioned above are important since they provide valuable information about the effects of AWE feedback on learners' scores given by both AWE tools and human raters, learners' number of errors in drafts, and learner attitudes towards the tools. However, these studies are product-oriented; they have mainly concentrated on learners' written products, but have ignored learners' learning processes using these tools. Though written products and learner attitudes can provide evidence for the effectiveness of AWE tools to some extent, process-oriented methods are necessary to find out how learners use AWE tools and whether or not AWE tools provide the ideal conditions for SLA.

Taking into account theory and research on instructed SLA, Chapelle (2001) argues that learners' performance during applications of computer-assisted language learning (CALL) can be investigated. CALL is "the search for and study of applications of the computer in language teaching and learning (Levy, 1997, p. 1). The criteria that Chapelle (2001) puts forward for evaluating CALL applications is applicable to the evaluation of AWE tools since AWE tools are also computer applications in language learning. The current study is concerned with two of the

CALL criteria for the empirical evaluation of ACDET: language learning potential and meaning focus. The purpose of the form-focused instruction in this study was to enhance learners' causal discourse development by helping them express causal relations using grammatical metaphor. For this, ACDET was designed as a formative assessment tool with the aim of drawing learners' attention to causal discourse form and causal meaning during learners' interactions with ACDET, which is related to the language learning potential and meaning focus qualities. Chapelle (2001) defines language learning potential as "the extent to which the activity can be considered as a language learning activity rather than simply an opportunity for language use," and meaning focus as "the extent to which learners' attention is directed toward the meaning of the language" (Chapelle, 2001, p. 55). In this study, ACDET's language learning potential is defined as the extent to which the activity of revising causal discourse using ACDET appears on the basis of the data observed to engage students in a language learning activity. Meaning focus is defined as the extent to which learners' attention is drawn to causal meaning during the course of their paper revision with ACDET.

Empirical Evaluation of ACDET and Research Questions

This study had two objectives. First, it aimed to develop an automated causal discourse evaluation tool (ACDET) in order to conduct formative assessment of learners' causal discourse that would engage them in learning. Second, it aimed to evaluate ACDET empirically by using ACDET in classroom settings and looking for evidence for the two CALL qualities: language learning potential and focus on meaning. Table 2.15 presents the evaluation approach taken addressing theories, CALL qualities, and research questions.

Table 2.15

Theories, CALL Qualities, and Research Questions

Theories of Language and Language Learning	CALL Qualities	Research Questions
Systemic Functional Linguistics & The Interaction Hypothesis	1) Language learning potential: - **focus on form**, - **interactional modifications**, - **causal discourse development**	1) To what extent does ACDET feedback help learners **focus on causal discourse form**? And what features of ACDET feedback draw learners' attention to causal discourse form? 2) To what extent does ACDET create opportunities for **interactional modifications**? And what features of ACDET create opportunities for interactional modifications? 3) To what extent does using ACDET **develop ESL learners' causal discourse** in papers and across pre- and post-tests?
	2) **Meaning focus**	4) To what extent does ACDET feedback help learners **focus on causal meaning**? And what features of ACDET feedback draw learners' attention to causal meaning?

Language learning potential of ACDET was investigated based on three aspects: focus on form, interactional modifications, and causal discourse development. Focus on form refers to learners' attention to causal discourse form. Interactional modifications refer to the interruptions learners make during their interactions with ACDET to receive sentence-level and text-level feedback or to use dictionaries or the causal discourse help page. Causal discourse development in papers refers to learners' causal discourse modifications of congruent expressions of causal meaning to less congruent or grammatically metaphoric expressions of causal meaning and an increase in lexical density after modifications. Causal discourse development across pre- and post-tests refers to a decrease in the number of causal conjunctions and an increase in the number of causal nouns and in lexical density from pre-tests to post-tests. Focus on meaning refers to learners' attention to causal meaning. Based on language learning potential and meaning focus

qualities under investigation, this dissertation aimed to find answers to the following research questions:

1. To what extent does ACDET feedback help learners focus on causal discourse form? And what features of ACDET feedback draw learners' attention to causal discourse form?
2. To what extent does ACDET create opportunities for interactional modifications? And what features of ACDET create opportunities for interactional modifications?
3. To what extent does using ACDET develop ESL learners' causal discourse in papers and across pre- and post-tests?
4. To what extent does ACDET feedback help learners focus on causal meaning? And what features of ACDET feedback draw learners' attention to causal meaning?

The research questions and the corresponding CALL qualities also relate to the theoretical perspectives presented earlier in this chapter. Learners' attention to causal discourse form (Research Question 1), interactional modifications (Research Question 2), and attention to causal meaning (Research Question 3) are informed by the Interaction Hypothesis. Learners' causal discourse development (Research Question 4) is informed by Systemic Functional Linguistics.

Chapter Conclusion

Starting with theoretical perspectives, this chapter provided background to this dissertation study. It introduced causal discourse and features used to express causal relations in written English by describing how causal discourse features are categorized in existing research and in this study. The chapter then presented the implementation in this study as form-focused instruction and discussed the teaching and learning of causal discourse by pointing to the need

for formative assessment of causal discourse. It provided a brief presentation of AWE tools and their evaluation in the existing literature referring to their methodological limitations. The chapter concluded by introducing the empirical evaluation of ACDET and research questions under investigation.

CHAPTER 3

METHODOLOGY

This study had two objectives: (1) to develop an automated causal discourse evaluation tool (ACDET) and (2) to empirically evaluate learners' causal discourse development with ACDET. The first objective was the initial step for achieving the second objective, on the basis of which the research questions were formulated. Addressing the two objectives of the study, this chapter is divided into two parts describing the methodology employed for developing ACDET and evaluating learners' causal discourse development using ACDET. The first part reports on the development of ACDET by describing the developmental approaches adopted: the linguistic approach, the natural language processing approach, and the pedagogical approach. The second part lays out the methodology employed to investigate the research questions. It details the research design chosen and restates the research questions. Descriptions of the setting with information related to the course, assignments, and instructional materials are then provided. It presents the participants in the study, and describes data collection materials and instruments. Study procedures -- from the beginning of the study to the end -- are then explained. Finally, data analyses conducted to investigate the research questions are described and the study methodology is summarized.

Development of ACDET

The first objective of this study was to develop the automated causal discourse evaluation tool (ACDET) in order to perform automated formative assessment of learners' causal discourse. ACDET analyzes causal discourse in written texts, provides sentence-level feedback to highlight causal discourse meaning and form in the text, and also text-level formative feedback for causal discourse improvement. At present, ACDET is part of a bigger system:

CyWrite. CyWrite is an AWE tool that is being developed by a group of researchers in the Applied Linguistics and Technology Program at Iowa State University. The program evaluates learner writing in several aspects including grammar, mechanics, and discourse. CyWrite works as an editor that is embedded into the course management system Moodle and is still under development. During class implementation, ACDET was referred to as "the Editor" for the sake of using simple language with students.

I used three approaches for the development of ACDET: a linguistic approach, a natural language processing (NLP) approach, and a pedagogical approach.

Linguistic approach. I followed a functional linguistic approach for the identification of causal discourse features that ACDET detects and on which it generates feedback. The functional view of language in Systemic Functional Linguistics (SFL) was adopted and the Principles knowledge structures (presented in Table 2.1 in Chapter 2) from Mohan's Knowledge Framework were the basis of the generation of causal discourse features.

In order to identify causal discourse features, I first created a small corpus of 20 economic texts from the magazine *The Economist* (1,646 sentences and 32,922 words). I chose economic texts specifically because both the textbook chapter of cause-and-effect and the cause-and-effect assignments in the writing course were based on the topics of causes and effects of economic events. The linguistic approach to ACDET development was concerned with the ideational metafunction of language which asks: what are the linguistic resources to make explanations about causes and consequences of economic events in written English? I analyzed the economics texts to understand how causal meaning was realized through lexico-grammatical resources. The relationship between causal meaning and causal form in the particular context of economic events and their causes and consequences guided the identification of causal discourse

features by showing me how the communicative purpose of making explanations was achieved through linguistic resources in written economics texts.

As a result of the corpus analysis, I found that 363 sentences included 566 expressions of causal meaning. I classified those expressions into seven categories as causal conjunctions (n = 100), causal adverbs (n = 7), causal prepositions (n = 32), causal verbs (n = 335), causal adjectives (n = 1), causal nouns (n = 78), and other causal expressions (n = 13). Causal conjunctions included lexico-grammatical items such as "because, as, if," and "since." Causal adverbs consisted of items such as "as a result, therefore, thus," and "in response." Causal prepositions were items such as "due to, because of, thanks to," and "as a result of." Causal verbs included items such as "reduce, generate, lead to," and "destroy." The causal adjective was "effective." Causal nouns consisted of items such as "consequence, influence, factor," and "result." Other causal expressions were ones I could not categorize into the other six categories; those expressions included "why" questions (e.g., Why do people get so upset about such changes), and "the more…the more…" expressions of causal meaning (e.g., The higher up the income ladder, the bigger the rise has been). At the end of the analysis of the economics texts, the resulting number of items in each category of causal discourse features was as follows: causal conjunctions (n = 7), causal adverbs (n = 6), causal prepositions (n = 9), causal verbs (n = 155), causal adjectives (n = 1), and causal nouns (n = 8). The total number of distinct causal discourse features was 186. The category of "other causal expressions" was excluded from this study since that category did not match the categories in the causal developmental path..

The size of the corpus is one important factor in corpus studies. A corpus, "as a 'large' collection of texts" (Bowker & Pearson, 2002, p. 45) needs to include all the relevant target linguistic patterns. When studying grammar, small corpora can be used; however, studies on

lexis include large corpora (McEnery, Xiao, & Tono, 2006). The corpus analysis conducted in this study pertained to the lexico-grammatical features of causal discourse. Because the number of economics texts and the number of words in them were limited, the linguistic items in the categories of causal verbs, causal adjectives, and causal nouns were also scant. I addressed this limitation by extracting more lexical items from two sources: WordNet and FrameNet (Chukharev-Hudilainen & Saricaoglu, 2014). WordNet is a large lexical database at Princeton University supported by a National Science Foundation Grant (Erekhinskaya & Moldovan, 2013). Words which had "cause" in their definitions were extracted automatically from WordNet and added to relevant causal discourse features categories. FrameNet is a lexical database developed at the International Computer Science Institute in Berkeley, California (Baker, 2012; Baker, Fillmore, & Lowe, 1998). FrameNet has a "causation" section in the lexical unit index and several entries for causal words. These words were added manually to the relevant causal discourse features categories in this study. As a result of adding more items from WordNet and FrameNet, the total number of lexico-grammatical items used in ACDET increased to 1151: conjunctions (n = 9), causal adverbs (n = 8), causal prepositions (n = 10), causal verbs (n = 895), causal adjectives (n = 207), causal nouns (n = 22) (see Appendix A for the complete list of lexico-grammatical items in the causal discourse categories). Table 3.1 presents the number of distinct causal discourse features as a result of the corpus analysis and extraction from WordNet and FrameNet.

Table 3.1

Number of Causal Discourse Features from the Corpus Analysis and Automated Extraction

Corpus Analysis		Automated Extraction	
Features	Number of features	Features	Number of features
Causal conjunctions	7	Causal conjunctions	9
Causal adverbs	6	Causal adverbs	8
Causal prepositions	9	Causal prepositions	10
Causal verbs	155	Causal verbs	895
Causal adjectives	1	Causal adjectives	207
Causal nouns	8	Causal nouns	22
Total	186	Total	1151

Natural language processing approach. The natural language processing (NLP) approach to the development of ACDET was a hybrid one that combined automatic tagging of sentences and words (statistical approach) with manually created linguistic rules (rule-based approach). In the statistical approach, the *Stanford CoreNLP* splits texts into sentences and words, assigns part-of-speech tags to them, identifies the dependencies between them, and creates parse trees representing these types of information. A sample visual representation of a statistical analysis of a learner sentence is demonstrated in Figure 3.1.

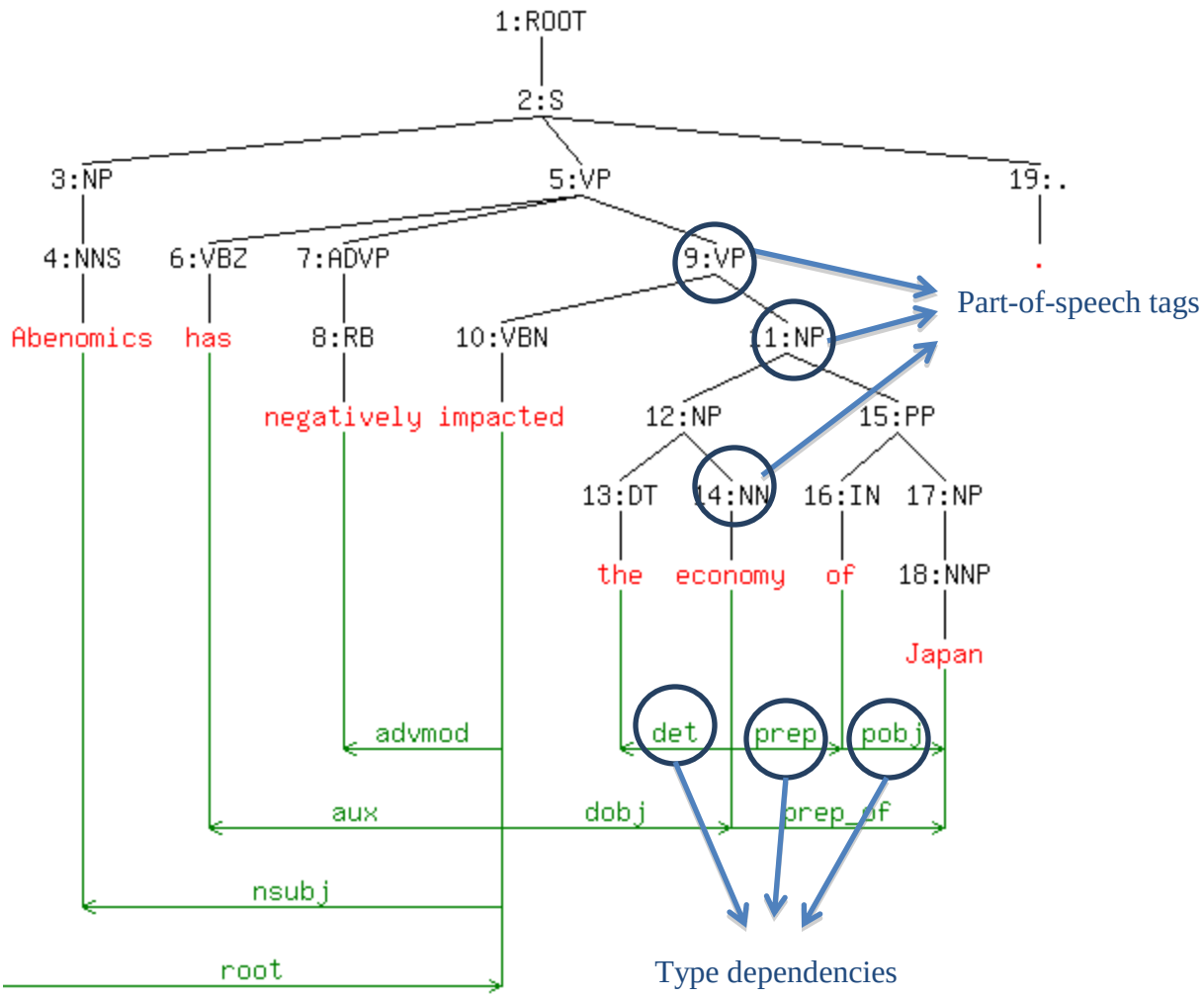

Figure 3.1. Visual representation of the statistical analysis of a sentence

In the rule-based approach, I used the information from the parse trees created by *Stanford CoreNLP* in the creation of hand-coded linguistic rules using the programming language Prolog. I wrote rules to detect different causal discourse features. The causal relation in the sentence shown in Figure 3.2, "Abenomics has negatively impacted the economy of Japan," is detected by one of the rules of causal verbs. The relevant linguistic rule is the following:

-f => 'causal_verb1(Cause,Effect,Verb) :-
subj(Cause, S), pred(Effect, S), sibling(Cause, Effect), effect_verbs(Verb), (root_of(Verb, Effect); dep(conj, _, Verb)), (dep(dobj, Verb, X); dep(xcomp, Verb, X); dep(ccomp, Verb, X)), ancestor(Effect, X), (dep(nsubj, Verb, _);dep(csubj, Verb, _)), \+verbform(passive, _, _, Verb).',

I wrote the rule above based on part-of-speech tags, type dependencies, and predicates (e.g., *sibling*, *ancestor*, or *verbform*) defined in the main analyzer. Once the main analyzer analyzes the sentences for causal discourse features detection, it produces output for each sentence. Using the output, I checked the accuracy of each rule in terms of whether or not the rule worked, whether or not it detected what it was supposed to detect, and how it could be improved in case of incorrect detections. For the sentence "Abenomics has negatively impacted the economy of Japan," the analyzer produces the following output:

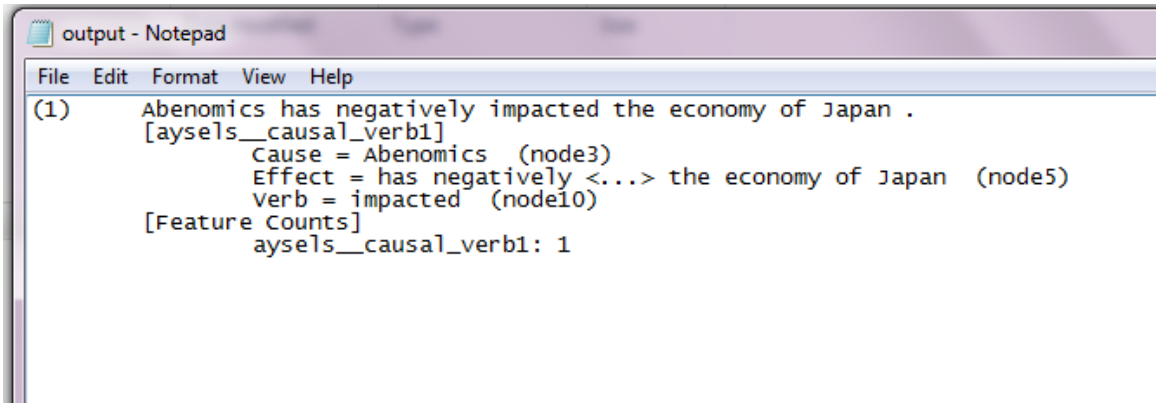

Figure 3.2. The output produced for the sample sentence

Based on the identification of causal discourse features described in the linguistic approach section above, I created 106 rules that detect causal discourse relations and features in sentences. The performance of the causal discourse analyzer was tested by Chukharev-Hudilainen and Saricaoglu (2014) in terms of how accurately the analyzer processed cause-and-effect sentences (585 sentences) written by 17 undergraduate ESL students. Chukharev-Hudilainen and Saricaoglu (2014) evaluated the analyzer's performance based on the identification of causes and effects and the boundaries of causal expressions using four measures: precision, recall, accuracy, and F-score. Precision means the ratio of correctly identified causal discourse features to the total number of identified features. Recall is the ratio

of causal discourse features identified to the total number of causal discourse features. F-score is the harmonic mean of precision and recall, and accuracy is the percentage of correctly identified causal discourse features. The analyzer extracted 93% of the causal discourse features correctly (precision). It was able to capture 71% of the causal discourse features that human annotators manually captured (recall). The analyzer's accuracy was found to be .76 and its F-score was .81. This level of accuracy is considered good for automated systems (Chukharev-Hudilainen & Saricaoglu, 2014).

Pedagogical approach. The pedagogical approach to designing ACDET feedback was concerned with the feedback decisions. ACDET feedback was designed in light of the theories of language and language learning and causal discourse research findings presented in Chapter 2. When learners write in ACDET, ACDET detects causal meaning and causal discourse form and makes them salient to learners through sentence-level feedback with color-coding and underlining features. Figure 3.3 demonstrates ACDET's sentence-level feedback with color-coding and underlining features.

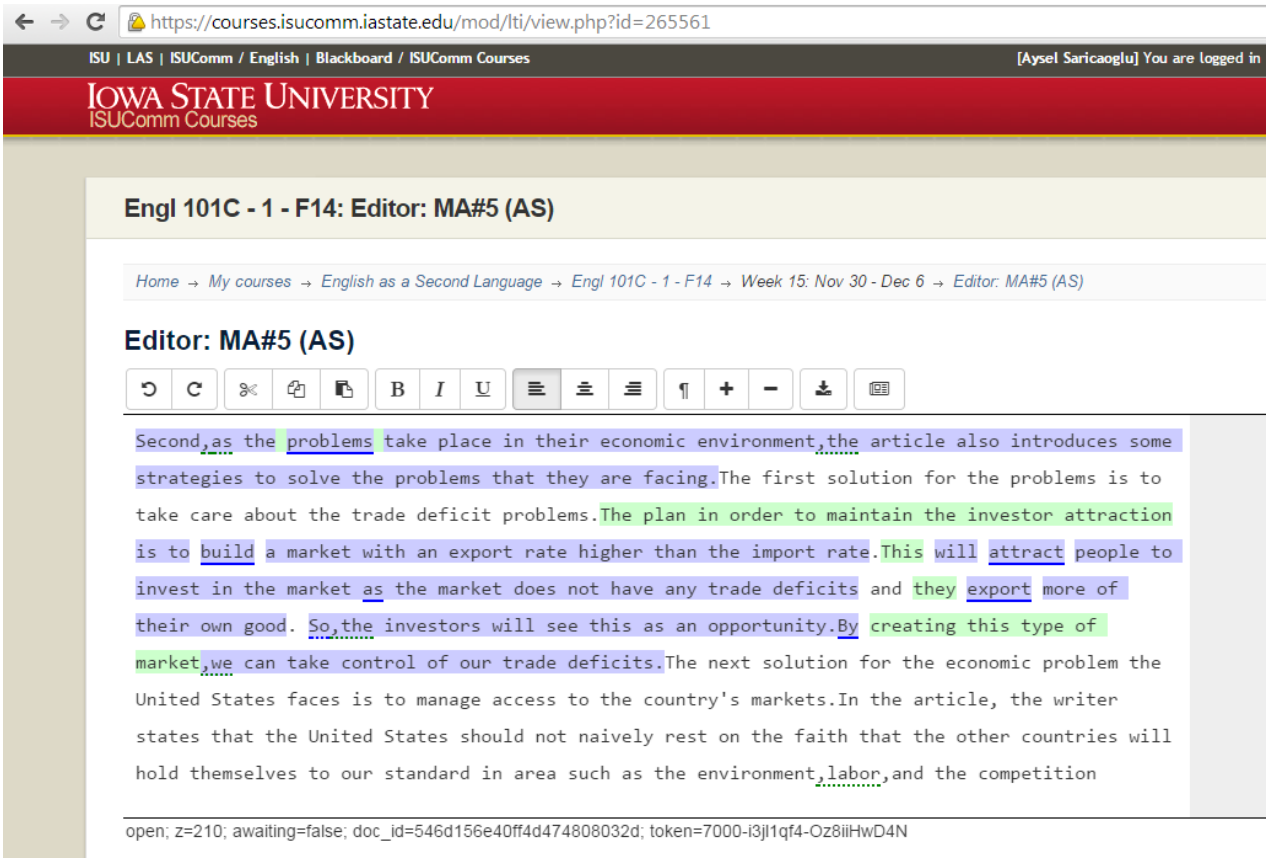

Figure 3.3. Color-coding and underlining features of the sentence-level feedback

As demonstrated in Figure 3.4, ACDET highlights cause in green and effect in blue and underlines the explicit causal discourse feature. Following the CALL principle (Chapelle, 1998), the purpose of highlighting causes and effects in colors is to make the target features salient and draw learners' attention to causal meaning. Key linguistic features that indicated causal relations are also made salient by underlining them. In this way, causal discourse meaning and form is presented to learners in a different way. When students click on one highlighted sentence, they receive sentence-level feedback presented in a box in the left margin (see Figure 3.4). The comment in the box explains that the green highlight is cause, the blue highlight is effect, and the underlined word/phrase is the explicit causal discourse feature. The comment also presents the grammatical category of the causal discourse feature identified in terms of whether it is a causal

verb, a causal noun or some other form. The purpose of this sentence-level feedback is to elaborate on causal meaning and form.

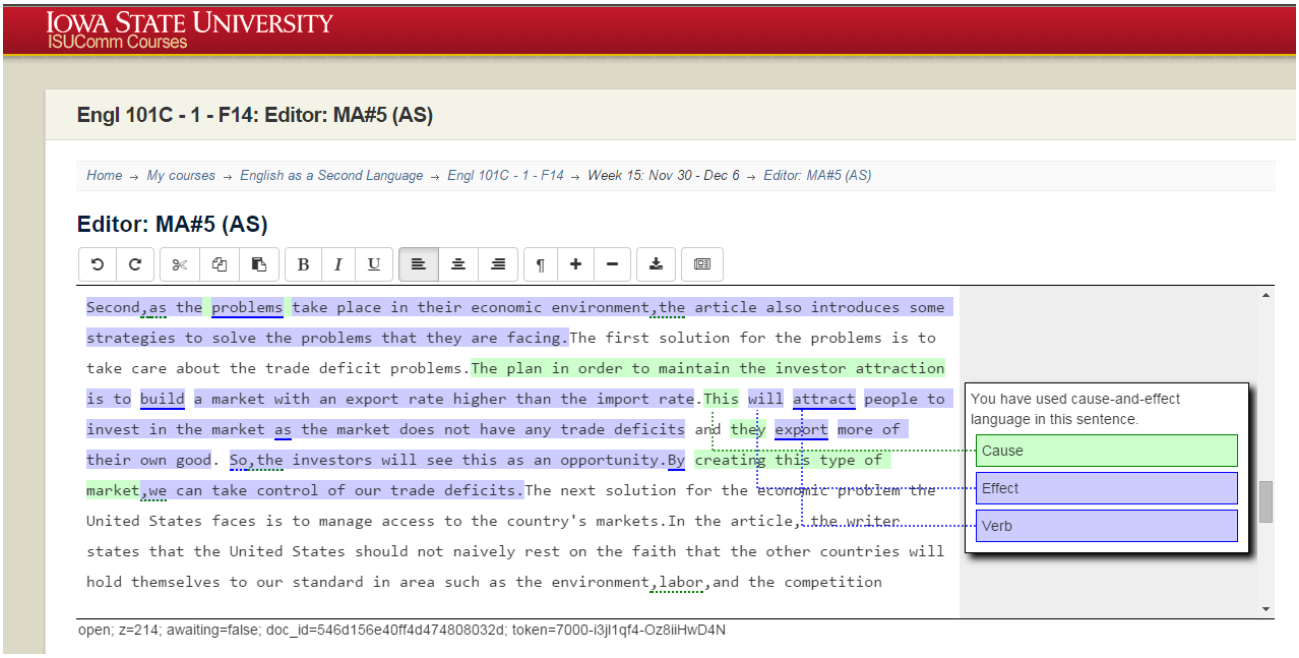

Figure 3.4. Sentence-level feedback by ACDET

When learners click on the "get text-level feedback" button, they receive feedback consisting of two parts (see Figure 3.5). In the first part, the causal discourse features in a text are summarized in a table with two columns as "the casual language features that you have used" and "the causal language features that you have not used." The analysis presents the word counts of causal features in each category.

Causal analysis of your text

The causal language features that you have used						The causal language features that you have not used
Causal Conjunction(s)	Causal Adverb(s)	Other Causal Construction(s)	Causal Prepositional Phrase(s)	Causal Adjective(s)	Causal Verb(s)	Causal Noun(s)
if = 5 times because = 2 times	therefore = 2 times thus	why	with = 3 times	bad	influence = 6 times create = 2 times transmit = 2 times make change produce	

Suggestions for improving your causal language

You have used the causal conjunction: "if" repeatedly. Please consider converting your repeated causal conjunctions to causal prepositional phrases. For example:
Emerging economies may be hit harder by a spike **since** they use a lot of oil oil per unit of output.
Emerging economies may be hit harder by a spike **because of** the amount of oil they use per unit of output.
You have used the causal prepositional phrase: "with" repeatedly. Please consider converting your repeated causal prepositions to causal verbs. For example:
The recent recession happened **due to** the financial crisis.
The financial crisis **led to** the recent recession.
You have used the causal verb: "influence" repeatedly. Please consider converting your repeated causal verbs to causal adjectives. For example:
The sound of running water **distracted** them.
The sound of running water was **distracting** for them.

Figure 3.5. Text-level feedback by ACDET

The second part of the text-level feedback gives learners suggestions based on the text-level analysis for helping them improve their causal discourse; it also provides examples. The feedback for improvement is offered based on the frequency of repetition, because even native speakers of English use conjunctions or prepositional phrases when writing. However, instead of using the same conjunctions, learners are given appropriate formative feedback so that they move forward in the developmental path of causal discourse that was explained in Chapter 2.

According to Halliday (1998), in developing causal discourse, learners shift from expressing causal meaning with conjunctions to expressing causal meaning with prepositions; from prepositions to verbs, from verbs to adjectives, and from adjectives to nouns (see Figure 3.6). Halliday (1998) refers to this pattern as the pattern of grammatical metaphor, which is also the pattern of causal discourse development.

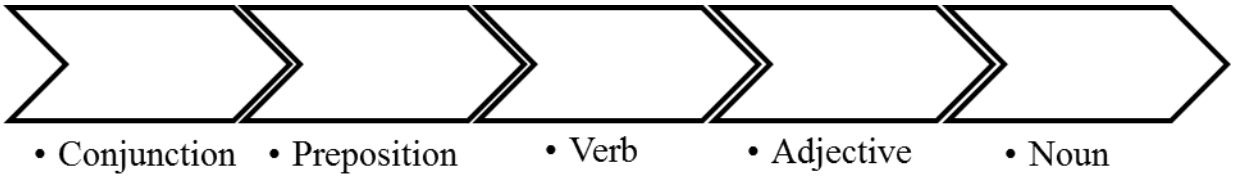

Figure 3.6. Halliday's (1998) pattern of grammatical metaphor

A learner's move from conjunctions to prepositions, from prepositions to verbs, or from prepositions to adjectives means progress in language development, while a move from prepositions to conjunctions or from adjectives to conjunctions does not (Halliday, 1998). This pattern of grammatical metaphor has been assumed as the basis for ACDET when offering formative feedback to learners.

Empirical Evaluation of Causal Discourse Development with ACDET

The second objective of this study was to conduct an empirical evaluation of learners' causal discourse development with ACDET. For this, four research questions were formulated, and the empirical evaluation was conducted in two academic writing classes with undergraduate ESL learners. The following sections provide details about the methodology that was employed to investigate the research questions.

Research Design

This study is a qualitative case study. Creswell (2007) defines a case study as "the study of an issue explored through one or more cases within a bounded system (i.e., a setting, a context)" (p. 73). The issue under investigation in this study was causal discourse development with ACDET. The case in qualitative studies can be individual participants or a group of participants in a bounded context (Duff, 2008). In this study, the context was two academic writing courses and the case included students from these two classes. According to Duff (2008), cases in qualitative case studies are selected on the basis of specific attributes such as

participants' ages, first or second languages, proficiency levels, and skill areas (e.g., reading, writing, listening, & speaking). The specific attributes of the case in this study were as follows: the participants were between the ages of 18 and 25; their second language was English; they were advanced-low level students; and they were all taking the academic writing course.

Yin (2003) divides case studies into three types: exploratory, descriptive, and explanatory. This case study was not exploratory, since its purpose was not to define the research questions or to determine the research procedures. This case study was descriptive and explanatory. A descriptive case study "presents a complete description of a phenomenon within its context" (Yin, 2003, p. 5). This study was concerned with describing learners' learning process using ACDET in their cause-and-effect assignments. An explanatory case study "presents data bearing on cause-effect relationships – explaining how events happened" (Yin, 2003, p. 5). This case study was also explanatory, since it investigated learners' causal discourse development and aimed to find out how the development happened or did not happen by using ACDET.

In case studies, research questions are investigated through many sources of data. Four common sources of data in case studies are observations, interviews, documents, and audiovisual materials (Creswell, 2013). In this study, observations were not included. I was both the researcher and the teacher in the cases that were investigated. As the teacher, I focused on my teaching and my students' learning and followed the usual class process without doing observations as the researcher. Data collection sources in this study were interviews, documents and audiovisual materials. Documents consisted of ACDET's text-level feedback reports, learners' pre-and post-test drafts, and assignment drafts. Audiovisual materials were the screen capturing recordings of learners' use of ACDET during class. In addition to these sources,

questionnaires were also used to gather information about learners' perceptions of ACDET and to support the data that would be collected through interviews. Using such different sources of evidence in case studies is referred to as triangulation (Creswell, 2007; Duff, 2008). Triangulation is a major strength of case studies since findings from each data source contribute to the credibility of the overall study findings. Through different sources of information, the researcher can conduct a thorough analysis and provide a rich description of the investigated issue (Duff, 2008).

One concern that some researchers raise about case studies is related to generalizability (Duff, 2008). Generalizability is "the extent to which a researcher can generalize the account of a particular situation, context, or population to other individuals, times, settings, or context" (Plano Clark & Creswell, 2008, p. 278). Higher generalizability increases the applicability of the findings to different conditions and larger population. Generalizability is an important concept in quantitative research (Duff, 2008), yet it is a primary goal of qualitative research (Bloomberg & Volpe, 2012). Rather than generalizability, the goal in case studies is transferability. Transferability means the extent to which "findings may be applicable in similar situations" (Major & Savin-Baden, 2010, p. 75). It is the responsibility of the researchers and readers to decide whether one research study context fits their own research study or teaching context (Duff, 2008). Transferability in qualitative research is dealt with by the provision of rich descriptions. Based on rich descriptions, researchers make judgements about how similar the participants, contexts, and other characteristics of the research studies are. In this study, the goal was transferability, and it was addressed by describing the methodology in detail (i.e., participants, the setting, data collection materials and instruments, data collection procedures, and data analyses).

Another concern about case studies is related to trustworthiness (Creswell, 2013) even though "[u]sing personal judgment in making research decisions, framing studies based on earlier research, and drawing interpretations and conclusions are involved in all research" (Duff, 2008, p. 55). Trustworthiness is defined as the extent to which one study "is carried out fairly and ethically and whose findings represent as closely as possible the experiences of the respondents" (Padgett, 2008, p. 184). Biases of the researcher or the researcher's closeness to the participants might be threats to trustworthiness and might result in subjectivity of the researcher in conducting case studies, analyzing data, and interpreting the findings. Knowing that the researcher was also the teacher of the participants in the study "might lead readers to interpret the researcher's claims differently" (Duff, 2008, p 130). In this study, I was also the teacher of the participants. In order to avoid any influence of my role as a teacher on the students' decision about participating in this study, I followed the principles of ethical research, asked for their informed consent, and gave them free choice about whether or not to participate (Creswell, 2007).

In qualitative research, trustworthiness can be established using strategies that can help in increasing the readers' confidence in the findings. These strategies include triangulating different data sources, using rich description, presenting negative findings, and clarifying the role of the researcher (Creswell, 2013; Padgett, 2008; Yin, 2011). These strategies were used in this study in order to address any possible concerns of the readers about my trustworthiness as a researcher. Data were collected from different sources, rich description of methodology was provided, and negative findings were presented.

With the above considerations in mind, this study investigated the following research questions:

1. To what extent does ACDET feedback help learners focus on causal discourse form? And what features of ACDET feedback draw learners' attention to causal discourse form?
2. To what extent does ACDET create opportunities for interactional modifications? And what features of ACDET create opportunities for interactional modifications?
3. To what extent does using ACDET develop ESL learners' causal discourse in papers and across pre- and post-tests?
4. To what extent does ACDET feedback help learners focus on causal meaning? And what features of ACDET feedback draw learners' attention to causal meaning?

For the investigation of the research questions, six sets of data were collected: pre- and post-test drafts, ACDET's text-level feedback reports generated for students to revise their causal discourse, screen capturing recordings of learners' use of ACDET, drafts of papers written by students in two cause-and-effect assignments, responses to questionnaires, and audio-recordings of semi-structured interviews (see Table 3.2 for a summary of data collected).

Table 3.2

Summary of Data Collected

Data Sets	n
Pre-test drafts	n = 31
ACDET's text-level feedback reports	n = 104
Screen capturing recordings	n = 47
Assignment drafts	n = 104
Questionnaires	n = 32
Semi-structured interviews	n = 27
Post-test drafts	n = 31

In total, 32 students, 16 in each class, participated in this study. However, the number in each data set was different. One student was absent when the pre-test was administered. Even

though all students joined the post-test, the draft of that one student was excluded, since it would not be possible to make a comparison between his/her pre-test and post-test. The number of interviews conducted was 27 since five of the students did not want to participate in the interview. Screen capturing recordings came from two assignments, and the total number was 47, because either students were absent when ACDET was used or students experienced technical problems in recording their screens. The numbers of ACDET reports and assignment drafts were 104, since six students revised their drafts in Word and forgot to update their drafts on ACDET to receive the text-level feedback. When one draft of a student was missing, both drafts from that assignment and ACDET reports for the drafts were omitted from the data analysis.

Setting

This study was conducted in two Academic Writing II classes (henceforth, referred to as Class A and Class B) at Iowa State University (ISU). Academic Writing II is an undergraduate level English academic writing course for native speakers of languages other than English at ISU. Students are placed into the writing classes according to their placement test results.

Course description. The objectives of Academic Writing II course are to help learners (a) complete written assignments in various academic disciplines and genres using appropriate language, (b) improve their thinking skills of analyzing, synthesizing, and evaluating, and (c) write independently by identifying their own weaknesses and revising their drafts (see Appendix B for course syllabus). Academic Writing II consists of five assignments in four discourse modes: (a) exposition (Assignment 1), (b) classification (Assignment 2), (c) comparison and contrast (Assignment 3), and (d) cause-and effect (Assignments 4 & 5). This study was conducted using two cause-and-effect assignments, which were the last two assignments of the course.

The writing course's five major assignments formed 70% of students' final grades, and 30% of the grade came from the minor assignments. In the major assignments, students were required to write papers on topics such as role models, culture and identity, and economics. Minor assignments included textbook assignments, quizzes, group/pair work, and attendance and participation. Attendance was mandatory in the writing course. Class A met for 50 minutes on Mondays, Wednesdays, and Fridays. Class B met for an hour and 20 minutes in Tuesdays and Thursdays. Class A met in a classroom without computers on Mondays and Wednesdays, and Class B met in a classroom without computers on Tuesdays. Both classes met in a computer lab on one of the days.

Assignments. This study was completed using two cause-and-effect assignments. In Assignment 1, students were required to analyze a newspaper article on their selected topic and refer to it in their essays in composing the essay for Assignment 1 (see Appendix C for the assignment sheet). In Assignment 2, students were asked to analyze three to four newspaper articles on their topic (see Appendix D for the assignment sheet) and refer to them when writing their essays. In both assignments, students were asked to choose one of the following three topics (each prepared by the coordinator of the Academic Writing II classes) and write an essay of about 700 words:

a) The effects of globalization on a country, region, or city
b) The reasons why a country has a strong, weak, or a variable economy.
c) The effects of a specific event that brought about a positive, negative, or mixed economic results in a country, region, or city. This can be a natural disaster (like an earthquake or flood), a major development policy (like modernization, or new industry), a political change, a treat agreement (like the Euro-zone, or OPEC), a war, or other action

Both assignments were graded on a scale of 0-100. In Assignment 1, students earned their grade in five stages. They received 10 points on the timeliness and completeness of their first drafts, 10 points on their reviewer input when they reviewed their peers' first drafts, 20 points on the revisions they made from first drafts to the second drafts based on peer feedback, 20 points on their revisions from second drafts to the third drafts based on instructor feedback, and 40 points on their final drafts based on the fulfillment of the evaluation rubric criteria. In Assignment 1, students used ACDET after they received teacher feedback and revised their drafts.

Students completed Assignment 2 in three stages. They submitted their first drafts and earned 20 points based on their timeliness and completeness. They did not do peer review due to time limits. They received teacher feedback on their first drafts. They revised according to teacher comments and submitted their second drafts, which was valued at 40 points. They received another 40 points on their final drafts based on the fulfillment of the evaluation rubric criteria. ACDET was used between second and final drafts.

Instructional materials. Three main instructional materials were used in the writing classes: a textbook, the classroom management system Moodle, and the automated writing evaluation software ACDET.

Textbook. The textbook for the academic writing course was *Engaging Writing 2* (second ed.) by Fitzpatrick (2011). In the textbook, every chapter consists of three main sections: reading, writing, and revising. Chapters start with a reading passage followed with "understanding the reading" questions and "vocabulary expansion" exercises. The "writing" section first explains the discourse that students will be producing, such as expository writing or comparison-and-contrast writing, and why the discourse is important in academic writing. It continues with the

steps of the writing process and presents a sample essay of the target discourse. The "revising" section focuses on how to improve the first drafts with several revision checkpoints (i.e., introductions, organization of body paragraphs, transitional words, development and unity, conclusions, discourse-specific language focus) and revision exercises.

Moodle. Modular Object-Oriented Dynamic Learning Environment (Moodle) was used as the main online course platform for both Class A and Class B (see Figure 3.7 for a screenshot). Moodle is an open source, widely used learning/course management system (Cole, & Foster, 2008), and it was used in all English Department courses at ISU. It allows for interactions between instructors and students and provides a platform for learners to see their learning path with content and materials of the courses (Dvorak, 2011).

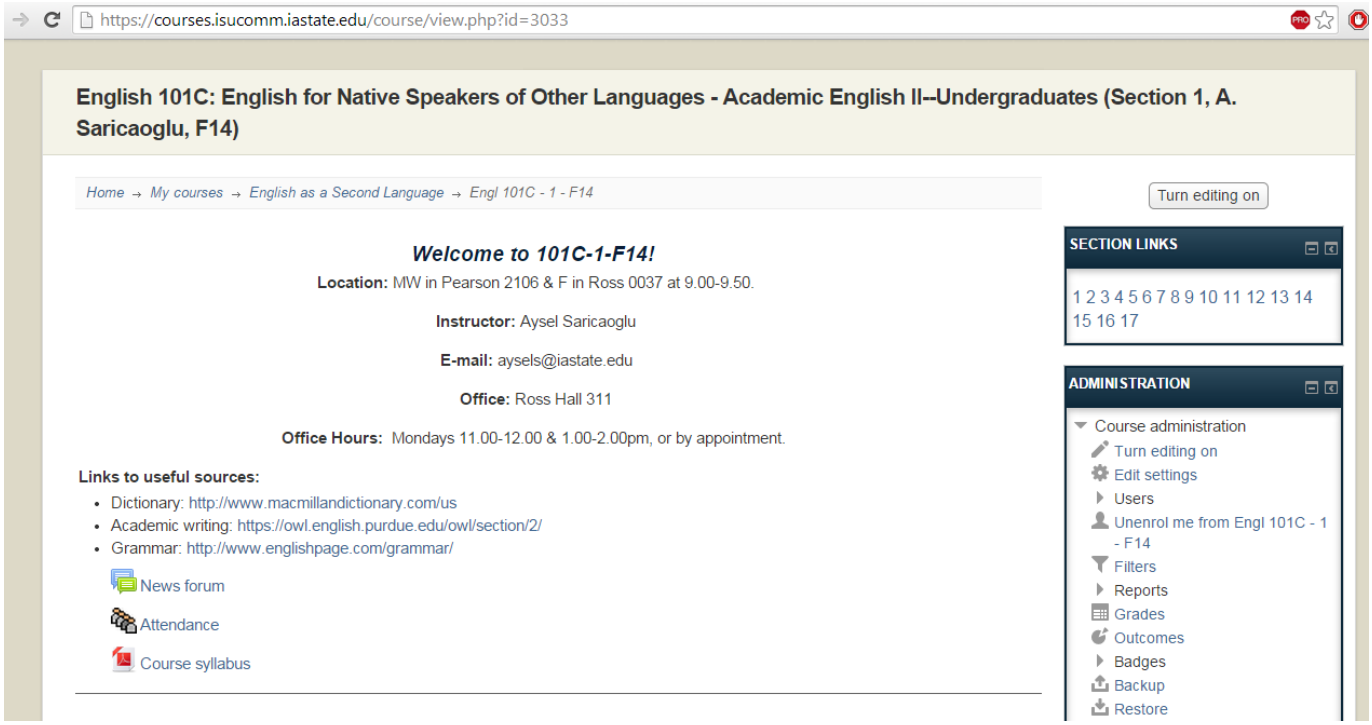

Figure 3.7. A screenshot of the Moodle site for Class A

Participants

Participants of this study were 32 low-advanced undergraduate ESL learners (11 females and 21 males) from two academic writing classes in Fall 2014 at ISU (Class A and Class B, 16 students in each class). The participants were the students who took ENGL 101C, Academic Writing II for Native Speakers of Other Languages.

This study was exempted by the Institutional Review Board because it was conducted in an instructional setting using customary classroom practices and it was based on investigating the effectiveness of instructional techniques. Even though formal documentation was not required, students' consent was obtained through consent forms. At the beginning of the study, I informed my students about the study. I explained that we would spend the rest of the semester on cause-and-effect writing and we would use an automated tool to compose this type of writing. I explained that I was developing the tool within the scope of my dissertation study and that the tool was still under development, and in order to measure its effectiveness and develop it further to help learners write causal assignments, it was necessary to conduct this study. I introduced them the tool briefly and explained possible learning benefits from using it. I then informed participants that in addition to what we would do as a normal part of our classroom activities, I would need to record their screens and would interview them about their learning experiences. They read the consent form and I answered any questions they had. I assured participants that all data would be kept confidential. They all gave their consent for participating in the study; however, five students did not want to share their interview data for study purposes. These students' interviews were not recorded.

Table 3.3 presents the demographics of the participants. As seen in the table, participants had different native languages: Chinese (66%, n = 21), Malay (13%, n = 4), Spanish (9%, n = 3),

Hindi (3%, n = 1), Korean (3%, n = 1), Portuguese (3%, n = 1), and Thai (3%, n = 1). The ages of the participants ranged from 18 to 25; five students were 18 years old; 16 were 19 years old; seven were 20 years old; three were 21 years old; and one student was 25 years old.

Participants were also from a variety of majors: Agricultural Biochemistry (n = 1), Agricultural Engineering (n = 1), Agriculture (n = 1), Business (n = 4), Business Economics (n = 1), Chemical Engineering (n = 1), Civil Engineering (n = 3), Communication Studies (n = 1), Computer Engineering (n = 1), Computer Science (n = 1), Economics (n = 1), Electrical Engineering (n = 5), Food Science (n = 2), Food Science and Technology (n = 1), Mathematics (n = 1), Mechanical Engineering (n = 4), Nutritional Science (n = 2), and Supply Chain Management (n = 1).

Table 3.3

Demographics of the Participants

Classes	Gender	Age	Native Language	Major
Class A (n=16)	Female (n=11)	18 (n=5)	Chinese (n=21)	Electrical Engineering (n=5)
Class B (n=16)	Male (n=21)	19 (n=16)	Malay (n=4)	Business (n=4)
		20 (n=7)	Spanish (n=3)	Mechanical Engineering (n=4)
		21 (n=3)	Hindi (n=1)	Civil Engineering (n=3)
		25 (n=1)	Korean (n=1)	Business Economics (n=1)
			Portuguese (n=1)	Food Science (n=2)
			Thai (n=1)	Nutritional Science (n=2)
				Agricultural Biochemistry (n=1)
				Agricultural Engineering (n=1)
				Agriculture (n=1)
				Chemical Engineering (n=1)
				Communication Studies (n=1)
				Computer Engineering (n=1)
				Computer Science (n=1)
				Economics (n=1)
				Food Science and Technology (n=1)
				Mathematics (n=1)
				Supply Chain Management (n=1)

Materials and Instruments

Data for this study were collected via six sources: pre- and post-test drafts, ACDET's text-level feedback reports generated for students to revise their causal discourse, drafts of papers written by students in two cause-and-effect assignments, responses to questionnaires, audio-recordings of semi-structured interviews, and screen capturing recordings of learners' use of ACDET.

Pre- & post-tests. At the beginning of the first cause-and-effect assignment, students were asked to write a cause-and-effect essay in order to see what causal discourse features they would use in their texts. The pre-test was conducted in class, and students were given 40 minutes to complete their essays. Students were given this amount of time for the pre-test because this was the time limit in the writing section of the English Placement Test (EPT) exam they had taken before they were placed into the writing classes. The prompt for the pre-test was as follows: "Write an essay about the causes and effects of poverty (not having enough money to pay for one's needs) for a family or a city or a country." The same prompt was used in both classes, and 31 pre-test drafts were collected in total. The post-test was administered as the final exam of the course after the second cause-and-effect assignment was completed. It was also given in class, and students were given 40 minutes for completing the test. The prompt for the post-test was: "What can cause close friends to become enemies and what are the consequences?" In total, 32 post-test drafts were collected, but the draft of the student who was absent in the pre-test was excluded in the data analysis.

ACDET's text-level feedback reports. In order to make a comparison between learners' drafts in terms of causal discourse features, text-level feedback reports were collected. For Assignment 1, reports for third drafts (i.e., their drafts before they received ACDET feedback) and final drafts (i.e., their revised drafts based on ACDET feedback) were gathered. In Assignment 2, reports for second drafts and final drafts were collected. The reason why third drafts were collected in one assignment while second drafts were collected in the other is because there was a difference in the writing process followed in the two assignments. In Assignment 1, the writing process included peer-feedback, which resulted in a revised draft based on peer-feedback. However, because the writing course was intensive in terms of the

number of assignments, the time was limited in the second cause-and-effect assignment, and there was no time for peer-feedback. Students' first drafts were reviewed only by the instructor, who provided feedback on the texts' grammar and organization.

In total, 25 students' reports were collected (25 reports of their third drafts and 25 reports of their final drafts (in total 50 reports) in Assignment 1 and 27 students' reports in Assignment 2 (in total 54 reports) (see Table 3.4). Six students' text-level reports were not included in the analysis, since their either a second, third, or final draft report was missing, which did not allow for a comparison.

Table 3.4

Number of ACDET's Text-level Feedback Reports Collected

Assignment	Number of Reports
Assignment 1	Third drafts reports (n=25) Final draft reports (n=25)
Assignment 2	Second draft reports (n=27) Final draft reports (n=27)
	Total=104

Assignment drafts. In order to compare lexical density in students' drafts before and after ACDET use, their third and final drafts in Assignment 1 and second and final drafts in Assignment 2 were collected. In Assignment 1, 25 students' third and final drafts were collected. In Assignment 2, 27 students' second and final drafts were collected. In total, 104 drafts were collected for lexical density analysis.

Questionnaires. Students were asked to complete a five-point Likert scale (with points indicating Strongly Agree, Agree, Neutral, Disagree, Strongly Disagree) questionnaire with two items which aimed to find answers to two of the research questions.

Table 3.5

Questionnaire Items for Research Questions

Research Questions	Questionnaire Items
1) To what extent does ACDET feedback help learners focus on causal discourse form?	The Editor draws my attention to cause-and-effect forms.
2) To what extent does ACDET feedback help learners focus on causal meaning?	The Editor draws my attention to cause-and-effect meaning.

In the questionnaire items and during the implementation of ACDET, ACDET was referred to as "the Editor" for the sake of using simple and clear terms with the students.

Semi-structured interviews. I conducted semi-structured face-to-face interviews with 27 participants after they used ACDET in both assignments in order to gather information about their experiences with ACDET as they pertained to the study's research questions. Five participants did not want to be recorded since they did not feel comfortable doing so. I chose a semi-structured format because having a fixed number of questions guided me and gave me the flexibility to change the order and wording of questions while also allowing me to ask additional questions as needed (Blee & Taylor, 2002; Merriam, 2009).

Five main guiding questions were prepared for the interviews as follows:

1. What aspects of the Editor did you like in terms of cause-and-effect writing? Please explain.
2. What aspects of the Editor did you not like in terms of cause-and-effect writing? Please explain.
3. Did the Editor help you focus on cause-and-effect form? If yes, what features of the Editor helped you focus on cause and effect form?

4. Did the Editor help you focus on cause-and-effect meaning? If yes, what features of the Editor helped you focus on cause-and-effect meaning?
5. Were you able to interact with the Editor? If yes, what features of the Editor enabled you to interact with it?

I recorded the interviews with a digital audio-recorder. The length of the interviews ranged from five to 14 minutes. The amount of time in which each interview was completed is presented in Table 3.6:

Table 3.6

Length of Interviews

Student	Length of the Audio (h:mm:ss)
Student 1	00:13:59
Student 2	00:08:47
Student 3	00:08:01
Student 4	00:10:20
Student 5	00:08:59
Student 6	00:10:24
Student 7	00:07:25
Student 8	00:06:52
Student 9	00:09:00
Student 10	00:10:15
Student 11	00:07:22
Student 12	00:13:19
Student 13	00:12:48
Student 14	00:11:30
Student 16	00:10:04
Student 17	00:06:58
Student 18	00:09:51
Student 21	00:09:39
Student 23	00:14:06
Student 24	00:11:10
Student 25	00:12:13
Student 26	00:07:40
Student 27	00:05:54
Student 28	00:10:10
Student 29	00:06:57
Student 30	00:05:10
Student 31	00:07:58
Total length	04:16:51
Mean length	00:15:00

Coding scheme for interviews. Learners responses to interview questions were coded and analyzed using the qualitative data analysis software NVivo 10 developed by QSR International (Bazeley, 2007) (see Figure 3.8).

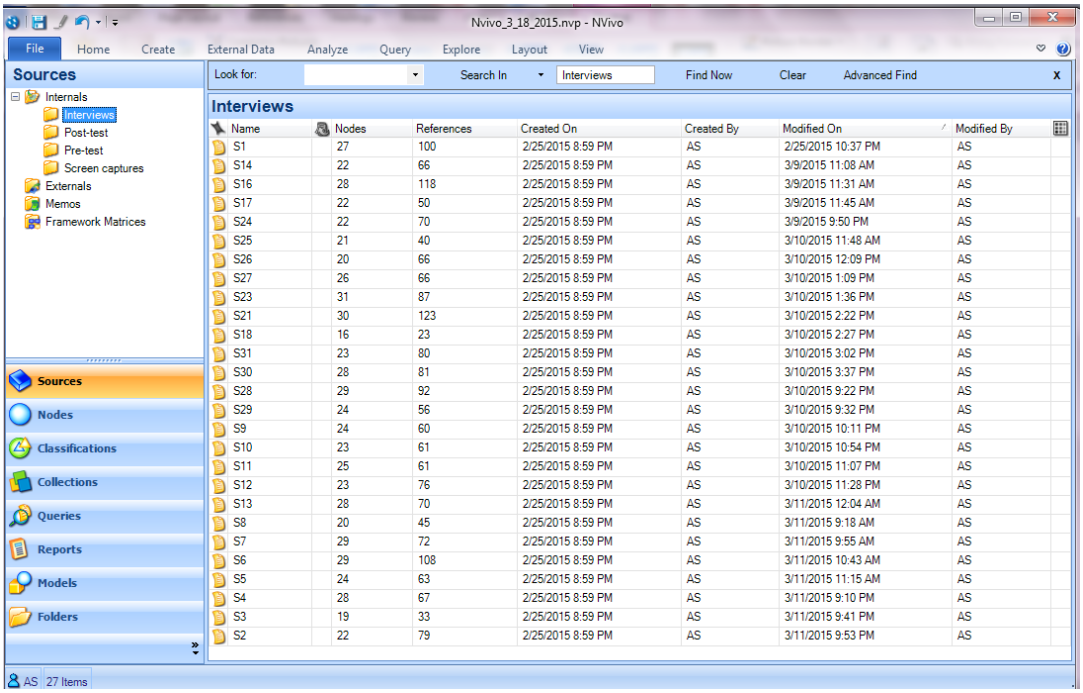

Figure 3.8. A screenshot of the NVivo interface

A second coder was not involved in this study. Inter-coder reliability is done for the purposes of validating the coding scheme (Neuendorf, 2002). This study is a qualitative study which evaluates learning with ACDET. The interview questions that were asked to the participants in this study were based on the research questions which were formulated and investigated under the guidance of theoretical perspectives and research findings. The coding scheme was developed on the basis of the research questions. This systematic evaluation of ACDET establishes the validation of the coding scheme.

The coding scheme was created based on the three research questions: focus on form, interactional modifications, and focus on meaning. For example, the first research question

investigated what features of ACDET drew learners' attention to causal discourse form. For focus on form, the coding categories were created around feedback features of ACDET as text-level feedback, sentence-level feedback, color-coding feedback feature, and underlining feedback feature. The same process was followed for interactional modifications and focus on meaning. Learners' responses for each coding category were coded as negative and positive. For example, learners' overall perceptions of ACDET's capacity to help them focus on form were coded as positive overall perceptions and negative overall perceptions. Coding categories for focus on form and examples for each coding category are presented in Table 3.7.

Table 3.7

Coding Categories for Focus on Form and Examples

Coding Categories	Examples for Positive Perceptions	Examples for Negative Perceptions
Overall perceptions	Yes like since it shows uhh, you know the specific word, like it's a specific adjective or maybe it's a conjunction (S13)	No…it just tell me this is a cause-effect sentence and, uh, and how many times, the, uh, the verb you use that's, that's all (S5)
Perceptions of text-level feedback	Yeah because I when I wrote my article, I I didn't realize I have so many repeated words, and when I see the feedback and I can find the words and then change it to another word (S31)	No examples
Perceptions of sentence-level feedback	For example you can you can search what like the inter relation cause and effect on a word like the key word for that relationship and which part is the relation which part is the cause and which part is the effect, the effect (S21)	No examples
Perceptions of color-coding feature	Yeah …the blue one and the green one can indicate uh both uh can indicate the cause or effect, and while I'm writing the sentence, I can uh, I can restructure, I can form my structure of my sentence (S12)	No examples
Perceptions of underlining feature	When I see the underline I know it's the verb or something (S17)	No examples

The units of texts that were coded were learners' responses to interview questions, which might include several sentences or a few words. In this way, a specific code could apply to units of texts with different lengths. For example, the response of Student 21, "My opinion about the

editor is like it's pretty nice because you can take it uh, like the structural phrase isn't good or you have to make any change in it also like the words that you spell wrong you have like different options like the same as word," and the response of Student 11, "Uh, it shows me, uh, what is my cause-effect word" were both coded with the code positive perceptions of text-level feedback since they were responses to the interview question about the text-level feedback.

Screen capturing recordings. Participants' use of ACDET in class was recorded through screen capturing programs in order to analyze their interactions with the program and revisions of causal discourse based on ACDET feedback. Two screen capturing programs were used, because classes were in two different labs and different screen capturing software had been installed on the respective labs' computers. *Quick Time Player* was installed in the computers in one lab and computers in the other lab had *Camtasia*. For confidentiality, students were asked not to leave open or visible any personal information on their screens such as email accounts.

In total, 47 screen capturing videos were collected (25 from Assignment 1 and 22 from Assignment 2). There were more students in classes using ACDET, but a few had some technical problems on their computers and were not able to record their screens. The length of each screen capturing recording collected is given in Table 3.8. The length of recordings ranged from five minutes to 48 minutes.

Table 3.8

Length of Screen Capturing Recordings

	Assignment 1	Assignment 2	Total
Students	Length (h:mm:ss)	Length (h:mm:ss)	Length (h:mm:ss)
Student 1	00:31:58	0	0:31:58
Student 2	00:22:58	00:14:30	0:37:28
Student 3	00:28:06	00:11:52	0:39:58
Student 4	00:35:02	0	0:35:02
Student 5	00:21:31	0	0:21:31
Student 6	00:28:39	00:30:00	0:58:39
Student 7	0	00:16:55	0:16:55
Student 8	00:09:39	0	0:09:39
Student 9	00:26:25	00:35:50	1:02:15
Student 10	0	0	0:00:00
Student 11	00:29:37	00:45:42	1:15:19
Student 12	00:21:17	0	0:21:17
Student 13	00:25:22	00:29:04	0:54:26
Student 14	00:29:19	00:12:01	0:41:20
Student 15	00:22:28	00:04:58	0:27:26
Student 16	00:28:59	00:07:59	0:36:58
Student 17	00:22:34	00:05:41	0:28:15
Student 18	0	00:31:48	0:31:48
Student 19	0	00:15:04	0:15:04
Student 20	0	00:34:32	0:34:32
Student 21	00:27:29	00:37:49	1:05:18
Student 22	00:24:22	0	0:24:22
Student 23	00:36:25	00:38:24	1:14:49
Student 24	00:40:03	00:44:08	1:24:11
Student 25	00:37:12	00:32:18	1:09:30
Student 26	0	0	0:00:00
Student 27	0	00:05:21	0:05:21
Student 28	00:31:22	00:15:52	0:47:14
Student 29	00:33:35	00:20:33	0:54:08
Student 30	00:15:12	00:20:09	0:35:21
Student 31	00:31:30	00:17:55	0:49:25
Student 32	00:28:58	00:48:38	1:17:36
Total length	11:30:02	09:37:03	21:07:05

Coding scheme for screen capturing recordings. Screen capturing recordings were also coded and analyzed in NVivo. For this coding, a few recordings were previewed and pattern codes were created based on the research questions. Then, the rest of the recordings were coded using the pattern codes. Coding categories and sub-codes for screen capturing data are provided in Table 3.9.

Table 3.9

RQs and Corresponding Coding Categories and Sub-categories

Research Questions	Coding Categories & Sub-categories
1. To what extent does ACDET feedback help learners focus on causal discourse form? And what features of ACDET feedback draw learners' attention to causal discourse form?	Output modifications Added causal discourse form Deleted causal discourse form Revised causal discourse form
2. To what does ACDET create opportunities for interactional modifications? And what features of ACDET creates opportunities for interactional modifications?	Interactional modifications Clicked on text-level feedback Clicked on sentence-level feedback Clicked on causal discourse help page Clicked on dictionaries
3. To what extent does using ACDET develop ESL learners' causal discourse within papers and across two papers?	Revised causal discourse form Less congruence Same congruence More congruence
4. To what extent does ACDET feedback help learners focus on causal meaning? And what features of ACDET feedback draw learners' attention to causal meaning?	Focus on meaning Causal meaning maintained Causal meaning lost

Screen capturing recordings of learners' use of ACDET were coded for interactional modifications. Interactional modifications refer to learners' interruptions during revising their causal discourse to receive help from ACDET's text-level feedback, sentence-level feedback, causal discourse help page, and dictionaries. For instance, if a learner clicked on the text-level

feedback button to see the text-level feedback while working on his/her cause-and-effect draft on ACDET, the portion of the screen capturing video with the click was coded with the code "clicked on the text-level feedback" under the coding category of interactional modifications.

Screen capturing recordings of learners' use of ACDET were also coded for causal discourse modifications. Causal discourse modifications refer to the changes learners made in their causal discourse form. The modifications were coded into one of the three codes: added causal discourse form, deleted causal discourse form, or revised causal discourse form. Modifications as revisions were further coded in one of the three categories as exhibiting less congruence, the same congruence, or more congruence. Learners' causal discourse modifications were also coded in terms of focus on meaning as causal meaning maintained or causal meaning lost. Table 3.10 provides examples for the coding of learners' causal discourse modifications.

Table 3.10

Codes for Learners' Causal Discourse Modifications and Examples

	Examples	
Codes	Before modifications	After modifications
Added causal discourse form	We can imagine how the economy will increase by including female workforce.	We can imagine how the economy will increase by including female workforce because of their participation.
Deleted causal discourse form	Taco Bell is willing to consider what the customer need, so that they can improve or change it.	Taco Bell is willing to consider what the customer need, so that they can improve it.
Less congruence	So, economy is something magical; the global economy will always find a way out to keep it in balance.	Thanks to magical economy; the global economy will always find a way out to keep it in balance.
Same congruence	…which may and will cause conflicts to the bonds of families	…which may and will generate conflicts to the bonds of families
More congruence	These could be hard tasks and challenges.	These could be hard tasks and will challenge them hardly.
Causal meaning maintained	…which have many potential benefits	…which can be beneficial
Causal meaning lost	It must affect Hong Kong's impression on customers from different parts of the world.	It must bring an effective disorder to Hong Kong society and let customers disappointed.

When the sentence of a learner did not contain any causal discourse form and the student added causal discourse form in the sentence, this modification was coded as "added causal discourse form." For example, the change from "We can imagine how the economy will increase by including female workforce" to "We can imagine how the economy will increase by including female workforce because of their participation" was coded as "added causal discourse form"

because the learner added “because of” to his/her sentence. When a sentence included causal discourse form and the student deleted it from the sentence, this modification was coded as “deleted causal discourse form.” For example, a learner revised the sentence “Taco Bell is willing to consider what the customer need, so that they can improve or change it” by deleting the causal verb at the end: “Taco Bell is willing to consider what the customer need, so that they can improve it.” This revision was coded as “deleted causal discourse form.”

When a learner revised the causal discourse form in a sentence by changing it to another causal discourse form, this modification was coded in terms of congruence. If a congruent expression of causal meaning (e.g., So, economy is something magical; the global economy will always find a way out to keep it in balance) was changed to a less congruent expression (e.g., Thanks to magical economy; the global economy will always find a way out to keep it in balance), this modification was coded as “less congruence.” If an expression of causal meaning (e.g., These could be hard tasks and challenges) was changed to a more congruent expression (e.g., These could be hard tasks and will challenge them hardly), this modification was coded as “more congruence.” If the congruence was the same before modification (e.g., which may and will cause conflicts to the bonds of families) and after modification (e.g., which may and will generate conflicts to the bonds of families), this modification was coded as “same congruence.”

When a learner revised the causal discourse form in a sentence by changing it to another causal discourse form, this modification was coded in terms of causal meaning as well. If the causal meaning (e.g., which have many potential benefits) was maintained after the modification (e.g., which can be beneficial), this modification was coded as “maintained causal meaning.” If the causal meaning (e.g., It must affect Hong Kong's impression on customers from different parts of the world) was lost after the modification (e.g., It must bring an effective disorder to

Hong Kong society and let customers disappointed), this modification was coded as "lost causal meaning."

Procedures

This study was conducted in two academic writing classes in Fall 2014 during the last eight weeks of the semester. The same procedures were followed in both of the classes. Steps during which data were collected in class procedures are highlighted in bold in Table 3.11.

Table 3.11

Data Collection Procedures

Assignment	Weeks	In/Out of class	Data Collection Steps
Assignment 1	Week1	In class	**Pre-test**
		In class	Textbook instruction on causal discourse
		Out of class	First drafts
	Week 2	In class	Peer feedback on first drafts
		In class	Textbook instruction on causal discourse
		In & Out of class	Revision of drafts
		Out of class	Second drafts
	Week 3	Out of class	Teacher feedback on second drafts
		In class	Causal discourse instruction
		In & Out of class	Revision of drafts
	Week 4	Out of class	**Third drafts**
		In class	**ACDET feedback on third drafts**
			Screen capturing recordings
		In class	Revision of drafts & **Final drafts**
Assignment 2	Week 5	In & Out of class	First drafts
	Week 6	Out of class	Teacher feedback on first drafts
		In & Out of class	Revision of drafts
		Out of class	**Second drafts**
	Week 7	In class	**ACDET feedback on second drafts**
			Screen capturing recordings
		In class	Revision of drafts & **Final drafts**
		Out of class	**Interviews**
	Week 8	In class	**Post-test**
		In class	**Questionnaires**

Data collection began in the first class of the first cause-and-effect assignment with the administration of the pre-test. After the pre-test, the reading and writing exercises in the cause-and-effect essay chapter of the textbook were completed. Students composed their first drafts until the beginning of the second week. In the second week, students conducted peer-reviews providing their peers with feedback on grammar and organization. They also completed the revising exercises in the textbook chapter. Based on textbook exercises and peer feedback, students revised their drafts and submitted their second drafts for instructor feedback. In the third week, students received instructor feedback on their grammar and organization. They also received causal discourse instruction beyond what the textbook taught. They were given handouts of causal discourse features, and they did more causal discourse exercises based on the causal discourse features taught. By the beginning of the fourth week, students completed their third drafts, and ACDET was implemented during class. Students received automated feedback on their cause-and-effect essays and made revisions during class. Their screens were recorded during the class. Their revised drafts were their final drafts of the first cause-and-effect assignment.

In the second cause-and-effect assignment, no textbook instruction or exercises was given since the chapter was completed during Assignment 1. Students did not receive peer feedback due to the limited time left for the rest for the semester. In the fifth week, students were given their new assignment, and they composed their first drafts in and out of class and submitted them for instructor feedback. In the sixth week, they received instructor feedback on their grammar and organization and revised their drafts in and out of class. In the seventh week, they received ACDET feedback and revised their drafts during class. This week, semi-structured interviews

were held with students out of class. In the final week, students were given the post-test and also the questionnaire.

Data Analysis

The first research question was investigated through ACDET's text-level feedback reports, learners' responses to interview questions and the questionnaire item, and screen capturing recordings of learners' use of ACDET. The second research question was investigated by analyzing learners' responses to interview questions, and screen capturing recordings of learners' use of ACDET. The third research question was investigated by analyzing learners' pre- and post-test drafts, assignment drafts, and screen capturing recordings. The fourth research question was investigated by analyzing screen capturing recordings of learners' use of ACDET and learners' responses to interview questions and the questionnaire item. The same data sets were used to answer different research questions. Table 3.12 presents research questions, data sets that were analyzed to answer the research questions, and data analyses.

Table 3.12

Research Questions, Data Sets, and Data Analyses

Research Questions	Data Sets	Data Analyses
1) To what extent does ACDET feedback help learners focus on causal discourse form? And what features of ACDET feedback draw learners' attention to causal discourse form?	-ACDET's text-level feedback reports -Screen capturing recordings -Interviews -Questionnaires	Descriptive statistics (frequencies, percentages, means & standard deviations) Manual content analysis
2) To what does ACDET create opportunities for interactional modifications? And what features of ACDET creates opportunities for interactional modifications?	-Screen capturing recordings -Interviews	Descriptive statistics (frequencies, percentages, means & standard deviations) Manual content analysis
3) To what extent does using ACDET develop ESL learners' causal discourse within papers and across pre- and post-tests?	-Pre- & Post-tests -Assignment drafts -Screen capturing recordings	Descriptive statistics (frequencies, percentages, means & standard deviations) Manual content analysis Lexical density analysis
4) To what extent does ACDET feedback help learners focus on causal meaning? And what features of ACDET feedback draw learners' attention to causal meaning?	-Screen capturing recordings -Interviews -Questionnaires	Descriptive statistics (frequencies, percentages, means & standard deviations) Manual content analysis

Research question 1: Focus on causal discourse form. The first research question (i.e., To what extent does ACDET feedback help learners focus on causal discourse form? And what features of ACDET feedback draw learners' attention to causal discourse form?) was investigated through ACDET's text-level feedback reports, screen capturing recordings of learners' use of ACDET, and their responses to semi-structured interviews and a questionnaire item.

The extent to which ACDET drew learners' attention to causal discourse form was first investigated by analyzing ACDET's text-level feedback reports (n = 104). In order to see whether ACDET feedback led to any causal discourse modifications from third/second drafts to the final drafts, frequencies of causal discourse features in ACDET's text-level feedback reports were tabulated and compared across drafts. Any differences in the frequencies of causal discourse features in the final drafts relative to the previous drafts were interpreted as an indicator that ACDET helped learners focus on causal discourse form. For example, the number of causal conjunctions in students' third/second drafts was compared to the number of causal conjunctions in their final drafts. Frequencies of other causal discourse features (prepositions, verbs, adjectives, and nouns) were compared in the same way. Means and standard deviations for the whole group were also calculated for each causal discourse feature and compared across drafts. The screen capturing recordings (n = 47) of learners' use of ACDET were analyzed for evidence of causal discourse modifications. Frequencies of each type of causal discourse modifications (i.e., additions, deletions, and revisions) were tabulated and means and standard deviations were calculated. Learners' (n = 31) responses to the questionnaire item (i.e., The Editor draws my attention to cause-and-effect forms) were also analyzed. Frequencies and

percentages of responses for each response category (Strongly agree, Agree, Neutral, Disagree, Strongly disagree) were calculated.

What features of ACDET drew learners' attention to causal discourse form was investigated by manually analyzing the coded interview responses of learners (n = 27) to the interview question about focus on form. The coding categories included learners' comments showing their positive and negative evaluation of ACDET in terms of its text-level feedback, sentence-level feedback, color-coding feature and underlining feature, and the tool overall. The number of comments (idea units) coded and the number of participants who made those comments were counted and percentages were calculated. Representative examples from each category were chosen to report the findings.

The analyses of the four sets of data provided evidence about the extent to which ACDET drew learners' attention to causal discourse form, and through what features. The analyses of ACDET's text-level feedback reports and screen capturing recordings yielded information about learners' focus on causal discourse form by demonstrating the modifications they made in their causal discourse. The analysis of learners' responses to the questionnaire item indicated their perceptions of ACDET's focus on form quality. The analysis of learners' responses to the interview questions indicated what features of ACDET drew their attention to causal discourse form.

Research question 2: Interactional modifications. The second research question (i.e., To what does ACDET create opportunities for interactional modifications? And what features of ACDET create opportunities for interactional modifications?) was investigated using screen capturing recordings of learners' use of ACDET and their responses to the semi-structured interviews. Screen capturing recordings (n = 47) of learners' use of ACDET were analyzed to

count the number of clicks on text-level feedback, sentence-level feedback, the causal discourse help page, and dictionaries. Means and standard deviations were calculated for each type of interactional modifications students made during the use of ACDET. The interview responses of learners (n = 27) coded under the category of interactional modifications were also analyzed for the third research question. Specifically, the coding categories of positive and negative evaluation of ACDET in terms of its text-level feedback, sentence-level feedback, color-coding feature, and underlining feature, and the tool overall were analyzed. The number of comments coded and the number of participants who made those comments were counted and percentages were calculated. Representative examples from each category were chosen to report the results.

The results of the analyses described enabled me to answer the second research question. The analysis of screen capturing recordings indicated the extent to which ACDET created opportunities for learners to modify the interaction between them and ACDET. The analysis also demonstrated what features of ACDET led to those interactional modifications. The analysis of learners' responses to the interview questions yielded information about their positive and negative perceptions of ACDET's interactional modifications quality with reference to ACDET's feedback features.

Research question 3: Causal discourse development. For the third research question (i.e., To what extent does using ACDET lead to causal discourse development within papers and across pre- and post-tests?), data from pre- and post-test drafts, assignment drafts, and screen capturing recordings were analyzed.

Causal discourse development within papers. Causal discourse development within papers was investigated in terms of grammatical metaphor and lexical density. For grammatical metaphor analysis, the coded data of learners' causal discourse modifications from the screen

capturing recordings (n = 47) as less congruence, same congruence, or more congruence were analyzed. Frequencies, percentages, means and standard deviations of types of modifications were calculated. Less congruence findings indicated causal discourse development within papers while same congruence and more congruence indicated no causal discourse development within papers.

Learners' assignment drafts (n = 104) (third and final drafts in Assignment 1 and second and final drafts in Assignment 2) were analyzed for lexical density. The lexical density analysis was conducted automatically using the automated Lexical Complexity Analyzer (LCA) (Lu, 2012) developed by researchers in the Department of Applied Linguistics at the Pennsylvania State University. Lexical density was measured by taking the ratio of the number of lexical items (nouns, verbs, adjectives, and adverbs) to the number of both lexical and functional (articles, prepositions, pronouns, auxiliary verbs, conjunctions, and demonstratives) in each draft. Means and standard deviations were calculated and compared across drafts. An increase in lexical density from third/second drafts to the final drafts indicated causal discourse development within papers, and a decrease in lexical density from third or second drafts to the final drafts indicated no causal discourse development within papers.

Causal discourse development across pre- and post-tests. Pre-test drafts (n = 31) and post-test drafts (n = 31) were analyzed to investigate learners' causal discourse development across pre- and post-tests in terms of causal discourse features and lexical density. Frequencies of each category of causal discourse features (i.e., conjunctions, prepositions, verbs, adjectives, and verbs) in pre- and post-test drafts were counted for each student. Means and standard deviations of each causal discourse category were calculated and compared across drafts. A

decrease in the means of causal conjunctions and an increase in the means of causal nouns indicated causal discourse development across pre- and post-tests.

Learners' pre- and post-test drafts were also analyzed automatically for lexical density for each student. Means and standard deviations were calculated and compared across drafts. An increase in lexical density from pre-tests to post-tests indicated causal discourse development across pre- and post-tests. A decrease in lexical density from pre-tests to post-tests indicated no causal discourse development across pre- and post-tests.

Research question 4: Focus on causal meaning. The final research question (i.e., To what extent does ACDET feedback help learners focus on causal meaning? And what features of ACDET feedback draw learners' attention to causal meaning?) was investigated through screen capturing recordings of learners' use of ACDET, and learners' responses to semi-structured interviews and a questionnaire item.

The extent to which ACDET drew learners' attention to causal meaning was first investigated by analyzing screen capturing recordings (n = 47) of learners' use of ACDET for causal discourse modifications in terms of whether causal meaning was maintained or lost after the modification. The frequencies of modifications with causal meaning maintained or lost were tabulated, and means and standard deviations were calculated.

What features of ACDET drew learners' attention to causal meaning was investigated by manually analyzing the coded interview responses of learners (n = 27) from the coding categories of focus on meaning. These coding categories included learners' comments showing their positive and negative evaluation of ACDET in terms of its text-level feedback, sentence-level feedback, color-coding feature, and underlining feature, and the tool overall. The number of comments (idea units) coded and the number of participants who made those comments was

counted and percentages were calculated. Examples from each category were chosen for illustrative purposes when reporting the results.

Learners' (n = 31) responses to the questionnaire item (i.e., The Editor draws my attention to cause-and-effect meaning) were analyzed, and frequencies and percentages of responses for each category (according to Likert-scale responses indicating Strongly agree, Agree, Neutral, Disagree, or Strongly disagree) were calculated.

The analyses allowed for finding out the extent to which ACDET drew learners' attention to causal meaning, and through what features. The analysis of screen capturing recordings demonstrated how much learners focused on causal meaning in their modifications. The analysis of learners' responses to the questionnaire item enabled me to understand if they had positive or negative perceptions of ACDET's focus on meaning quality. The analysis of learners' responses to the interview questions produced information about what features of ACDET drew their attention to causal meaning.

Chapter Conclusion

This chapter presented the methodology for the development of ACDET and its empirical evaluation. It first described the linguistic approach, the natural language processing approach, and the pedagogical approach to ACDET. Then, it provided details about how the research questions were investigated, in particular, the research design, the setting, participants, data collection materials and instruments, procedures, and data analyses.

CHAPTER 4

RESULTS AND DISCUSSION

This chapter presents the results of the analyses described in Chapter 3 and provides answers to the four research questions which addressed two qualities of ACDET: language learning potential and meaning focus. For ACDET's language learning potential, evidence was sought for ACDET's capacity to help learners focus on causal discourse form, ACDET's capacity to create opportunities for interactional modifications, and causal discourse development with ACDET within papers and across pre- and post-tests. For the meaning focus quality, evidence was sought for ACDET's capacity to draw learners' attention to causal meaning. In order to answer the four research questions, six types of data were analyzed: pre- and post-test drafts, assignment drafts, ACDET's text-level feedback reports, screen capturing recordings of learners' use of ACDET, and learners' responses to semi-structured interview questions and questionnaires. Data were analyzed through manual content analysis, descriptive statistics (frequencies, percentages, means, medians, modes, and standard deviations), and lexical density analysis. The results are presented and discussed for each research question.

RQ1: Focus on Causal Discourse Form

Research Question 1 (RQ1) investigated to what extent ACDET feedback helped learners focus on causal discourse form and what features of ACDET drew learners' attention to causal discourse form. The investigation of RQ1 was conducted analyzing ACDET's text-level feedback reports (n = 104), screen capturing recordings (n = 47), learners' responses to semi-structured interviews (n = 27), and questionnaires (n = 32). The findings from the analyses of ACDET reports and screen capturing recordings demonstrated modifications in causal discourse form in learners' drafts. The modifications in the causal discourse indicated their attention to causal discourse form. Findings from the analyses of learners' responses showed learners'

positive perceptions of ACDET as a means of helping them focus on form. Overall, for most of the learners, ACDET was able to draw their attention to causal discourse form.

Findings from the analysis of ACDET's text-level feedback reports. Learners' focus on causal discourse form was first investigated based on ACDET's text-level feedback reports. In total, 104 reports were analyzed: 25 reports of third drafts and 25 reports of final drafts in Assignment 1, and 27 reports of second drafts and 27 reports of final drafts in Assignment 2. Six students' text-level reports were not included in the analysis, since their second or third, or final draft reports were missing, which did not allow for a comparison. Frequencies of causal discourse features (i.e., conjunctions, prepositions, verbs, adjectives, and nouns) in ACDET's text-level feedback reports were tabulated for each student. The mean, median, mode, standard deviation, and range were calculated for each causal discourse feature and compared across drafts in both assignments. Table 4.1 presents the findings for Assignment 1.

Table 4.1

The Mean, Median, Mode, Std. Deviation, and Range for Causal Discourse Features in Third and Final Drafts in Assignment 1

Causal Discourse Features	Assignment 1					
	n	Mean	Median	Mode	Std. Deviation	Range
Conjunctions 3D	25	5.12	5	4	3.44	0-13
Conjunctions FD	25	4.04	4	2	2.37	0-9
Prepositions 3D	25	1.76	1	0	1.85	0-7
Prepositions FD	25	2.2	1	0	2.36	0-9
Verbs 3D	25	16.72	17	20	7.46	5-32
Verbs FD	25	16.84	17	21	5.79	6-28
Adjectives 3D	25	0.84	0	0	1.07	0-3
Adjectives FD	25	1.16	1	0	1.37	0-5
Nouns 3D	25	4.08	3	0	3.67	0-12
Nouns FD	25	3.67	4	2	2.81	0-9

Note. 3D = Third drafts, FD = Final drafts

The findings in Table 4.1 show differences in the means of every category of causal discourse features between third and final drafts. The mean of conjunctions (M = 5.12 in third drafts and M = 4.04 in final drafts) and nouns (M = 4.08 in third drafts and M = 3.67 in final drafts) decreased slightly, and the means of prepositions (M = 1.76 in third drafts and M = 2.2 in final drafts) and adjectives (M = 0.84 in third drafts and M = 1.16 in final drafts) increased slightly from third drafts to final drafts. The means of verbs were very similar in both drafts (M = 16.72 in third drafts and M = 16.84 in final drafts).

The mode of the number of conjunctions, verbs, and nouns changed from third drafts to final drafts, but there were no changes in the mode of the number of prepositions and adjectives. The most frequent number of causal conjunctions decreased from four to two; the most frequent number of causal verbs changed from 20 to 21; and the most frequent number of causal nouns changed from zero to two.

The standard deviations of conjunctions (SD = 3.44 in third drafts and SD = 2.37 in final drafts), verbs (SD = 7.46 in third drafts and SD = 5.79 in final drafts), and nouns (SD = 3.67 in third drafts and SD = 2.81 in final drafts) also decreased from third drafts to the final drafts. The decrease in the standard deviations indicates less variation among students in their use of causal conjunctions. In other words, the number of conjunctions, verbs, and nouns in more students' essays were closer to the mean in the final drafts. In these three categories of causal discourse features, the range also became smaller in final drafts, which explains the decrease in the standard deviations. On the other hand, the standard deviations of prepositions (SD = 1.85 in third drafts and SD = 2.36 in final drafts) and adjectives (SD = 1.07 in third drafts and SD = 1.37 in final drafts) increased from third drafts to final drafts, which points to more variation among students in the number of prepositions and adjectives used.

The changes in the mean, mode, standard deviation, and range of causal conjunctions from third drafts to the final drafts show that learners modified their causal discourse using ACDET. The purpose of ACDET's text-level feedback was to help learners revise their causal discourse, which would result in differences in the frequencies of causal discourse features they used. The group findings in Table 4.1 demonstrate those differences and provide evidence that ACDET drew learners' attention to causal discourse form in Assignment 1.

Table 4.2 presents the findings for Assignment 2. According to the findings in the table, there were differences in the means of causal discourse features between second and final drafts for all features except causal prepositions. The mean of conjunctions (M = 4.81 in second drafts and M = 4.37 in final drafts), verbs (M = 19.22 in second drafts and M = 18.07 in final drafts), and nouns (M = 4.00 in second drafts and M = 3.81 in final drafts) decreased slightly, and the means of adjectives (M = 0.81 in second drafts and M = 1.00 in final drafts) increased slightly from second drafts to final drafts.

Table 4.2

The Mean, Median, Mode, Std. Deviation, and Range for Causal Discourse Features in Second and Final Drafts in Assignment 2

Causal Discourse Features	Assignment 2					
	n	Mean	Median	Mode	Std. Deviation	Range
Conjunctions 2D	27	4.81	5	2	3.61	0-14
Conjunctions FD	27	4.37	3	2	3.31	0-14
Prepositions 2D	27	1.78	1	1	1.55	0-6
Prepositions FD	27	1.78	1	1	1.42	0-4
Verbs 2D	27	19.22	19	11	7.75	3-34
Verbs FD	27	18.07	19	19	7.44	3-34
Adjectives 2D	27	0.81	0	0	1.21	0-4
Adjectives FD	27	1.00	1	0	1.21	0-4
Nouns 2D	27	4.00	3	1	3.13	0-10
Nouns FD	27	3.81	4	4	3.10	0-12

Note. 2D = Second drafts, FD = Final drafts

The mode of the number of verbs and nouns changed from second drafts to final drafts, but there were no changes in the mode of the number of conjunctions, prepositions, and adjectives. The most frequent number of causal verbs increased from 11 to 19, and the most frequent number of causal nouns changed from one to four.

The standard deviations of causal discourse features decreased slightly from second drafts to final drafts except for the standard deviations in the use of adjectives. There was not much change in the standard deviations, because the range of causal discourse features in most categories was the same in both second and final drafts except for prepositions and nouns.

Even though the changes in the mean, mode, standard deviation, and range of causal discourse features from second drafts to final drafts were very slight, they show causal discourse modifications. The causal discourse modifications indicate that ACDET drew learners' attention to causal discourse form in Assignment 2.

Findings from the analysis of screen capturing recordings. Learners' focus on causal discourse form was also investigated by analyzing screen capturing recordings of their use of ACDET during class. The analysis of learners' modifications yielded three types of modifications: learners added causal discourse form to their sentences; they deleted causal discourse form from their sentences; and they revised the causal discourse form in their sentences. Table 4.3 presents the mean, median, mode, standard deviation, and range for each type of causal discourse modifications in Assignment 1.

Table 4.3

The Mean, Median, Mode, Std. Deviation, and Range for Causal Discourse Modifications in Assignment 1

Causal Discourse Modifications	Assignment 1					
	n	Mean	Median	Mode	Std. Deviation	Range
Additions	25	1.16	0	0	1.89	0-8
Deletions	25	0.6	0	0	1.15	0-5
Revisions	25	4.76	5	5	2.89	1-12

According to Table 4.3, in Assignment 1, learners' causal discourse modifications included additions of causal discourse form in their sentences (M = 1.16), deletions of causal discourse form from their sentences (M = 0.6), and revisions of causal discourse features in their sentences (M = 4.76). It appears from the means that students revised causal discourse form more than they added or deleted. The number of causal discourse revisions students made ranged from one to 12, and five revisions were the most frequent number of revisions made by students. Although the mean of the number of additions that students made in their causal discourse was 1.16, the standard deviation was higher than the mean (SD = 1.89), indicating high variation among students for causal discourse form additions. The number of additions ranged from zero to eight, and the most frequently occurring number of additions was zero, meaning that most of the students did not add causal discourse form to their texts. A closer look at the data revealed that 13 students did not add any causal discourse form to their texts. For deletions of causal discourse form, the standard deviation (SD = 1.15) was also higher than the mean (M = 0.6). The number of deletions ranged from zero to five, and several students (n = 16) did not delete causal discourse form from their sentences as indicated by the mode 0.

ACDET's text-level feedback aimed to give learners feedback on how to change expressions of causal meaning by using grammatical metaphor. Therefore, the fact that revisions had the highest mean is a positive finding. Additions having a higher mean than deletions is also good, since learners make their texts richer in terms of causal discourse by adding more forms. However, deletions of causal discourse form suggest fewer efforts on incorporating causal discourse form, since the writers did not try to express causal meaning using less congruent expressions, but rather simply deleted the causal discourse form.

Table 4.4 presents the mean, median, mode, standard deviation, and range for each type of causal discourse modifications in Assignment 2. Positive findings about revision also appeared in Assignment 2 where students' causal discourse modifications included more revisions (M = 4.41) than additions (M = 0.36) and deletions (M = 0.32). The number of students' revisions of causal discourse form varied from one to nine, and most of the students made two revisions. The standard deviations of additions (SD = 0.66) and deletions (SD = 0.57) were higher than the means. The range for both types of modifications was from zero to two, and most of the students did not add or delete causal discourse form, as indicated by the mode findings.

Table 4.4

The Mean, Median, Mode, Std. Deviation, and Range for Causal Discourse Modifications in Assignment 2

Causal Discourse Modifications	Assignment 2					
	n	Mean	Median	Mode	Std. Deviation	Range
Additions	22	0.36	0	0	0.66	0-2
Deletions	22	0.32	0	0	0.57	0-2
Revisions	22	4.41	4	2	2.52	1-9

Figure 4.1 below provides the visual representation of the means of causal discourse additions, deletions, and revisions learner made in Assignment 1 and Assignment 2. In both assignments, causal discourse deletions had the lowest mean, causal discourse additions had a slightly higher mean, and causal discourse revisions had the highest mean. The three types of causal discourse modifications students made in Assignment 1 and Assignment 2 indicate learners' attention to causal discourse form while using ACDET. The fact that similar findings were found in both assignments (i.e., high means of revisions and low means of additions and deletions) demonstrates the consistency of ACDET to lead to more revisions than additions or deletions, which was the desired outcome.

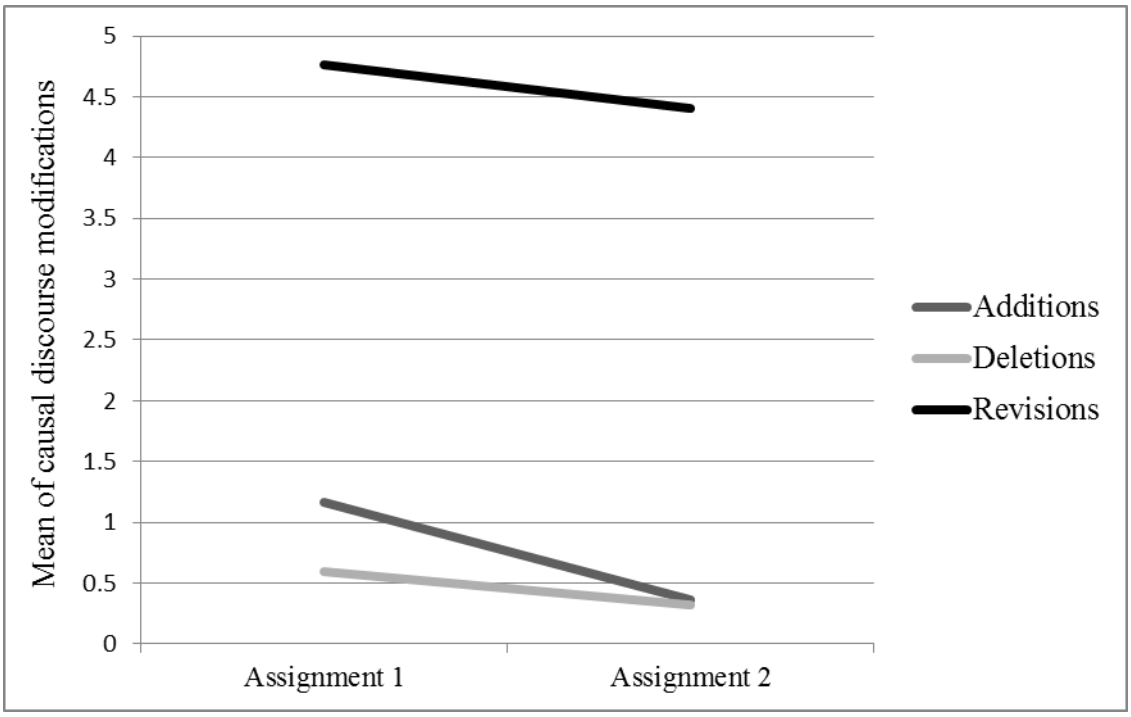

Figure 4.1. Additions, deletions, and revisions in Assignment 1 and Assignment 2

Findings from the analysis of learners' responses to the interview questions. Learners' focus on causal discourse form was also explored through their responses to an

interview question. In the interviews, students were asked "Did the Editor help you focus on cause-and-effect forms? If yes, what features of the Editor helped you focus on cause and effect forms?" The analysis of 27 learners' perceptions revealed both positive and negative comments about ACDET overall in terms of whether or not it helped learners focus on causal discourse form. The analysis also yielded learners' positive perceptions of ACDET's text-level feedback, sentence-level feedback, color-coding feature, and underlining feature as a means of drawing learners' attention on causal discourse form. Table 4.5 presents the number of idea units coded for ACDET and ACDET features for helping students focus on causal discourse form and the number of students who made the comments.

Table 4.5

Frequencies of Learners' Negative and Positive Comments on Focus on Causal Discourse Form

	Number of negative comments	Number of students who commented (n = 27)	Number of positive comments	Number of students who commented (n = 27)
Overall evaluation	3	2 (7%)	35	18 (67%)
Evaluation of text-level feedback	0	0	39	25 (93%)
Evaluation of sentence-level feedback	0	0	5	5 (19%)
Evaluation of color-coding feature	0	0	11	9 (33%)
Evaluation of underlining feature	0	0	12	11 (41%)

Each category of responses shown in Table 4.5 will be demonstrated with the most representative quotes that highlight the theme of the category (Hesse-Biber & Leavy, 2011; King & Horrocks, 2010). The analysis of participants' responses to the question "Did the Editor help you focus on cause-and-effect forms?" indicated negative evaluation of ACDET's feedback to help them focus on causal discourse form by two students (7%). These participants (S5 & S21) made the following negative comments:

> No cause it's not helping anything it just leave me, uh, it just tell me this is a cause-effect sentence and, uh, and how many times, the, uh, the verb you use that's, that's all (S5)

> Umm no not draw my attention, but those the green on the line like remind me where is wrong, that draws my attention (S5)

> I don't think so, no, not for me, I just focused on the relationship and with form I used this word because for example the word cause on the essay but you could use like in different nouns in different sentence and different like parts of the sentence that could meaning different that's why I don't feel it very useful (S21)

The analysis of learners' responses to the question "Did the Editor help you focus on cause-and-effect forms?" yielded 35 (67%) comments from 18 students containing positive evaluations of ACDET overall. Responses indicated that ACDET's feedback helped them focus on causal discourse form in a general way without referring specifically to text-level or sentence-level feedback, color-coding or underlining features, as exemplified by the following remarks:

> In a way that the editor tell me, tells me which one are the words that the cause-effect are looking for like the main words to uh classify cause-effect (S1)

> Uh, yeah, they seemed helpful. uh, it let me knows, uh, whether a sentence is right or enough to to compress myself and because, uh, if I, if uh, uh this counter shows there is a, a sentence that I wrote that didn't have cause or effect so then I can find it and fix it (S4)

> Yes like since it shows uhh, you know the specific word, like it's a specific adjective or maybe it's a conjunction (S13)

> Uh I think uh only a little bit but uh because uh I think the only thing that helped me was yeah the forms yeah (S14)

> Um, well when I get the feedback from the editor it help me to to look at uh, what the cause and effect uh, sentence and what made them so it helps me to improve my skill to write a cause and effect the sentence more correctly (S16)

> I think so um sometimes when I use the word to connect the cause and effect, I only use the word that I feel very comfortable for me, but sometimes maybe it can express

> some other uh, meanings when I choose to use another word, that it also works, that I never thought of before (S17)
>
> Try to put like a little bit of different like actual causal verbs or adjectival verbs I can put that into the everything in the essay (S21)
>
> Yes I think um make me more remember more this cause and effects words (S24)
>
> Yeah sure uh, I, it makes me realize if I can change something, um, into a better uh better word that's what I was saying before just the structure of yeah of how it is written right? (S27)
>
> Um, I think maybe verbs like I used a lot, like for noun or umm, yeah maybe for noun it's not like I'm confused about this, but verbs and conjunctions pretty helpful (S29)
>
> I think so because you can use all kinds of of forms not like only conjunction (S30)

Table 4.5 indicates 39 positive comments about the ACDET's text-level feedback with regards to helping learners focus on causal discourse form. The majority of the participants (n = 25, 93%) acknowledged that ACDET's text-level feedback helped them focus on causal discourse form as the excerpts from the interviews below illustrate:

> Yeah it umm, I mean, the editor tells like what type of language forms I use and why did I use them actually is the just, how should I use them, and it helps me umm, when they are over used, like words words, and I should think of more variety (S6)
>
> I feel like the charts summarize, the summarize charts, so here its uh more it's very uh directly tell you uh what did you did in this, in this essay so, it it it is more like a summarize here so it's more, it it's easier to find a program, uhh, something I should do or I can improve in this essay (S9)
>
> Uh, it shows me, uh, what is my cause-effect word (S11)
>
> Uh, you mean the feedback from the editor? I think it can improve my essay a lot. it just I it points out the it points out the sentence which is a cause and effect and at the At the bottom side, it just like it just says this is a report about uhh, which sentence and which vocabulary I used in my essay, hmm, and it also shows some uh some points that did not mention to it (S12)

> It mentioned what features I need to uh improve or add, and like there's some more suggestions down here to give me a idea of how to change them (S14)

> Yeah, it helps. Like it didn't use the my like this cause and I had a verb it didn't use you in your paper and like show you the words you used many times and you can change them to make your essay (S16)

> Its like cause and effect and the linking verb or something like that, and I know I use this a lot like so many times, then I can make change to try to use like other word and thing (S23)

> Maybe like maybe the feedback after you um, wrote the wrote a whole essay and then you show you oh you used this words like too many times, so and change it and then you can just find other words to replace that word so (S28)

> Oh it's good because you can see how many times you use a a word a conjunction and then you can stop like and it gives you a way just repeat that again and you can change (S30)

> Yeah because I when I wrote my article, I I didn't realize I have so many repeated words, and when I see the feedback and I can find the words and then change it to another word (S31)

The analysis also yielded five comments that showed learners' positive perceptions that ACDET's sentence-level feedback helped them focus on causal discourse form. Five students made five positive comments, as illustrated in the following examples:

> Uhh, because we learn cause and effect so it's I think it's a good it can find which is the cause and which is the effect and the verb we I use so, that's is better than Word (S2)

> Umm for example you can you can search what like the inter relation cause and effect on a word like the key word for that relationship and which part is the relation which part is the cause and which part is the effect, the effect (S21)

> It's good they show very good like the uh, the cause and effects which is cause which is effect the type and kind of if it's like a noun or verb because you can identify uh, where you putting the causes and effect like it's easier to understand I think (S30)

Eleven comments from nine participants (33%) addressed ACDET's color-coding feature of the sentence-level feedback. Students' responses indicated their positive perceptions that color-coding was helpful to them to focus on causal discourse form, which is seen in the example interview excerpts below:

> Yeah it uh, actually it can hmm, just uh, er, the blue one and the green one can indicate uh both uh can indicate the cause or effect, and while I'm writing the sentence, I can uh, I can restructure, I can form my structure of my sentence (S12)

> Sometimes yeah, like when I look to it again and then I will see oh ok, I did something wrong here. And then like because the color of the red and oh sorry the green and blue and then you feel like oh ok maybe maybe there's something wrong there (S13)

> Yeah I I really focus on that because you know it's highlighted (S18)

> Sometimes I think that this like cause and effect sentence is not like highlighted, cause it was like, oh, maybe something is wrong in this sentence maybe grammar or something (S23)

> The color yeah it's the repeat word so I can I can find another word to use instead of that (S31)

There were also 12 comments in which learners (n = 11, 41%) expressed their positive perceptions of ACDET's underlining feature of the sentence-level feedback in that it helped them focus on causal discourse form. The examples below serve to demonstrate this trend:

> Uh, it shows me, uh, what is my cause effect word (S11)

> Uh the underline tell you that like, that what this part exactly be like is cause or effect or cause or verb or something like that (S16)

> When I see the underline I know it's the verb or something (S17)

> That your exact phrase that you use that relates to cause effect and the editor underlines exactly the word that is for like the key words for that relationship. I think

> that's pretty good because you can focus on that word intended for like another causal verb another relationship, so I think it's pretty good, yeah (S21)
>
> I like the underlining, that one thing that show it's like the how to um, its show you like the what cause and effect words that we use in the sentence (S23)
>
> Underlined words can help me pay more attention about my language form, like, this is verb this is adjective, and uh so I can use different word form to um, improve my article (S24)
>
> Well it it underlines exactly where you can improve so it it makes it a lot easier to to see your mistakes and correct it (S27)

Overall, the results of the analysis of learners' responses to the question "Did the Editor help you focus on cause-and-effect forms? If yes, what features of the Editor helped you focus on cause and effect forms?" indicated that the majority of the students positively perceived ACDET to help them focus on causal discourse form. In their responses, learners referred to ACDET's text-level feedback the most in their positive evaluations, which suggests that they found ACDET's text-level feedback feature the most helpful. They pointed to the underlining feature and the color-coding feature several times in their responses. Sentence-level feedback had the lowest number of references among the positive evaluations of feedback features. This finding might indicate that learners did not find sentence-level feedback as helpful as other types of feedback provided by ACDET when making revisions of causal discourse within their drafts.

Findings from the analysis of learners' responses to the questionnaire item.

Learners' focus on causal discourse form using ACDET (referred to as "the Editor" during the implementation for the sake of using basic language with the students) was investigated by analyzing their responses to the questionnaire item "The Editor draws my attention to cause-and-effect forms." One student did not respond to the item. The results (see Figure 4.2) showed that 36 % of 31 students strongly agreed that the Editor drew their attention to causal discourse form;

45% agreed, 16% were neutral about the item, and 3% disagreed that ACDET drew attention to causal discourse form.

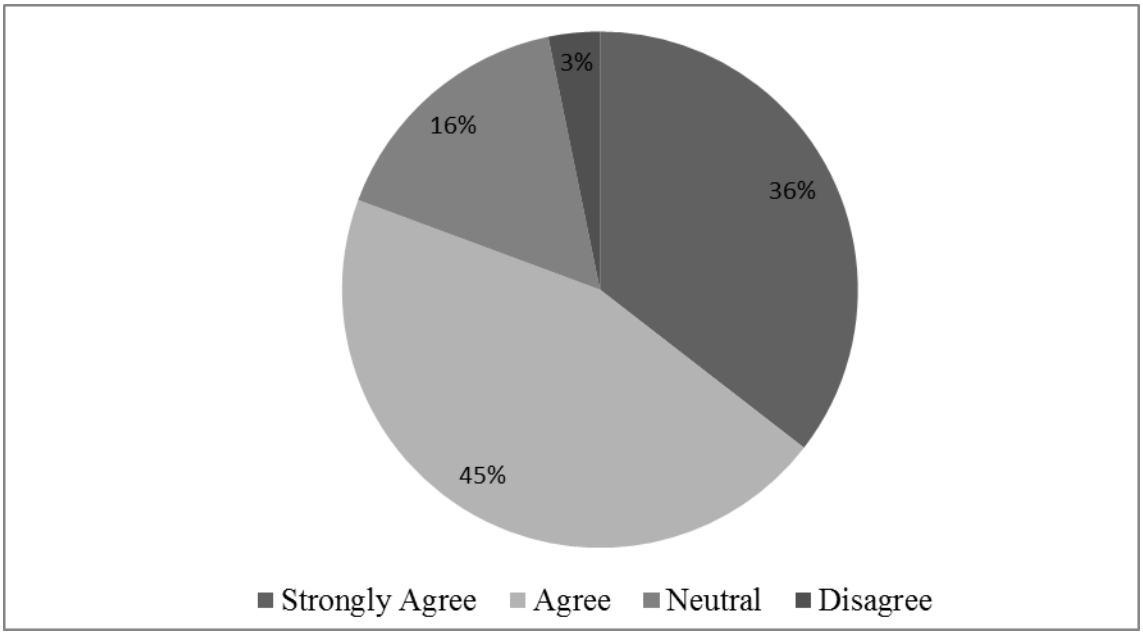

Figure 4.2. Percentages of learners' responses to the questionnaire item on focus on causal discourse form

Discussion of the findings of RQ1. Attention to linguistic form is important for learning the target language structures (Robinson, 1995). One way to draw learners' attention to focus on form is by providing feedback during interaction (Long & Robinson, 1998). Making key linguistic features salient through highlighting them in colors or presenting them in a different mode is also helpful for drawing learners' attention to the target features (Chapelle, 1998). Taking these perspectives into account, ACDET's design aimed to draw learners' attention to causal discourse form though text-level feedback and sentence-level feedback that included color-coding and underlining features. Learners' focus on causal discourse form in this study was analyzed based on their causal discourse modifications and perceptions.

The findings of the analysis of data from ACDET's text-level feedback reports and screen capturing recordings demonstrated modifications in learners' causal discourse. The causal

discourse modifications show that ACDET drew learners' attention to causal discourse form. In the Interaction Hypothesis (IH), feedback is considered as the link between attention and output modifications (Long, 1996). Only by noticing what needs to be improved or corrected based on the feedback given can learners modify their output. In ACDET, text-level feedback gave learners information about what needed to be improved in their causal discourse. It also offered learners some examples of how to modify their causal discourse features. During their interactions with ACDET, learners deleted causal discourse form and added causal discourse form to their sentences, but mostly revised the causal discourse form in their sentences. These modifications provided evidence that ACDET drew learners' attention to causal discourse form.

Regarding what features of ACDET drew learners' attention to causal discourse form, findings from the analysis of learners responses to the interview questions illustrated more positive comments on text-level feedback than the sentence-level feedback, which is not surprising. ACDET's sentence-level feedback made causal discourse form salient and elaborated on causal meaning and form. Text-level feedback was negative, pointing out learners' weaknesses in causal discourse. In L2 development, learners' attention to form is triggered by problems with production (Long & Robinson, 1998). Sentence-level feedback highlighted and elaborated on causal discourse; however, it did not inform learners about weaknesses in their causal discourse or how to improve their causal discourse. Findings on learners' perceptions in this study support the IH in that attention is drawn to form by providing feedback on the problematic areas in the language.

The findings of RQ1 provided evidence that ACDET drew learners' attention to causal discourse form. However, the findings did not yield information about whether or not their attention to form led to causal discourse development within or across pre- and post-tests. The

evidence only indicated that learners focused on form during the use of ACDET. Causal discourse development will be addressed in results regarding the fourth research question.

RQ2: Interactional Modifications

Research Question 2 (RQ2) investigated to what extent ACDET created opportunities for interactional modifications and what features of ACDET created those opportunities. RQ2 was investigated by analyzing data from screen capturing recordings (n = 47) and semi-structured interviews (n = 27). Findings showed that ACDET created opportunities for interactional modifications. Students clicked on the text-level feedback, sentence-level feedback, causal discourse help page, and dictionaries to receive help when revising their causal discourse. Learners' responses to the interview questions demonstrated both negative and positive perceptions of their interactions with ACDET.

Findings from the analysis of screen capturing recordings. Screen capturing recordings of learners' use of ACDET were analyzed to count the number of clicks on text-level feedback, sentence-level feedback, the causal discourse help page, and dictionaries. The mean, median, mode, standard deviation, and range were calculated for each type of interactional modifications students made during the use of ACDET. Table 4.6 presents the findings of interactional modifications in Assignment 1:

Table 4.6

The Mean, Median, Mode, Std. Deviation, and Range for Interactional Modifications in Assignment 1

Types of Interactional Modifications	Assignment 1					
	n	Mean	Median	Mode	Std. Deviation	Range
Clicks on sentence-level feedback	25	4.52	3	0	5.10	0-18
Clicks on text-level feedback	25	9.32	10	12	4.70	0-19
Clicks on causal discourse help page	25	4.04	2	0	4.28	0-12
Clicks on dictionaries	25	3.76	3	0	4.21	0-13

According to Table 4.6, students clicked on the text-level feedback (M = 9.32) more than they clicked on the sentence-level feedback (M = 4.52), causal discourse help page (M = 4.04), and dictionaries (M = 3.76). The number of clicks on the text-level feedback ranged from zero to 19, and 12 was the most frequent number of clicks on text-level feedback. Even though the means for the number of clicks on the sentence-level feedback, causal discourse help page, and dictionaries were above three, the standard deviations were higher than the means, which indicates high variation among students in terms of the number of clicks. The number of times students clicked on the sentence-level feedback ranged from zero to 18, and the most frequent number of clicks on the sentence-level feedback was zero. A closer look at the data showed that six students did not click on sentence-level feedback. The range for the number of clicks on the causal discourse help page was from zero to 12, and the most frequent number of clicks was zero, signifying that not all students clicked on the causal discourse help page. It was seen from the data that six students did not click on the causal discourse help page. The number of clicks on dictionaries ranged from zero to 13, and the mode was also zero. Ten students did not click on

dictionaries while using ACDET. Overall, in Assignment 1, the high mean, mode, and range findings for the text-level feedback indicate that ACDET's text-level feedback created more opportunities for interactional modifications than the sentence-level feedback, causal discourse help page, and dictionaries did. Table 4.7 presents the findings of interactional modifications in Assignment 2.

Table 4.7

The Mean, Median, Mode, Std. Deviation, and Range for Interactional Modifications in Assignment 2

Types of Interactional Modifications	Assignment 2					
	n	Mean	Median	Mode	Std. Deviation	Range
Clicks on sentence-level feedback	22	3.09	2	0	4.30	0-17
Clicks on text-level feedback	22	7.14	7	7	3.93	0-14
Clicks on causal discourse help page	22	1.95	0	0	3.53	0-13
Clicks on dictionaries	22	5.18	3	0	7.12	0-30

As shown by the means in Table 4.7, in Assignment 2, all features of ACDET led to interactional modifications: sentence-level feedback (M = 3.09), text-level feedback (M = 7.14), causal discourse help page (M = 1.95), and dictionaries (M = 5.18). However, text-level feedback gave learners more chances for interactional modifications, as indicated by the higher mean (M = 7.14) and mode (Mo = 7). The standard deviation of the number of clicks on text-level feedback was 3.93, and the number of clicks ranged from zero to 14. The standard deviations of the number of clicks on sentence-level feedback (SD = 4.30), causal discourse help page (SD = 3.53), and dictionaries (SD = 7.12) were higher than the means of the number of clicks on these features. This indicates high variation in the number of clicks on these features

among students. The most frequent number of clicks on the sentence-level feedback, causal discourse help page, and dictionaries was zero, showing no opportunities for interactional modification created by these features for some students. A closer look at the data revealed that in Assignment 2, seven students did not click on sentence-level feedback, 14 students did not click on causal discourse help page, and 10 students did not click on dictionaries.

Figure 4.3 provides the visual representation of the means of types of interactional modifications in Assignment 1 and Assignment 2. In both assignments, text-level feedback had the highest mean of clicks. There were more clicks on the text-level feedback in Assignment 1 than there were in Assignment 2. In both assignments, there were more clicks on the sentence-level feedback than clicks on the causal discourse help page. The clicks on the dictionaries had the lowest mean in Assignment 1, but in Assignment 2, students clicked on dictionaries more than they clicked on the sentence-level feedback or the causal discourse help page. Overall, the means in Figure 4.3 provide evidence that ACDET created opportunities for interactional modifications in both assignments, but students took the opportunities more in Assignment 1 than in Assignment 2.

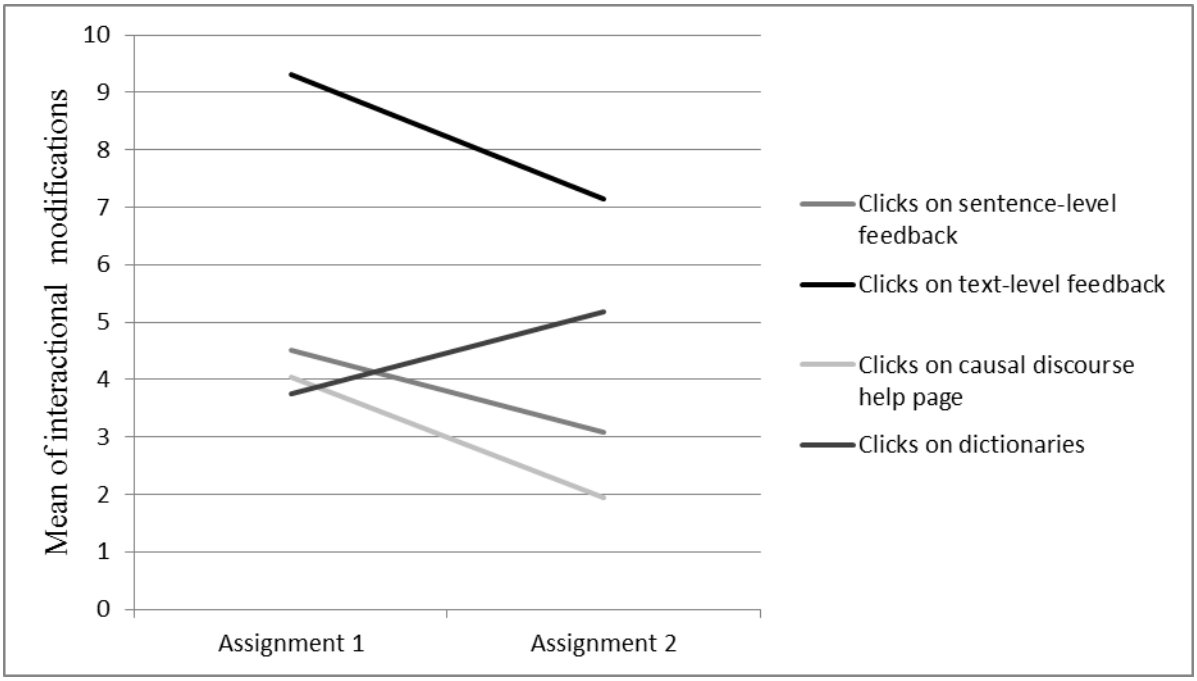

Figure 4.3. Means of types of interactional modifications in Assignment 1 and Assignment 2

Findings from the analysis of learners' responses to the interview questions.

Interactional modifications were also investigated based on learners' perceptions. In the interviews, learners were asked the question "Were you able to interact with the Editor? If yes, what features of the Editor enabled you to interact with it?" In their responses, learners made both positive and negative comments about ACDET overall and the ACDET feedback features. Table 4.8 presents the number of idea units coded and the number of students who made the comments in their responses to the question. The total number of students who participated in the interviews was 27. However, in some cases the same students made both positive and negative comments about ACDET.

Table 4.8

Frequencies of Learners' Negative and Positive Comments on Interactional Modifications

	Number of negative comments	Number of students who commented (n = 27)	Number of positive comments	Number of students who commented (n = 27)
Overall evaluation	13	13 (48%)	45	22 (81%)
Evaluation of text-level feedback	11	8 (30%)	32	22 (81%)
Evaluation of sentence-level feedback	0	0	0	0
Evaluation of color-coding feature	7	5 (19%)	34	20 (74%)
Evaluation of underlining feature	0	0	13	11 (41%)

The responses to the question "Were you able to interact with the Editor?" included 13 negative comments from 13 (48%) participants that they were not able to interact with ACDET. While most of the participants expressed their perceptions with a short answer such as "no" (S16) or "not really" (S14), a few participants made explanations about why they perceived their interactions with ACDET negatively, as illustrated in the quotes below:

> That the effect doesn't sometime show up. Sometime it doesn't show up (S6)

> But umm, sometimes I find it fun to go back to like when we receive the feedback it couldn't refresh it, so.. (S7)

> Not really like I would prefer like like me talking to lecturer like I would like that better than facing a laptop and wondering, ok I need to figure this out umm I was able to interact with it, it helped me sometimes, but I would rather improve this (S13)

> Sometimes like I didn't think it was, it's helpful, but it's not much because sometimes I was like it's not even cause and effect, it's like sentence, but then it showed the cause and effect (S23)

> Umm, uh, actually, I don't think it is so well if I have letting people feel comfortable, but the way you talk to a computer uhh no matter this computer, how developed it still can't with people (S4)

Regarding overall positive evaluations of interactions with ACDET, the results of the analysis demonstrated 45 comments from 22 (81%) students. When expressing that learners could interact with ACDET, they referred to the tool in a general way without referring to any specific feedback features. Their positive perceptions are represented by the following quotes:

> In a way that the editor tell me, tells me which one are the words that the cause-effect are looking for like the main words to uh classify cause-effect (S1)
>
> First of all, umm, I think I cannot get the point about cause and effect at the first because I don't know which is the cause and which is effect. And after use this, I think it is clearly to show that, umm, which one is which (S2)
>
> By typing. uhh, just attach the essay then he give me the feedback and point out my error (S3)
>
> Umm, yes, I, I did communicate with the system (S7)
>
> It just I it points out the it points out the sentence which is a cause and effect and at the at the bottom side, it just like it just says this is a report about uhh, which sentence and which vocabulary I used in my essay, hmm, and it also shows some uh some points that did not mention to it (S12)
>
> Well when I get the feedback from the editor it help me to to look at uh, what the cause and effect uh, sentence and what made them so it helps me to improve my skill to write a cause and effect the sentence more correctly (S16)
>
> It can tell me the cause and the effects so I can be I can uhh, understand about my art article (S24)
>
> Think it's really good because it tells me that this sentence tells about the cause and this sentence about the effect so it's good, I mean, it directly tells us uh, about the sentence, the structure of the sentence is good (S26)
>
> Find you the sentence about the cause and effects and it's like automatically so it's like really good like smart so, yeah I think it's good (S28)
>
> When I click the sentence, it will show you which one is umm, cause and which one is effect (S29)

The question "Were you able to interact with the Editor? If yes, what features of the Editor enabled you to interact with it?" received 32 comments from 22 (81%) students that showed learners' positive evaluations. Students' positive perceptions that they were able to interact with the text-level feedback are illustrated in the examples below:

> Yes. It help me like how many words of, the causal upper, how many times I use those. Those times. (S1)

> Yeah, I can see, uhh, which kind of, uh, vocabulary I use the most and which kind I use the least so, it can improve at the, at least one (S2)

> The editor tells like what type of language forms I use and why did I use them actually is the just, how should I use them, and it helps me umm, when they are over used, like words words, and I should think of more variety (S6)

> The editing part like uhh it shows you all the mistakes or whatever you uhh, the verbs adjectives you use throughout the essay so you can know what you used and what haven't used and on that basis you can even modify your, uhh, essay like, uhh, use different words and they don't uhh, let us know this here that uhh, you have used this word uhh, interpretation so you can change it (S7)

> I feel like the charts summarize, the summarize charts, so here its uh more it's very uh directly tell you uh what did you did in this, in this essay so, it it it is more like a summarize here so it's more, it it's easier to find a program, uhh, something I should do or I can improve in this essay (S8)

> It tells you your performance overall your text (S14)

> You can see how many times you use a a word a conjunction and then you can stop like and it gives you a way just repeat that again and you can change (S30)

> When I wrote my article, I I didn't realize I have so many repeated words, and when I see the feedback and I can find the words and then change it to another word (S31)

Eight students' responses to the question "Were you able to interact with the Editor? If yes, what features of the Editor enabled you to interact with it?" reflected their negative evaluations of ACDET's text-level feedback. There were 11 comments from eight students about

text-level feedback. Students' negative perceptions of their interactions with ACDET can be seen in the following examples:

> Yeah, but it still has a some mistakes because uh, when you make some change to the, to the, article, on so you change it, but the way you, you open the feedback, it is still not changed (S4)

> The real time doesn't update thing umm, for the text level feedback (S6)

> But sometimes, uhh, it uhh, whenever you refresh it it does, sometimes it doesn't refresh the essay and I, I know you you have experienced that problem, the text-level umm, yeah, it doesn't (S7)

> Um, it's ok but I'm not sure like I change a few words it will change on this or no, yeah [not updated] I don't think so it's like the same data mm I think in the middle, I'm not, it it's not very like not very active but it's not perfect. I'm in the middle (S29)

Five students evaluated ACDET's color-coding feedback feature negatively in 11 comments. Below are some examples of their negative perceptions:

> Umm, sometimes, like, uhh when I type, this kind of things appears and because uhh, I think that uhh, sometimes it might distract the reader because of the green and the blue linings everywhere, all over the place (S7)

> It didn't show the color at first time and then when I yeah, I yeah, until I didn't finish, and then when after you said that I need to submit it, and then when I check it back with you then it really shows the colors (S10)

> Umm, because we usually only do it like half the colors after we finish our assignments so I'm not sure if if it really helps like we can't really like finish it and then we see it it only shows like white and until usually I go to class and then I'll see the color (S13)

The color-coding feature was positively evaluated by 20 (74%) students in terms of their interactions with the tool. There were 34 comments, and some examples are provided below:

> It can find which is the cause and which is the effect, and the verb we, I use (S2)

> They use, um, different colors to show the different parts umm, to be frank, uh, sometimes I can, uh write a sentence, but then I don't know, uh, whether exactly structure it is, but, uh, with the use of this system, I can understand the structure umm, it shows the relationship between each structure this green co, this green color means, uh, this sentence is the cause of the whole, whole sentence (S4)
>
> The highlight part Because is more easy, easy to use easy to understand (S8)
>
> Actually it can hmm, just uh, er, the blue one and the green one can indicate uh both uh can indicate the cause or effect, and while I'm writing the sentence, I can uh, I can restructure, I can form my structure of my sentence (S12)
>
> Uhh that that as soon as I see the green color then I know this is a cause. When I see the underline I know it's the verb or something (S17)
>
> The different color and it can tell me the cause and the effects so I can be I can uhh, understand about my art article (S24)
>
> It's good they show very good like the uh, the cause and effects which which is cause which is effect the the type and kind of if it's like a noun or verb because you can identify uh, where you putting the causes and effect like it's easier to understand I think (S31)

Thirteen positive comments from 11 (41%) students were about the underlining feedback feature of ACDET, showing that students perceived the underlining feedback as helpful for interactions, as exemplified in the following quotes:

> Also I like the underline the the picture, it's underline, cause uh it can show, the relationship between uh, the the the sentence that has cause and effects it show the relationship, Maybe I write it, uhh, I write it, include the both elements but if if don't have this underline underline feature, it may takes me more time to find out what I wrote, why I wrote, what I wrote in this essay, If I, so this feature can save much time(S9)
>
> The underline tell you that like, that what this part exactly be like is cause or effect or cause or verb or something like that (S16)
>
> When I see the underline I know it's the verb or something (S17)

> I like the underlining, that one thing that show it's like the how to um, its show you like the what cause and effect words that we use in the sentence (S23)

> I can, and underlined words can help me pay more attention about my language form, like, this is verb this is adjective, and uh so I can use different word form to um, improve my article (S24)

Overall, in their responses, learners evaluated their interactions with ACDET both positively and negatively, but the majority of the comments were positive. They referred to ACDET's text-level feedback, color-coding feature, and underlining feature, but they did not make any comments on the sentence-level feedback. Text-level feedback and color-coding feature were perceived both negatively and positively, although the number of positive comments was higher than the number of negative comments. Regarding the underlining feature, there were only positive comments. The higher number of positive comments on the text-level feedback and color-coding feature demonstrated learners' positive perceptions of interacting with ACDET using these features.

Discussion of the findings of RQ2. Interaction in this study was defined as the activity between learners and ACDET to revise their causal discourse. ACDET was designed in a way that would help learners receive help from ACDET features while interacting with it. In other words, ACDET was designed to create opportunities for interactional modifications. Interactional modifications in this study were defined as learners' interruptions of their revising activity to get help from ACDET to revise their causal discourse. The means and the standard deviations of the number of clicks on ACDET features indicated that learners took the opportunities to modify their interactions with ACDET. The higher mean and mode, and the lower standard deviation of the number of clicks on the text-level feedback showed a higher

capacity for ACDET's text-level feedback to offer students chances for interactional modifications than the sentence-level feedback and causal discourse help page.

Timing is one of the important characteristics of automated feedback (Shute, 2007). In this study, ACDET's text-level feedback was delayed, unlike the sentence-level feedback which was provided instantaneously to students. This means that learners were not able to receive real-time text-level feedback every time they made causal discourse modifications. They received text-level feedback once, at the beginning, and made modifications based on that throughout their use of ACDET in one assignment. The timing of the text-level feedback was negatively perceived by students (n = 8), since they were not able to update the text-level feedback every time they made a causal discourse modification. Despite the limitation of the text-level feedback being delayed, the mean of the number of clicks on the text-level feedback demonstrated that learners were able to modify their interactions with ACDET.

RQ3: Causal Discourse Development

Research question 3 (RQ3) investigated to what extent ACDET developed learners' causal discourse within papers and across pre- and post-test drafts by analyzing data from screen capturing recordings (n = 47), assignment drafts (n = 104), and pre-tests (n = 31) and post-tests (n = 31). Screen capturing recordings and assignment drafts were analyzed for the investigation of causal discourse development within papers; pre- and post-test drafts were analyzed for the investigation of causal discourse development across pre- and post-tests.

Causal discourse development within papers. Learners' causal discourse development within papers was investigated in terms of grammatical metaphor and lexical density. For grammatical metaphor analysis, learners' causal discourse modifications, the ones in which they revised the causal discourse form in their sentences, were coded as exhibiting less congruence,

same congruence, or more congruence. The frequencies of types of modifications were counted and means and standard deviations were calculated. Less congruence indicated causal discourse development within papers while same congruence and more congruence indicated no causal discourse development within papers. For example, while using ACDET in Assignment 1, S2 changed his expression from “those always attract people” to “those are always attractive to people.” The student’s first expression is congruent; it involves a subject (those) and a verb (attract). The focus is on the doer. In his/her modification, the student changes the causal verb “attract” to a causal adjective “attractive.” The focus shifts from the subject “those” to the object “people.” In Assignment 2, the same student wrote “The economy is something magical; the global economy will always find a way out to keep it in balance.” When revising his/her causal discourse, the student made the following modification: “Thanks to magical economy, the global economy will always find a way out to keep it in balance.” Before modification, the economy being magical was expressed in a clause: “The economy is something magical.” In the modification, the student used a les congruent expression by changing the clause to a noun phrase attached to a prepositional phrase: “thanks to magical economy.” Such less congruent modifications in expressing causal meaning indicated causal discourse development within papers.

As an example of causal discourse modifications with same congruence, in Assignment 1, S11 wrote “The first effect that entrepreneurs brought to Chinese economy is a new structure of the economic development.” This sentence includes the causal noun “effect.” While revising his/her causal discourse with ACDET, the student modified the causal discourse form as the following: “The first consequence that entrepreneurs brought to Chinese economy is a new structure of the economic development.” In this modification, the student changed the word

"effect" to "consequence." This modification did not make the expression of the causal meaning less congruent. Similarly, S16 modified his/her sentence "Because more small and medium size companies appear and these companies can bring profit for the country, Chinese economy is growing strong" to "Since more small and medium size companies appear and these companies can bring profit for the country, Chinese economy is growing strong." The modification was the conjunction "because" being changed to the conjunction "since." This modification also did not result in less congruent expression of causal meaning.

Table 4.9 presents the findings of the analysis of learners' causal discourse modifications for grammatical metaphor. In Assignment 1, students made more causal discourse modifications which did not change the congruence of causal meaning (M = 3.91, SD = 3.03) than the causal discourse modifications which led to less congruence or grammatical metaphor (M = 0.78, SD = 1.17). The number of modifications with less congruence ranged from zero to four, and zero was the most frequent number of modifications with less congruence, indicating no modifications with less congruence for some students. A more detailed analysis of the data showed that 13 students did not make any modifications with less congruence (i.e., they did not use grammatical metaphor). The number of causal discourse modifications with same congruence ranged from zero to 12, and the most frequent number of modifications was two. These findings show that using ACDET resulted in limited causal discourse development in learners' papers in Assignment 1, since only 12 learners were able to modify their causal discourse using grammatical metaphor.

Table 4.9

The Mean, Median, Mode, Standard Deviation, and Range of Causal Discourse Modifications with Less or Same Congruence in Assignment 1

Causal Discourse Modifications	Assignment 1					
	n	Mean	Median	Mode	Std. Deviation	Range
Less congruence	25	0.78	0	0	1.17	0-4
Same congruence	25	3.91	3	2	3.03	0-12

Table 4.10 presents the findings of the analysis of learners' causal discourse modifications for grammatical metaphor. In Assignment 2, students made more causal discourse modifications with same congruence (M = 3.86, SD = 2.62) than the causal discourse modifications with less congruence (M = 0.50, SD = 0.80). The number of modifications with less congruence ranged from zero to three, and zero was the most frequent number of modifications with less congruence, indicating no modifications with less congruence for some students. The number of these students was 14. The number of causal discourse modifications with same congruence ranged from zero to nine, and the most frequent number of modifications was three. These findings are similar to what was observed in Assignment 1, and they indicate limited causal discourse development in learners' papers as a result of using ACDET in Assignment 2; only eight students made grammatically metaphorical changes in their causal discourse.

Table 4.10

The Mean, Median, Mode, Standard Deviation, and Range of Causal Discourse Modifications with Less or Same Congruence in Assignment 2

Causal Discourse Modifications	Assignment 2					
	n	Mean	Median	Mode	Std. Deviation	Range
Less congruence	22	0.50	0	0	0.80	0-3
Same congruence	22	3.86	3	3	2.62	0-9

Figure 4.4 provides the visual representation of the means of causal discourse modifications with less congruence and same congruence in Assignment 1 and Assignment 2. In both assignments, students made more causal discourse modifications in which the congruence of causal meaning did not change than the modifications in which causal meaning was less congruent. The mean of modifications with same congruence was similar in both assignments, but there were fewer grammatically metaphorical causal discourse modifications in Assignment 2 than in Assignment 1. Overall, Figure 4.4 also shows that causal discourse development while revising the cause-and-effect drafts using ACDET was very limited in both assignments.

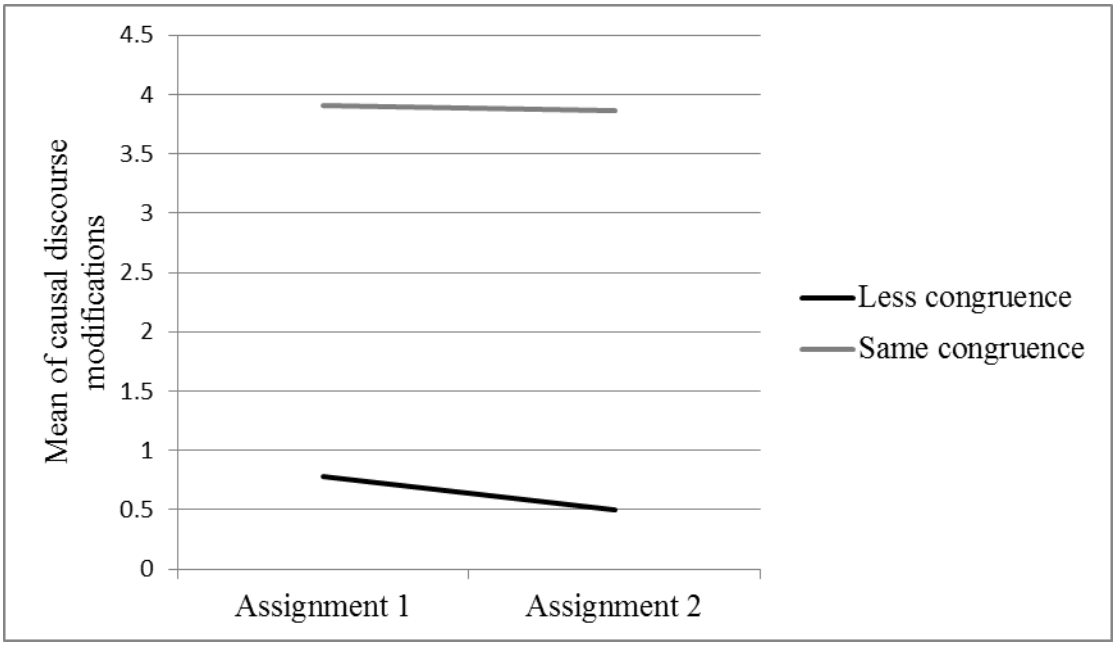

Figure 4.4. Means of causal discourse modifications with less congruence and same congruence in Assignment 1 and Assignment 2

Learners' third and final drafts in Assignment 1 and second and final drafts in Assignment 2 were analyzed for lexical density. The lexical density analysis was conducted automatically using an automated analyzer. The analyzer measured lexical density by a ratio of the number of lexical items (nouns, verbs, adjectives, and adverbs) to the number of both lexical and functional (articles, prepositions, pronouns, auxiliary verbs, conjunctions, and demonstratives) in a text. Lexical density was analyzed for each draft, and means and standard deviations were calculated for group findings. An increase in lexical density from second or third drafts to the final drafts indicated causal discourse development within papers.

Table 4.11 shows the lexical density findings. There was no change in the means and standard deviations of learners' lexical density in learners' drafts in both assignments. In Assignment 1, the mean of lexical density was .55 in both third drafts and final drafts. Similarly, the standard deviation was .03 in both drafts. In Assignment 2, the mean of learners' lexical

density was found to be .54 in both second drafts and final drafts. The standard deviation (SD = .02 in both second drafts and final drafts) did not change as well. These findings indicate no causal discourse development within papers in terms of lexical density.

Table 4.11

The Mean and Std. Deviation of Lexical Density in Assignment 1 & Assignment 2 Drafts

	Assignment 1				Assignment 2			
	Third drafts (n = 25)		Final drafts (n = 25)		Second drafts (n = 27)		Final drafts (n = 27)	
	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
Lexical density	0.55	0.03	0.55	0.03	0.54	0.02	0.54	0.02

Causal discourse development across pre- and post-tests. Learners' causal discourse development across pre- and post-tests was investigated by analyzing their pre- and post-test drafts in terms of causal conjunctions and lexical density. Frequencies of conjunctions in pre- and post-test drafts were counted for each student. Means and standard deviations of each causal discourse category were calculated for group findings and compared across pre- and post-test drafts. A decrease in the mean of the number of causal conjunctions from pre-tests to post-tests would indicate causal discourse development across pre- and post-tests. A lexical density analysis was also conducted. Lexical density in pre- and post-test drafts was measured automatically for each student. Means and standard deviations were calculated for group findings and compared across drafts. An increase in lexical density from pre-tests to post-tests was interpreted as causal discourse development across pre- and post-tests. A decrease in lexical density from pre-tests to post-tests would indicate no causal discourse development across pre- and post-tests.

Table 4.12 provides findings of causal conjunctions across pre- and post-tests. The means of the number of causal conjunctions show that students used slightly fewer causal conjunctions in post-tests (M = 5.00) than pre-tests (M = 5.16). The standard deviation in post-tests (SD = 2.53) was found to be smaller than the standard deviation in pre-tests (SD = 4.01). This indicates more variation in the number of causal conjunctions in pre-tests among students, meaning that more students were closer to the mean in post-tests. The range of causal conjunctions decreased from 1-21 to 1-11 in post-tests, which also explains why the standard deviation was lower in post-tests. The smaller range means that students used fewer causal conjunctions in post-tests. These findings are positive with regard to causal discourse development, since it is characterized by a decrease in the number of causal conjunctions in learners' language.

Table 4.12

The Mean, Median, Mode, Std. Deviation, and Range for Causal Conjunctions in Pre- and Post-tests

	n	Mean	Median	Mode	Std. Deviation	Range
Pre-tests	31	5.16	5	1	4.01	1-21
Post-tests	31	5.00	5	4	2.53	1-11

Causal discourse development was also investigated by measuring lexical density in pre- and post-tests, a higher lexical density being an indicator of causal discourse development. Table 4.13 presents the findings of lexical density analysis. There was a decrease in lexical density from pre-tests to post-tests indicated by the means and standard deviations. According to the lexical density indicator, there was no causal discourse development across pre- and post-tests.

Table 4.13

The Mean and Std. Deviation of Lexical Density in Pre- and Post-tests

	Pre-tests			Post-tests		
	n	Mean	Std. Deviation	n	Mean	Std. Deviation
Lexical density	31	0.52	0.30	31	0.50	0.04

Discussion of the findings of RQ3. Grammatical metaphor (i.e., the shift from congruent expressions of meaning to less congruent expressions) is an indicator of children's language development (Christie & Derewianka, 2008; Halliday, 1994). Child language is characterized by clauses including a subject and a verb, and conjunctions combining clauses to show the relationships between events. As children become adults, they learn how to express meaning in more sophisticated and complex ways; they use fewer clauses by nominalizing the meaning of clauses and expressing meaning through less congruent linguistic resources. This developmental pattern is also observed in the causal discourse development (Halliday & Martin, 1993; Mohan & Beckett, 2003; Slater, 2004). Learners shift "from the more congruent 'so' to the less congruent 'the cause' " (Mohan & Beckett, 2003, p. 426). ACDET was designed based on this causal developmental path to help learners improve their causal discourse by assisting them in expressing causal meaning through grammatical metaphor. However, the findings of RQ3 demonstrated only a small number of grammatically metaphoric modifications in learners' causal discourse. This could be due to how text-level feedback was presented to students. ACDET's text-level feedback consisted of both a summary table and suggestions for modifying causal expressions. The summary table provided learners with lists of what causal discourse features they had used in their texts and how many times they used each feature. It appears from the findings that students paid more attention to the summary table and the frequencies of their

causal discourse features and changed their causal discourse, but did so without use of grammatical metaphor. That is, learners mostly substituted certain words or phrases with others in the same category (i.e., changing "effect" to "consequence" or "because" to "since"). The suggestions offered in the text-level feedback were based on the causal developmental path and would have helped learners use less congruent expressions. However, students might have depended on the summary table more than the suggestions when revising their causal discourse. This finding has important implications for improving ACDET, which will be discussed in Chapter 5.

The findings of lexical density as an indicator of causal discourse development are not surprising. The lexical density analysis in this study looked for evidence of an increase in lexical density within papers and across pre- and post-tests. The amount of time from pre-tests to post-tests was eight weeks and learners used ACDET only twice in those eight weeks, once in Assignment 1 and once in Assignment 2. Eight weeks is a very short period of time for the intervention, and two times of using ACDET is a very limited number of practices, which is supported by previous work on causal discourse development. For example, Slater (2004) looked into English as a Second Language (ESL) learners' and non-ESL learners' lexical density across primary and high schools. Lexical density of high-school non-ESL students (35.3) was higher than lexical density of primary-school non-ESL students (39.2). Lexical density of high-school ESL students (39.2) was almost the same as lexical density of primary students (39.5). Slater's (2004) findings show that lexical density of ESL students might not increase even throughout the course of several years. Considering the time that is necessary for an increase in lexical density, the findings that ACDET feedback did not increase learners' lexical density in an instructional setting are understandable.

RQ4: Focus on Causal Meaning

Research Question 4 (RQ4) investigated to what extent ACDET feedback helped learners focus on causal meaning and what features of ACDET drew learners' attention to causal meaning. RQ4 was investigated by analyzing screen capturing recordings (n = 47) and learners' responses to semi-structured interviews (n = 27) and the questionnaire item (n = 31). Findings indicated that learners were able to express causal meaning in different ways; only a small number of their modifications resulted in losing the causal meaning. Findings also showed that learners had both negative and positive perceptions of ACDET as a means of helping them focus on causal meaning. Learners made references to ACDET's sentence-level feedback and color-coding features as being helpful to focus on causal meaning. Learners did not make any comments about whether or not ACDET's text-level feedback helped them to focus on causal meaning.

Findings from the analysis of screen capturing recordings. Whether or not ACDET drew learners' attention to causal discourse meaning was first investigated through their causal discourse modifications observed in screen capturing recordings. It was found that learners made modifications in their causal discourse using ACDET. The modifications were further analyzed for focus on causal meaning in terms of whether causal meaning was maintained or lost after the modification. Three modifications were excluded, since a decision could not be made regarding the meaning change due to the ambiguity in the sentences. Table 4.14 presents the mean, median, mode, standard deviation, and range of modifications with causal meaning lost and causal meaning maintained.

Table 4.14

The Mean, Median, Mode, Std. Deviation, and Range for Causal Discourse Modifications with Causal Meaning Lost and Maintained in Assignment 1

Causal Discourse Modifications	n	Mean	Median	Mode	Std. Deviation	Range
Causal meaning lost	25	1.2	1	0	1.63	0-6
Causal meaning maintained	25	5.32	4	4	3.38	0-14

According to Table 4.14, the mean of modifications with causal meaning maintained (M = 5.32) is higher than the mean of the modifications with causal meaning lost (M = 1.2). This is a very positive finding, showing that in most of the causal discourse modifications, students were able to express the causal meaning in a different way. The most frequent number of such modifications was four, and the number of these modifications ranged from zero to 14.

Table 4.15 presents the findings for focus on meaning in Assignment 2. Similar to Assignment 1, most of students causal discourse modifications maintained causal meaning in Assignment 2 as shown by the high mean (M = 4.36). The most frequent number of these modifications was two, and the number of modifications ranged from one to nine. On the other hand, the mean of causal discourse modifications with meaning lost was .55 with the most frequent number being zero. The standard deviation of these modifications was higher than the mean, indicating high variation among students. The number of causal discourse modifications with causal meaning lost ranged from zero to two.

Table 4.15

The Mean, Median, Mode, Std. Deviation, and Range for Causal Discourse Modifications with Causal Meaning Lost and Maintained in Assignment 2

Causal Discourse Modifications	n	Mean	Median	Mode	Std. Deviation	Range
Causal meaning lost	22	0.55	0	0	0.74	0-2
Causal meaning maintained	22	4.36	4	2	2.44	1-9

Table 4.16 provides examples of learners' modifications in which the discourse maintained the causal meaning. The examples demonstrate that learners' modifications of their causal discourse form were appropriate in terms of causal meaning. For example, in Assignment 2, S13 changed the causal verb "lead to" in his/her sentence to "result in" based on the text-level feedback. ACDET's text-level feedback presented students a summary of what causal discourse features they used in their texts by listing the frequencies of specific lexico-grammatical items. The text-level feedback also offered students suggestions of which causal discourse features they needed to modify by providing some examples of causal discourse modifications. In the sentence written by S13, the change from the verb "lead to" to the verb "result in" did not change the causal meaning. Such a modification illustrates that the student was able to select an appropriate synonym for the causal verb, which shows his/her attention to meaning. The causal discourse modifications made by S2, S19, S3, and S31 in Table 4.5 were also appropriate modifications in terms of causal meaning.

Table 4.16

Students and Examples of Causal Meaning before and after Modifications

Students	Causal Meaning Before Modification	Causal Meaning After Modification
S13_A2*	In the point of fact, unemployment in United States leads to the skills shortage for the right position.	In the point of fact, unemployment in United States has result in the skill shortage for the right position.
S2_A1	Apple actually has to find a better way to prove their devices and make them always make people want to buy.	Apple actually has to find a better way to prove their devices those always attract people and tend to buy.
S19_A2	For example, Samsung is much popular than Apple in Korea because Samsung is a Korean electronic product and it is the same technical level as iPhone.	For example, Samsung is much popular than Apple in Korea for the reason that Samsung is a Korean electronic product and it is the same technical level as iPhone.
S3_A2	The four articles discuss the global economy, which affect the U.S a lot.	The four articles discuss the global economy, which have a big effect on the U.S economy.
S31_A2	Currently, the decreasing of McDonald's sales is caused by the combination of those problems.	Currently, the decreasing of McDonald's sales is the result of the combination of those problems.

Note. "S" refers to the student and "A" refers to the assignment

Table 4.17 presents examples of learners' modifications which changed the causal meaning in the sentence. In the examples, the modifications that the students made changed the causal meaning in the sentences. For example, S21 used "so" as a conjunction in his/her sentence about the result of something. In his/her modification, the student changed "so" to "extremely." According to the screen capturing recording of S21, s/he looked "so" up in a dictionary (see the screenshot from the recording in Figure 4.5). In the dictionary, "extremely" was the first word presented as a synonym of "so." S21 changed "so" to "extremely" in the text (see Figure 4.6 for a screenshot). It is highly probable that the student chose the first synonym listed without paying attention to its meaning with regard to whether or not the selected word was causal.

Table 4.17

Students and Examples of Causal Meaning before and after Modifications

Students	Causal Meaning Before Modification	Causal Meaning After Modification
S21_A1	so when the first person was affected by the virus, everybody was very worried about the disease	extremely when the first person was affected by the virus, everybody was very worried about the disease
S24_A1	but the main causes are the low purchasing power in auto	but the main accounts are the low purchasing power in auto
S24_A1	perhaps the biggest problems are the consumer date	perhaps the biggest advantage are the consumer date
S27_A2	Since these criminal activities were under way, many different sicknesses were introduced into the population	For the time these criminal activities were under way, many different sicknesses were introduced into the population
S28_A1	the whole country's culture environment has been changed into a hard-working country	the whole country's culture environment has been distracted into a hard-working country

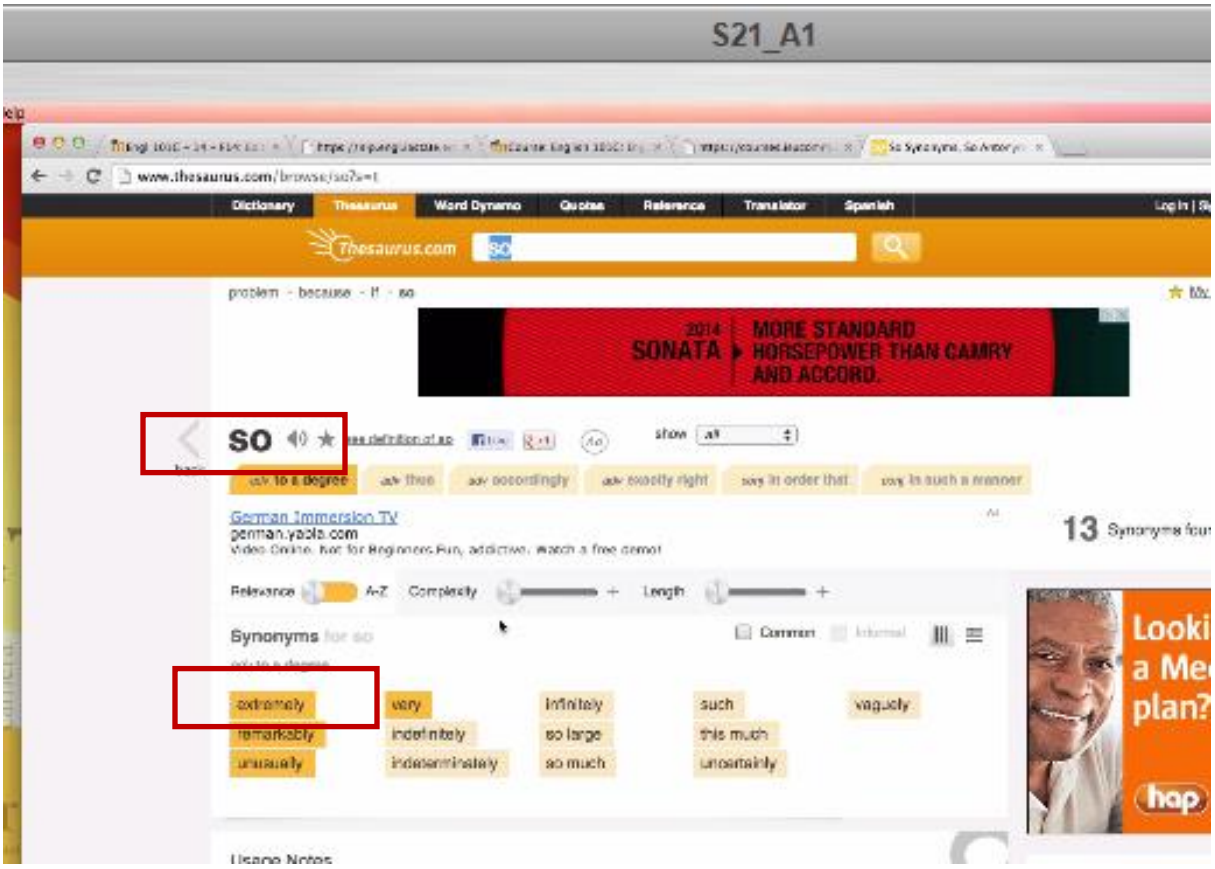

Figure 4.5. The screenshot of S21 looking "so" up in the thesaurus

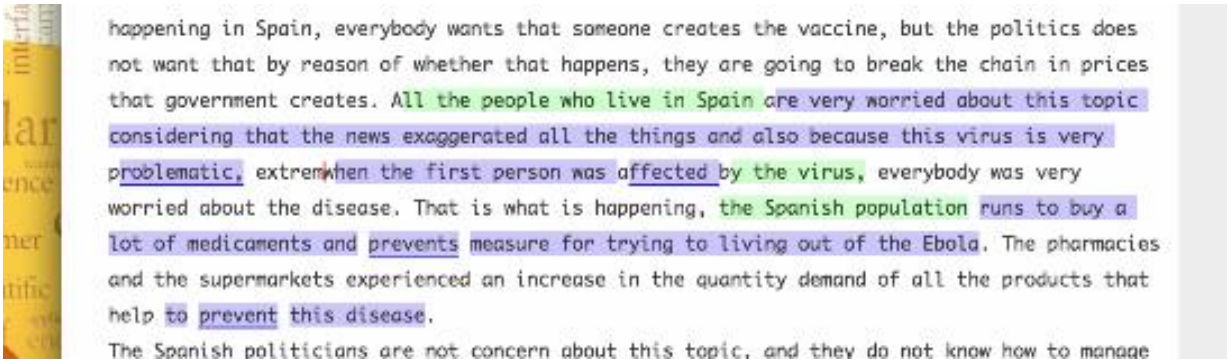

Figure 4.6. The screenshot of S21 changing "so" to "extremely"

Figure 4.7 provides the visual representation of the means of causal discourse modifications with causal meaning lost and causal meaning maintained in Assignment 1 and Assignment 2. The number of modifications with causal meaning maintained was much higher than the number of modifications with causal meaning lost in both assignments. There were

more modifications in both categories in Assignment 1 than in Assignment 2. Overall, the high means of causal discourse modifications in which learners could express causal meaning in a different way provide evidence that ACDET drew learners' attention to causal meaning.

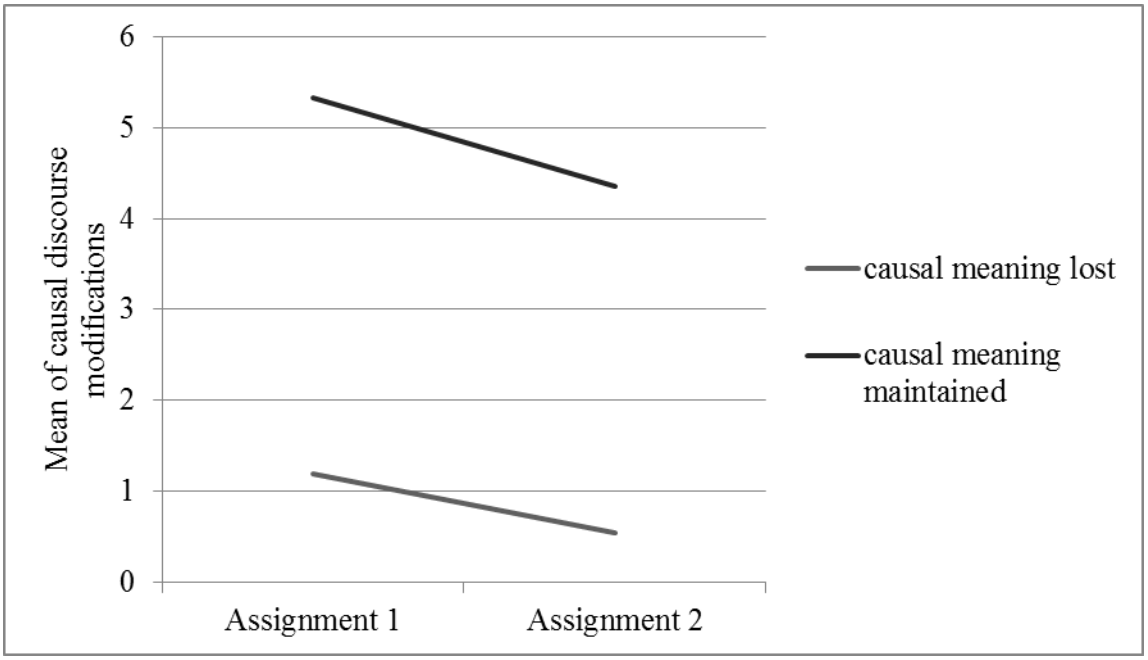

Figure 4.7. Means of causal discourse modifications with causal meaning lost and causal meaning maintained in Assignment 1 and Assignment 2

Findings from the analysis of learners' responses to interview questions. Learners' perceptions were also explored for the investigation of learners' focus on causal meaning while using ACDET. In the interview, students were asked "Did the Editor help you focus on cause-and-effect meaning? If yes, what features of the Editor helped you focus on cause-and-effect meaning?" In their responses, learners made both positive and negative comments about ACDET overall. Their perceptions of sentence-level feedback, and color-coding and underlining features of ACDET were positive. Their responses did not include any comments on the text-level feedback as a means of helping them to focus on causal meaning. Table 4.18 presents the number

of idea units coded for ACDET and the number of students who made the comments in their responses to the question.

Table 4.18

Frequencies of Learners' Negative and Positive Comments on Focus on Causal Meaning

	Number of negative comments	Number of students who commented (n = 27)	Number of positive comments	Number of students who commented (n = 27)
Overall evaluation	16	14 (52%)	25	16 (59%)
Evaluation of text-level feedback	0	0	0	0
Evaluation of sentence-level feedback	0	0	18	10 (37%)
Evaluation of color-coding feature	0	0	20	12 (44%)
Evaluation of underlining feature	0	0	5	4 (15%)

In their responses to the question "Did the Editor help you focus on cause-and-effect meaning," 14 students (52%) evaluated ACDET negatively and made 16 comments that ACDET was not helpful for drawing their attention to causal meaning, as represented by the following remarks by students:

> Uh, I don't think so (S3)
>
> No cause it's, it's not help helping anything. It just leave me, uh, it just tell me this is a cause-effect sentence and, uh, and how many times, the, uh, the verb you use That's, that's all the thing, right (S5)
>
> Ummm, I don't know, I didn't I didn't focus on meanings (S8)
>
> Hmm, I would say not yes cause I cause personally I didn't focus on that (S9)
>
> I'm not really sure about it, because, my my knowledge about language is kinda not really good, so the meaning on each word I I think is kinda like similar so I cannot really differentiate, so I just I think ok, I think this is the right word, so I just put it (S10)

> Sometimes like I didn't think it was, it's helpful, but it's not much because sometimes I was like it's not even cause and effect, it's like sentence, but then it showed the cause and effect (S23)
>
> I feel, my I mean I focus on meaning but I didn't really focus on that word with meaning, is not a very good activity (S25)
>
> Uh, not really. it's just like I write the sentence, I don't really think about the meaning (S26)
>
> But sometimes if I change the word, like the meaning will change, I'm not sure yeah, but it is very helpful (S29)

Regarding positive evaluation overall, there were 25 comments from 16 students (59%). According to their comments, students perceived ACDET positively, remarking that it was helpful to focus on causal meaning, as illustrated by the following examples:

> Ummm. Yeah, I. first of all, umm, I think I cannot get the point about cause and effect at the first because I don't know which is the cause and which is effect. And after use this, I think it is clearly to show that, umm, which one is which (S2)
>
> When when I, When I writing, uh, When I am writing an article, I won't write the sentence, uh, which is a cause and effect, I just wrote the article, then at last, I put I plug in the editor, and it tell me it is cause and effect (S5)
>
> So does it actually imply the meaning of this causing this effect yeah yeah, I mean like, like what I said before, like it, cause normally I write as a normal sentence and then realized it is a cause and effect, so if it detects it it tells me that it is a cause and effect then I'll be like Oh, ok, so it is a cause, I should like, fully focus the facts, meaning actually relates even full impact for it if not, then I am just gonna write a normal sentence again (S6)
>
> Yeah, uh sometimes you you will confuse the about, which is a cause which is a effect and uh, use the use the editor we can say, uh, we can directly see the uh, relationship with the cause and effect (S11)
>
> It can uh, the contrast, uh and it give me the reason and the result of every sentence and phenomena (S12)

> The either helps to see what is the cause and what is the effect relationship, but not exactly to how organized for being more more interesting to the reader (S21)

> Yeah, it's really helpful because uh, for me when self I don't even know if my sentence is a cause and effect sentence, uhh, but using this editor, it tells me this is a cause and effect sentence, so it's good, for me (S26)

> Uh, like kind of like, I don't know, just um, let me think, like it can make you like realize oh, you used those words to um, express like for your cause and effect sentences and uh, make you realize uh, how much you talk about like the the structure and stuff and so (S28)

> It's good they show very good like the uh, the cause and effects which which is cause which is effect the the type and kind of if it's like a noun or verb because you can identify uh, where you putting the causes and effect like it's easier to understand I think (S30)

> It can, cause, when I wrote the article I don't know which sentence I use cause and effect and this can help me to to know um, how can I improve my sentence and which sentence I um, I use cause and effect (S31)

ACDET's sentence-level feedback was referred to in 18 comments by 10 (37%) students. Students' responses indicated that they perceived sentence-level feedback positively for focus on causal discourse meaning, as exemplified by the remarks below:

> Uhh, because, we learn cause and effect so it's, it's, I think it's a good, it can find which is the cause and which is the effect, and the verb we, I use so, that's is better than Word (S2)

> Like tell you uh the underline tell you that like, that what this part exactly be like is cause or effect or cause or verb or something like that (S16)

> Umm for example you can you can search what like the inter relation cause and effect on a word like the key word for that relationship and which part is the relation which part is the cause and which part is the effect, the effect (S21)

> Cause effect, uh, easy about my paper, oh, yeah because when whenever I write an essay, it's like ok, uh, analyze something so it it tells me this is cause this is effect this is verb (S26)

> They would help you like oh use this and then what's your causes and then what's your effects and then just really clear like you can just have you revise this as say and have a clear mind like yeah (S28)
>
> Sometimes I'm very confused about the relationship between umm, the cause and effect so using this way is more helpful (S29)
>
> It's good they show very good like the uh, the cause and effects which which is cause which is effect the the type and kind of if it's like a noun or verb because you can identify uh, where you putting the causes and effect like it's easier to understand I think (S30)
>
> It can, cause, when I wrote the article I don't know which sentence I use cause and effect and this can help me to to know um, how can I improve my sentence and which sentence I um, I use cause and effect (S31)

There were 20 positive comments on the color-coding feature of the sentence-level feedback indicating that it was helpful to focus on causal meaning. The 20 comments were made by 12 students (44%) who made positive references to the color-coding feature of ACDET in their responses to the question: "Did the Editor help you focus on cause-and-effect meaning?" The following quotes illustrate learners' positive evaluation in this regard:

> Oh, they color, yeah colors they bring in the blue shows the cause, the green show the cause and the purple, effect (S1)
>
> Uh, well when I see the colors differences, I can know which is a cause and uh, if we, uh, lost something, I can add them to my passage (S11)
>
> Yeah it uh, actually it can hmm, just uh, er, the blue one and the green one can indicate uh both uh can indicate the cause or effect, and while I'm writing the sentence, I can uh, I can restructure, I can form my structure of my sentence (S12)
>
> Uhh that that as soon as I see the green color then I know this is a cause when I see the underline I know it's the verb or something (S17)
>
> Uh, the different color and it can tell me the cause and the effects so I can be I can uhh, understand about my art article (S24)

> It can, cause, when I wrote the article I don't know which sentence I use cause and effect and this can help me to to know um, how can I improve my sentence and which sentence I um, I use cause and effect (S31)

Referring to the underlining feature, four students (15%) made five positive comments. Their comments showed that these learners perceived ACDET's underlining feature as helpful for focusing on causal meaning. Below are two illustrative examples:

> It's underline, cause uh it can show, the relationship between uh, the the the sentence that has cause and effects it show the relationship, Maybe I write it, uhh, I write it, include the both elements but if if don't have this underline underline feature, it may takes me more time to find out what I wrote, why I wrote, what I wrote in this essay, If I, so this feature can save much time (S9)

> That your exact phrase that you use that relates to cause effect and the editor underlines exactly the word that is for like the key words for that relationship. I think that's pretty good because you can focus on that word intended for like another causal verb another relationship, so I think it's pretty good, yeah (S21)

Overall learners' responses to the interview question "Did the Editor help you focus on cause-and-effect meaning?" demonstrated both positive and negative perceptions of ACDET's capacity for helping them focus on causal meaning. The positive perceptions of learners mostly related to the fact that ACDET made the students realize that their sentences were cause-and-effect sentences through sentence-level feedback and its color-coding and underlining features. Learners' responses did not yield positive perceptions of text-level feedback to draw their attention to meaning. The negative perceptions of learners pertained to the ACDET overall.

Findings from the analysis of learners' responses to the questionnaire item. Learners' (n = 31) focus on causal discourse meaning using ACDET was also investigated with the questionnaire item prompting students to indicate level of agreement with the statement "The

Editor draws my attention to cause-and-effect meaning." Figure 4.8 shows that 23% (n = 7) of the students strongly agreed, 58% (n = 18) agreed, 16% (n = 5) were neutral, and 3% (n = 1) disagreed that ACDET drew attention to causal meaning.

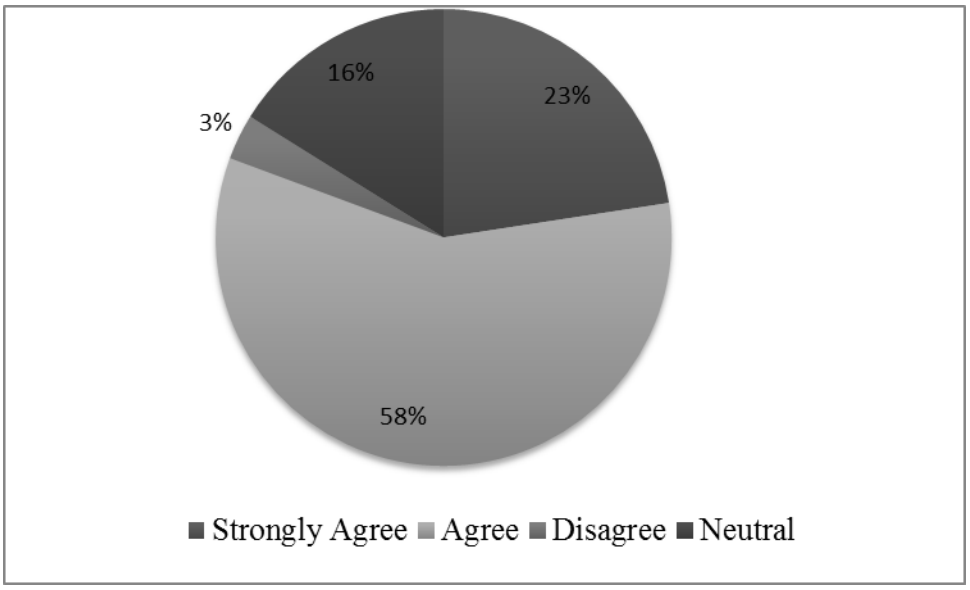

Figure 4.8. Percentages of learners' responses to the questionnaire item on focus on causal meaning

Discussion of the findings of RQ4. ACDET's meaning focus quality was analyzed on the basis of learners' modifications of causal discourse form to express causal meaning through different causal discourse features, their interview responses, and their responses to a questionnaire item. Learners' modifications in their causal discourse form to express causal meaning in a different way were considered an indicator of their focus on meaning. However, if the modifications changed the causal meaning in their sentences, the modifications were considered an indicator of no focus on causal meaning. The findings of RQ4 showed that in the majority of cases, learners paid attention to causal meaning when modifying their causal discourse, since the causal meaning was maintained in most of their expressions after modification, as shown by the high mean of modifications with causal meaning maintained in

both assignments. For focus on causal meaning, learners commented on ACDET both positively and negatively, indicating that their awareness of focus on casual meaning was not entirely consistent with their editing behavior.

The purpose of ACDET's color-coding feature was to draw learners' attention to causal meaning by highlighting their causes and/or effects in sentences using colors. The findings from learners' responses to the interview questions suggest that ACDET achieved that purpose for twelve students in this study, because 12 students made a total of 20 positive comments about the color-coding feature in their responses to the interview question.

Chapter Conclusion

This chapter provided answers to the four research questions by presenting and discussing the findings of the analyses conducted. Six types of data were used to investigate the research questions: pre- and post-test drafts, assignment drafts, screen capturing recordings of learners' use of ACDET, ACDET's text-level feedback reports, learners' responses to semi-structured interview questions, and learners' responses to questionnaires.

The findings of RQ1 showed that ACDET drew learners' attention to causal discourse form. Learners' causal discourse modifications as additions, deletions, and more revisions of causal discourse form and responses to the interview question and the questionnaire item provided evidence that the learners focused on causal discourse form.

The findings of RQ2 demonstrated four types of interactional modifications: clicks on text-level feedback, clicks on sentence-level feedback, clicks on the causal discourse help page, and clicks on dictionaries. These interactional modifications provided evidence that ACDET created opportunities for learners to modify their interactions with ACDET. Perceptions of the

majority of learners were positive (n = 22) regarding their interactions with ACDET; however, some learners had negative perceptions (n = 13).

The findings of RQ3 showed causal discourse development within papers to a small extent, since most of learners' modifications of causal discourse did not involve grammatical metaphor and did not change congruence of causal meaning (M = 3.91). A small number of their causal discourse modifications involved grammatical metaphor (M = 0.78). There was also no increase in lexical density as a result of causal discourse modifications. Regarding development across pre- and post-tests, causal discourse development was again found to be very limited. Learners used slightly fewer causal conjunctions in the post-tests; however, there was no change in lexical density from pre-tests to post-tests. These findings indicate limited capacity of ACDET for causal discourse development over this short time frame.

The findings of RQ4 showed that ACDET drew learners' attention to causal meaning in the majority of their causal discourse modifications. The number of learners' modifications with causal meaning maintained was much higher than the number of modifications with causal meaning lost in both assignments, as was demonstrated by the means of their causal discourse modifications. ACDET's overall helpfulness to focus on causal meaning received 25 positive comments from 16 students and 16 negative comments from 14 students. Sentence-level feedback was positively perceived by 10 students, color-coding feature by 12 students, and the underlining feature by five students as drawing attention to causal meaning.

CHAPTER 5

CONCLUSION

This qualitative case study had two objectives: (a) to develop ACDET and (b) to evaluate its effectiveness for causal discourse development by testing it in academic writing classes. To this end, four research questions were asked drawing upon two CALL evaluation framework criteria proposed by Chapelle (2001): language learning potential and meaning focus. Research questions were investigated through six sources of data: pre- and post-tests, ACDET's text-level feedback reports, cause-and-effect assignment drafts, screen capturing recordings, semi-structured interviews, and questionnaires. This chapter presents the main findings of the research questions, draws implications, discusses limitations, and suggests directions for future research.

Language Learning Potential

ACDET's language learning potential was investigated with research questions on focus on form, interactional modifications, and causal discourse development. It was found that ACDET drew learners' attention to causal discourse form, created opportunities for interactional modifications. However, ACDET was found to lead to limited causal discourse development in terms of grammatical metaphor only for a few students and promote no causal discourse development in terms of lexical density.

Focus on Causal Discourse Form. The first research question was concerned with learners' focus on causal discourse form using ACDET. It specifically asked, "To what extent does ACDET feedback help learners focus on causal discourse form? And, what features of ACDET feedback draw learners' attention to causal discourse form?" These research questions were investigated through a qualitative analysis of ACDET's text-level feedback reports (n = 104), screen capturing recordings (n = 47), semi-structured interviews (n = 27), and one questionnaire item (n = 31).

The findings from the analysis of ACDET's text-level feedback reports revealed differences in frequencies of causal discourse features between learners' third or second drafts and final drafts. These differences show that learners modified their causal discourse using ACDET, which indicates the program's helpfulness for students in focusing their attention on causal discourse form.

The findings from the text-level feedback reports found support from the findings of the analysis of the screen capturing recordings. The analysis of the screen capturing recordings revealed that learners made three types of causal discourse modifications: additions of causal discourse form, deletions of causal discourse form, and revisions of causal discourse form. In the majority of their modifications, learners revised their causal discourse form. Among deletions and additions, deletions had the lowest number indicating that deletions were the least common modification type. The causal discourse modifications are another indicator of students' focus on causal discourse form by using ACDET.

Results from the analyses of the interview responses and questionnaire responses also helped answer this research question. Out of 27 students that participated in the interviews, 25 shared positive perceptions that ACDET drew their attention to causal discourse form. Among all types of feedback that ACDET provides, text-level feedback was the most positively perceived as prompting their focus on form (39 comments from 25 students), followed by underlining feedback feature (12 comments from 11 students), color-coding feedback feature (11 comments from 9 students), and sentence-level feedback (5 comments from 5 students). Lastly, these positive perceptions were also observed in the findings of the relevant questionnaire item (i.e., The Editor draws my attention to cause-and-effect forms). The majority of the students

agreed or strongly agreed that ACDET drew their attention to causal discourse form (45% agreed and 36% strongly agreed).

Interactional Modifications. The second research question aimed to answer to what extent ACDET created interactional opportunities for learners and what features of ACDET created those opportunities. Interaction in this study was defined as the activity between learners and ACDET, and interactional modifications were defined as learner interruptions of their revising of causal discourse to receive help from sentence-level feedback, text-level feedback, causal discourse help page, and dictionaries. These conditions aimed to create opportunities for learners to modify their interactions with ACDET. Instances when learners interrupted the interaction and modified it by searching for help from ACDET features were considered as interactional modifications showing that learners were able to interact with the tool. The answer to this research question was obtained from the analyses of screen capturing recordings (n = 47) and semi-structured interviews (n = 27).

The analysis of the screen capturing recordings revealed four types of interactional modifications: clicks on text-level feedback, clicks on sentence-level feedback, clicks on causal discourse help page, and clicks on dictionaries. As shown by the mean frequencies of each type, there were more clicks on the text-level feedback. The mean of clicks on dictionaries was higher than the mean of clicks on the sentence-level feedback. The causal discourse help page had the lowest mean of clicks. These findings provided evidence that ACDET created opportunities for interactional modifications.

The screen capturing recordings did not reveal observable data of whether color-coding and underlining features were helpful for interactional modifications or not, since causal relations were highlighted in color and causal discourse features were underlined as students

wrote without them clicking on anything. Students' responses to the interview question about their interactions with ACDET were informative in this regard. Students referred to the text-level feedback (32 comments from 22 students), color-coding feedback feature, (34 comments from 20 students), and underlining feedback feature (13 comments from 11 students) when talking about their interactions with ACDET. Their comments suggest that text-level feedback and color-coding and underlining features provided conditions for interactional modifications. Students did not make comments on sentence-level feedback regarding whether or not it led to interactional modifications.

Causal Discourse Development. The third research question investigated whether or not ACDET was effective for causal discourse development: To what extent does using ACDET develop ESL learners' causal discourse within papers and across pre- and post-tests? Within papers and across pre- and post-tests, causal discourse development was investigated by examining changes (i.e., a decrease or an increase) in two indicators: grammatical metaphor and lexical density. For this, data from screen capturing recordings (n = 47), cause-and-effect assignment drafts (n = 104), pre-tests (n = 31), and post-tests (n = 31) were analyzed.

Causal discourse development within papers. Causal discourse development within papers was investigated through grammatical metaphor analysis of learners' causal discourse modifications and lexical density analysis of their third or second and final drafts. The grammatical metaphor analysis looked for substitutions of causal discourse features with other causal discourse features which were more metaphorical following Halliday's (1998) pattern of grammatical metaphor. According to this pattern, conjunctions are more congruent expressions of causal meaning than prepositions, and prepositions are more congruent expressions of causal meaning than verbs, with nouns being the non-congruent expressions of causal meaning.

Following this pattern, the conversion of causal conjunctions to causal prepositions and nominalizing the clause, or the conversion of causal prepositions to causal verbs or nouns were considered grammatically metaphorical modifications and as an indicator of causal discourse development. The analysis of learners' causal discourse modifications within papers revealed that the majority of learners' causal discourse modifications were not grammatically metaphorical. In other words, the congruence of causal meaning did not change in most of the students' modifications. The causal discourse modifications did not lead to an increase in lexical density either. These findings mean causal discourse development in terms of grammatical metaphor for only a few students and no causal discourse development in terms of lexical density within papers.

Causal discourse development across pre- and post-tests. Causal discourse development across pre- and post-tests was investigated through a frequency analysis of causal conjunctions and lexical density analysis of pre- (n=31) and post-tests (n=31). Students did not modify their causal discourse features in pre- or post-tests. In each test, they wrote a new cause-and-effect essay. Therefore, it was not possible to look for grammatical metaphor in learners' modifications as an indicator of causal discourse development. Instead, causal discourse development was sought as a decrease in the number of conjunctions from pre- to post-tests, and an increase in lexical density. Findings showed a very slight decrease in the number causal conjunctions which means causal discourse development. Findings also showed a slight decrease in lexical density from pre-tests to post-tests, indicating no causal discourse development.

Meaning Focus

The fourth research question pertained to ACDET's capacity to draw learners' attention to causal meaning: "To what extent does ACDET feedback help learners focus on causal

meaning? And, what features of ACDET feedback draw learners' attention to causal meaning?" Focus on causal meaning was investigated by analyzing data from screen capturing recordings (n = 47), semi-structured interviews (n = 27), and one questionnaire item (n = 31).

The answer to the fourth research question was sought first by looking at causal meaning before and after learners modified their causal discourse based on ACDET feedback as captured by the screen capturing recordings. The findings revealed that learners maintained the causal meaning in the majority of their modifications. In order words, learners were able to express causal meaning in different ways. The causal discourse modifications in which learners were able to maintain the causal meaning indicated that ACDET helped learners to focus on causal meaning.

The answer to the fourth question was also sought by analyzing learners' perceptions of ACDET based on their responses to the interview question and the questionnaire item (i.e., The Editor draws my attention to cause-and-effect meaning). According to students' comments, ACDET drew some students' attention to causal meaning (25 positive comments from 16 students), but it did not draw some others' attention (16 negative comments from 14 students). Regarding features of ACDET that helped learners focus on causal meaning, sentence-level feedback (18 comments from 10 students), color-coding feedback feature (20 comments from 12 students), and underlining feedback feature (5 comments from 4 students) were perceived positively by learners. Surprisingly, no students perceived text-level feedback as helpful to focus on causal meaning. This finding was most probably because learners mainly focused on the summary table, but did not pay attention to the suggestions for how to develop their writing to use less congruent expressions of causal meaning. The summary table included frequencies of causal discourse form and suggestions were meant to draw attention to meaning, which did not

happen as expected. Lastly, the analysis of the relevant questionnaire item also revealed positive perceptions of focus on meaning for most of the students (58% agreed & 23 strongly agreed).

Implications and Recommendations

Considering the findings of this study, several implications and recommendations can be reached. Implications and recommendations are proposed in two groups: for AWE development and for teaching causal discourse.

Implications and recommendations for AWE development. This dissertation has several implications for AWE development. The development of ACDET demonstrated how Systemic Functional Linguistics (SFL) as both a theory of language and a theory of language learning and the Interaction Hypothesis (IH) as a theory of language learning can inform AWE development. SFL helped identify the linguistic resources used in the explanation genre: how to realize the social function of making explanations linguistically in written English. ACDET was meant to identify causal meaning and the linguistic features that are used to express causal meaning with an aim of drawing learners' attention to causal meaning and form. To this end, applying the perspectives of IH to the interaction between learners and ACDET, causal meaning and form were made salient by highlighting causes and effects in and underlining causal discourse features. ACDET was also meant to help learners develop their causal discourse by interacting with learners and offering them help for modifying their causal discourse in a more sophisticated way. Formative feedback on how to express causal meaning with less congruent expressions was created based on SFL perspectives and research findings. With this feedback, the aim was to enable learners to modify their interactions with ACDET and get help to develop their writing. Despite the limited causal discourse development observed, the findings of this study show that ACDET drew learners' attention to causal meaning and form, and learners were

able to interact with the tool. These findings suggest that developers of AWE tools can rely on SFL and IH when developing AWE tools that evaluate meaning and provide discourse-specific feedback.

With this study, it is no longer true that "the ability of AWE tools to assess meaning is fairly limited" (Chukharev-Hudilainen & Saricaoglu, 2014, p.2). ACDET can analyze causal meaning and causal discourse features and can generate formative feedback on causal discourse. The linguistic and NLP approaches taken to ACDET development can serve as a model for AWE developers to assess other genres such as argumentation/persuasion, exposition, description, narration, or comparison. Essay prompts requiring these types of discourse are used in state-of-the-art AWE tools such as *Criterion* (Long, 2013); however, discourse-specific assessment is not complete. ACDET is the first attempt to assess cause-and-effect language through formative feedback, and the hope is that it can be informative for automated assessment of other genres.

Developers of currently used AWE tools commonly prefer statistical machine learning techniques over rule-based techniques when developing automated systems. *Criterion* and *RWT* are two examples of AWE tools that were both developed using statistical machine learning techniques (see Burstein, Chodorow, & Leacock, 2003 and Cotos, 2011). Statistical machine learning systems are trained with manually annotated data, and the systems (the machines) learn from the training set and produce a classifier model (Bird, Klein, & Loper, 2009). Hand-coded syntactic rules are not introduced to statistical machine learning systems. In contrast, ACDET was developed using a hybrid system of both statistical and rule-based (hand-coded) techniques (see Chukharev-Hudilainen & Saricaoglu, 2014). The analysis module of ACDET consists of 106 hand-coded feature detection rules. Although employing the rule-based approach, in addition

to the statistical approach, is not cost-effective and requires a great amount of effort, it is advantageous in that it "is not sensitive to the number of examples available, as human experts develop the rules and can apply their expert knowledge" (Crowston, Liu, Allen, & Heckman, 2010, n.p.). The rule-based approach also has the advantage of the flexibility to change the rules in view of data (Crowston et al., 2010). ACDET is informative for AWE developers in that rule-based techniques can be helpful in creating reliable tools; for example, ACDET was reported to have a precision of .93, recall .71, and accuracy 76. (Chukharev-Hudilainen & Saricaoglu, 2014).

Implications and recommendations for teaching causal discourse. This study also has implications for language instructors. As an important formative assessment tool, ACDET addresses several needs of academic writing instructors. It serves as supplementary material to the textbook when teaching cause-and-effect essays. It overcomes the limitation of textbooks with regard to teaching causal discourse according to the causal development path. Given the findings that learners were able to interact with ACDET and that ACDET was able to draw their attention to causal form and meaning, writing instructors should consider going beyond textbooks with ACDET and assessing learners' causal discourse automatically.

The findings from the screen capturing recordings of leaners' use of ACDET suggest that writing instructors should pay attention to whether or not learners have knowledge of parts-of-speech before they use ACDET. It was observed in the screen capturing recordings that a few students made inappropriate causal modifications by substituting their causal discourse features with what was listed in the dictionaries without paying attention to their grammatical category. In order to gain better learning outcomes from implementing ACDET, it is important that students are familiar with parts-of-speech in English. Students should be warned or reminded to pay attention to parts-of-speech when making interactional modifications using the dictionaries.

This will also be taken into consideration when improving ACDET. Suitable feedback will be given to learners to draw their attention to parts-of-speech when they modify their causal discourse.

The findings from learners' causal discourse modifications revealed that most of learners' causal discourse modifications were not grammatically metaphorical. From learners' responses to interview questions, it appeared that they might have paid more attention to the frequency numbers the text-level feedback presented ("It helps me umm, when they are over used, like words words, and I should think of more variety" S6; "Like show you the words you used many times and you can change them" S16) than the suggestions for grammatical metaphor. When ACDET is introduced to students, a demonstration should be given about what ACDET does and what every type of feedback means by placing emphasis on text-level feedback for grammatical metaphor. Instead of leaving learners' alone with the tool to follow the feedback, the developmental path of causal discourse should be explained so that learners can understand that the goal is not to replace lexical items with their synonyms, but to move towards less congruent expressions of causal meaning.

Even if some instructors use ACDET for teaching and learning purposes alone and are not interested in conducting research studies on ACDET, I highly suggest they collect screen recordings of their learners' interactions with ACDET. Observing students' interactions with ACDET during class can help instructors understand what works well and what creates problems for students. However, it is not possible to do close observations during limited periods of writing classes such as those investigated in this study. In the context of this study, there were 16 students in each class. It was not possible to observe one student even for five minutes trying to monitor all students. Since my during-class observations gave me the impression that students

were able to benefit from ACDET and make meaningful modifications, I did not preview the screen capturing recordings before data analysis. During students' interactions with ACDET in class and my observations as the instructor, I did not notice that some of the students did not pay attention to parts-of-speech when they were looking up synonyms in the dictionaries. Had I checked the first set of recordings before the second implementation in Assignment 2, I might have been able to reduce the number of the modifications in which students could not maintain the causal meaning. Therefore, instructors should watch the screen capturing recordings immediately after the first implementation in class so that they are able to notice and address any lack of clarity students have while using ACDET.

Limitations

This study has a number of limitations that should be noted. These limitations pertain to trustworthiness, data collection methods, ACDET's technical aspects, and ACDET's accuracy.

First, this study was a qualitative case study in which the researcher was also the developer of ACDET and the teacher of the participants. Multiple roles of the researcher and her closeness to the participants might raise concerns about the study's trustworthiness. Several strategies were employed to establish trustworthiness and increase readers' confidence in the findings. First, the development of ACDET and its empirical evaluation were carried out systematically based on theoretical perspectives and previous research findings. Second, the principles of ethical research were followed; students were informed about the study and ACDET and were given a free choice about whether or not to participate. Only those who gave their informed consent became the participants of the study. As suggested by Creswell (2013), Duff (2008), and Yin (2003), data were collected from different sources for triangulation, the methodology was described in detail for rich description, and negative findings were also

presented. Yet, all these strategies of trustworthiness do not allow for generalizability of the findings, which was not the goal in this study. Whether the findings of this study are applicable to different contexts needs to be decided by researchers who must judge how similar the participants, the contexts, and other research characteristics are. This study provides the basis for the evaluation of ACDET; ACDET needs be evaluated by researchers other than the developer of ACDET and also by researchers who do not have a teacher-student relationship with the participants.

The second limitation concerns the data collection materials. This study used semi-structured interviews in order to find out learners' perceptions of their experiences with ACDET. Learners' responses offered insights into how they perceived ACDET, but they were insufficient to reveal why students did certain things such as depending mostly on the summary table that demonstrated the frequency of causal discourse features in their texts, but ignoring the suggestions for improvement presented below the summary table. Interviews were conducted at the end of the study after students had completed the two assignments and yielded learners' overall perceptions; however, the interviews were inadequate in revealing in-depth perceptions and as many details as desired. Using stimulated recalls instead of interviews would have been more reflective of learners' use of ACDET. Stimulated recalls may trigger learners' thoughts (Gass & Mackey, 2000) when using ACDET. Soon after students had used ACDET, stimulated recall sessions should have been conducted by showing the students videos of their interactions with ACDET and prompting them to reflect on their interactions and output modifications.

The third limitation is concerned with the technical problems that students experienced while using ACDET. Learners' interview responses demonstrated a few negative comments that the color-coding feature of the sentence-level feedback sometimes was delayed ("It didn't show

the color at first time and then when I yeah, I yeah, until I didn't finish, and then when after you said that I need to submit it, and then when I check it back with you then it really shows the colors" S10; "Umm, because we usually only do it like half the colors after we finish our assignments so I'm not sure if if it really helps like we can't really like finish it and then we see it it only shows like white and until usually I go to class and then I'll see the color" S13). It is highly probable that the delay in the color-coding affected learners' experiences with ACDET in a negative way. In their interviews, students expressed that the colors helped them recognize their cause-and-effect sentences. A delay in colors probably caused ACDET to create fewer conditions for helping learners recognize their causal explanations. Similarly, because text-level feedback was not in real time, students were not able to refresh the text-level feedback to see how their texts would be evaluated after they modified their causal discourse. Students depended on their memory to keep in mind what causal discourse form they changed when following the text-level feedback. This probably increased their mental effort, which otherwise might have been spent on making more causal discourse modifications.

The last limitation is associated with ACDET's accuracy to identify causal discourse features and to provide feedback accordingly. Accuracy of ACDET was investigated in another study before it was empirically evaluated in this study. The investigation and findings of ACDET's accuracy was reported in *Causal Discourse Analyzer: Improving Automated Feedback on Academic ESL Writing* in detail by Chukharev-Hudilainen and Saricaoglu (2014). Since it was found that ACDET had a good level of accuracy, the accuracy was not investigated again in this study. However, a few students' comments made it obvious that they faced some accuracy issues such as some sentences being highlighted as causal even though students believed that

they were not. Even though such comments were few, it is worth restudying ACDET's accuracy for improvement purposes.

Directions for Future Research

While this study establishes an important starting point for automated formative assessment of causal discourse, considering the findings and limitations, several directions can be proposed for future research. The directions can be discussed around two groups, namely the development of ACDET and research on causal discourse development with ACDET.

Development of ACDET. ACDET needs to be improved in several aspects. First, ACDET's current delayed text-level feedback should be converted to immediate feedback. Interview findings demonstrated several negative comments from students regarding that the text-level feedback was not real-time. As Cotos (2014) states, "[w]riting can be viewed as a procedural skill in that it entails a mental procedure that involves the execution of a sequence of operations… Therefore, it is reasonable to assume that immediate feedback may be more beneficial for the development of academic writing skills" (p. 81). Since this claim is also supported by learners' negative perceptions in this study, ACDET's delayed text-level feedback will be converted into immediate feedback.

Second, additional help options need to be embedded within ACDET. Findings of this study demonstrated that some students needed to consult dictionaries and the file with the categories of causal discourse features frequently. Even though students were able to access these sources by themselves, since the links to dictionaries and causal discourse features file were included in the course management site, ACDET without these help options appears to be difficult for learners to navigate. As found in Cotos's (2011) study, help options will decrease the

task difficulty. With dictionaries and causal discourse feature instruction integrated in, ACDET would be more appropriate for learners.

Third, the accuracy of ACDET should be re-visited. In their study, Chukharev-Hudilainen and Saricaoglu (2014) reported ACDET's precision as .93, recall as .71, and accuracy as 76. Even though this level of accuracy was considered to be sufficient for classroom applications by Chukharev-Hudilainen and Saricaoglu (2014), comments from a few students in this study about inaccurate causal feedback indicate that the accuracy of ACDET needs to be improved. Increasing accuracy up to .90 or higher would be ideal for obtaining better learning outcomes with ACDET.

Last, it is essential that ACDET become a stand-alone AWE tool. Currently, ACDET is embedded within *CyWrite*. Learners used the tool only in order to have their causal discourse analyzed and receive feedback for improvement. The causal discourse instruction was administered using handouts and electronic files that were made available on the online course management system. Making ACDET a separate tool can allow for including several other features within one platform, such as causal discourse instruction and teaching and learning materials that can be used prior to learners' using ACDET for causal discourse evaluation. To this end, the domain www.causaldiscourse.com has been purchased and the first steps in making ACDET a stand-alone tool will start in Summer 2015.

Research on Causal Discourse Development with ACDET. More empirical research evaluating ACDET is needed. This qualitative case study involving the researcher with multiple roles (i.e., developer and teacher) highlights the need to continue this line of research in different educational settings by different researchers. Further studies with different research designs (i.e.,

quantitative or mixed-methods) and with more participants would enhance our understanding of the potential of ACDET as a formative assessment tool for causal discourse development.

It would be important to know if students of higher language proficiency levels would use ACDET in different ways and would benefit from it more or less than those in this study. Similarly, including native speaker participants might reveal valuable findings. The students in this study were all native speakers of other languages. However, causal explanations are important for every student, native or non-native. In fact, native speakers might find ACDET more helpful, because currently ACDET does not recognize causal language which is erroneous.

The study of students' use of ACDET in two assignments, in a total period of eight weeks during which they used ACDET twice, was helpful in gaining some understanding of ACDET's potential for causal discourse development. However, longer studies in which students have more exposure to ACDET might yield more findings. Longitudinal studies will be fruitful to investigate if ACDET feedback has a lasting effect on causal discourse development.

In future studies, including students from science and history majors can assist in better understanding learning with ACDET. These two fields, in particular, have yielded most of the literature in causal discourse, since causal explanations play an important role in both science and history. Students from these majors might have a higher level of motivation for having their texts analyzed and receiving formative feedback on their causal discourse. Students in this study were from a variety of majors, mostly engineering programs. Even though learner motivation was not investigated in this study as a language learning factor, I believe that my students represented a variety of motivation levels. Economics, psychology, and health would also be important majors in which to implement ACDET, because explanations are also dominant in these fields. Before using ACDET with students from various fields, it is necessary to examine

some texts from the fields to decide whether or not ACDET is ready for implementation in these fields. It might be necessary to add more rules to ACDET depending on the findings of the analysis of the texts from the fields.

Additional research is also needed to report the current accuracy of ACDET which in turn will inform its further development. The program's accuracy should be tested on both learner language and professional language. This study addressed two of the criteria (i.e., language learning potential and meaning focus), but excluded learner fit, impact, authenticity, and practicality criteria due to time and scope limitations. The findings of this study should be followed up with research that evaluates ACDET with the six CALL evaluation framework criteria by Chapelle (2001).

Conclusion

With their dominance in academic literacy, causal explanations deserve attention from writing instructors. ESL learners make explanations depending on limited lexico-grammatical features, and teaching causal discourse explicitly is essential (Slater, 2004). However, it is difficult for both instructors to conduct formative assessment of causal discourse and give feedback following the causal developmental path, and for learners to modify their causal discourse using grammatical metaphor. "[The teacher] suggests moving to a less congruent causal statement, but it is too difficult for [the student]" wrote Mohan and Beckett (2003, p. 428) based on their observations during teacher-student interactions of grammatical scaffolding of learners' causal explanations. Considering the amount of time it takes children to move from congruence to incongruence, the difficulty that ESL students have in educational settings is understandable.

In their evaluations of learners' explanations from early childhood to late adolescence (see Chapter 2 of this dissertation for a summary), Christie and Derewianka (2008) presented samples of students' language in order to show students move from congruent causal explanations to non-congruent causal explanations. The students whose causal discourse was more congruent were between ages of seven and 12 and the students whose causal discourse was less/non- congruent were between the ages of 15 and 17. Based on the ages of students in these examples by Christie and Derewianka (2008), it appears that learners complete the causal developmental path in around seven years in natural language acquisition settings. Given that, it is very normal that ESL students have difficulty learning grammatical metaphor of causal explanations in classroom settings. Students need more time, more feedback, and repeated practice when learning causal discourse.

This study was an attempt to address the need for formative assessment of learners' causal explanations. It was an important endeavor in the field of AWE to analyze meaning in written discourse automatically and provide causal discourse specific feedback. The empirical evaluation of ACDET was based on process-oriented data revealing how students used ACDET. Considering that the existing AWE studies are mostly product-oriented research which has focused on learners' written products to understand how effective AWE tools are (Cotos, 2010; Warschauer & Ware, 2006), this study is noteworthy. The findings from the analysis of process-oriented data demonstrated ACDET's capacity to draw learners' focus to causal discourse form and meaning and to create opportunities for interactional modifications. Product research relying on written products alone would not allow for an investigation of these qualities of ACDET and would not be as informative for the tool's further development. The limitations of this study and the findings are important in that they will inform the refinement of ACDET. Given the short

period of time in which this study was conducted, causal discourse development by using ACDET was limited. In order to gain a better understanding of ACDET's effectiveness for developing causal discourse, longitudinal product-oriented research studies are needed.

APPENDIX A

LIST OF LEXICO-GRAMMATICAL ITEMS IN THE CATEGORIES OF CAUSAL DISCOURSE FEATURES

Causal Conjunctions	Causal Adverbs	Causal Prepositions	Causal Verbs		Causal Adjectives	Causal Nouns
as	as a consequence	as a consequence of	abash	invigorate	abortifacient	advantage
because	as a result	as a result of	abbreviate	irritate	abrasive	asset
for	consequently	because of	accelerate	islamise	acid-fast	benefit
if	for this/that reason	by	acerbate	islamize	activating	burden
once	hence	due to	acidify	isomerise	actuating	cause
since	in response	in response to	activate	isomerize	adsorbent	con
so	therefore	in the absence of	actuate	itch	adsorptive	consequence
so that	thus	thanks to	addict	jab	advantageous	damage
when		through	adjust	jade	aeolian	disadvantage
		with	affect	jar	aetiologic	drawback
			affix	jaunt	aetiological	effect
			affright	join	alienated	factor
			age	jolly_along	aligned	handicap
			aggrieve	jolly_up	aligning	impact
			agitate	jolt	amaurotic	influence
			agonise	joy	amnesic	limitation
			agonize	jumble	amnestic	pro
			aid	jump	annoying	problem
			ail	keep_in	antimicrobial	reason
			air	keep_up	antimicrobic	removal
			alleviate	kick	apostate	result
			allow	kill	astigmatic	source
			allure	kindle	atactic	
			alter	knee	ataxic	
			amalgamate	knell	attritional	
			amaze	knock	bacteriolytic	
			ameliorate	knock_over	bacteriostatic	
			amend	land	bad	
			ammonify	lash	beneficial	
			amuse	latinise	cacogenic	

anesthesize	latinize	calculous
anger	launch	challenging
anguish	lay	chicken-breasted
annihilate	leach	cliff-hanging
annoy	lead to	comforting
apply	lead_off	confusing
arise	leak	contentious
arouse	leap	convenient
assasinate	leaven	cyanobacterial
assemble	lengthen	cyanophyte
asset	lessen	cytopathogenic
attach	let	damaging
attack	let_down	dangerous
attract	let_on	daunting
authorize	let_out	dazzling
automate	lift	deafened
autotomise	lift_up	deafening
autotomize	light	debilitative
awaken	lighten	decompositional
back	lighten_up	deformational
balance	lignify	demotivating
bang	limit	depressing
bash	liquefy	destructive
batter	lock	deterministic
beam	loose	detrimental
beat	loosen	diabetic
beautify	loosen_up	difficult
beef_up	louden	disadvantageous
bemuse	lower	disastrous
bend	lump	disintegrative
benefit from	macerate	displeasing
bethink	madden	disruptive
better	magnify	distressing
bewilder	maim	disturbing
bias	make	dysgenic
bilge	manufacture	earsplitting
birl	march	effective
birle	mature	embarrassing
blacken	maul	encouraging
blare	maximize	energyxdassaving
blast	meld	enervating
bleach	meliorate	enfeebling
blear	mellow	entertaining

blend	melt	errhine
bloat	merge	estranged
block	minimize	estrogenic
blow_up	mire	etiologic
bludgeon	mix	etiological
blunt	mobilise	eugenic
blur	mobilize	evangelical
bog_down	modernize	evangelistic
boil	modify	exciting
bore	moisten	exhausting
bother	moisturize	exhilarating
bounce	mollify	extinguished
bowl_over	morph	fatal
break	motivate	frightening
break_down	move	frigorific
break_in	move_out	gravitational
break_up	multiply	gravitative
brighten	murder	harmful
bring_down	mute	hazardous
bring_on	mutilate	healing
bring_out	name	heartwarming
bring_together	narrow	helpful
bring_up	necessitate	hexed
broadcast	nettle	hyperemic
broaden	neutralize	icteric
bruise	nudge	impressive
bubble	nullify	inconvenient
build	nurture	inculpative
bulge	obligate	inculpatory
bulk	oblige	influential
bundle_off	obstruct	injurious
buoy_up	odorize	intoxicant
burden	odourise	intoxicating
burn	offend	invidious
burst	offset	irritating
bust	open	jaundiced
button	open_up	jinxed
calm	operate	laborxdassaving
cap	organise	lifexdassaving
capacitate	organize	lossless
carve_out	orient	lossy
catalyse	outpace	luminescent
catalyze	outwear	meteoritic

catapult	overheat	meteoritical
catholicise	overturn	moneyxdassaving
catholicize	pacify	motivating
cause	pack	multifactorial
cause_to_sleep	pain	myopathic
chafe	paint	myotonic
challenge	pall	nail-biting
change	panic	nescient
change_surface	paralyze	neuromatous
cheer	parent	nocent
cheer_up	part	nonadsorbent
chill	pass_around	nonadsorptive
chip	pasteurise	nonaligned
choke	pasteurize	noncausal
chop	peeve	noncausative
chuck	pelt	nonlethal
circularise	penetrate	offensive
circularize	pension_off	painful
circulate	percolate	partisan
circumvolve	perfect	partizan
citrate	pervaporate	photic
clang	pick_up	pigeonxdasbreasted
clash	pique	pneumococcal
classify	place_upright	positioning
clatter	plant	proactive
cleave	please	problematic
click	plough	proinflammatory
clink	plow	pro-inflammatory
close	plunge	psychogenetic
clot	poise	psychogenic
coagulate	poison	putrefacient
coalesce	polarise	putrefactive
coerce	polarize	pyrectic
cohere	pollute	pyretic
collapse	polymerise	restorative
combine	polymerize	revolutionary
combust	position	rickettsial
come_across	pour	rotatory
come_home	prance	ruinous
comfort	precipitate	saddening
commence	predetermine	scary
compel	press	sciatic

compose	pressure	scratchy
compound	prevent	seismal
concenter	prick	seismic
concentre	prickle	sensational
concern	produce	sent
conflate	prohibit	shocking
confuse	project	sternutatory
connect	promote	stimulating
consolidate	prompt	strep
constrain	propagate	streptococcal
construct	propel	streptococcic
contaminate	protuberate	stressful
contribute to	provide	striking
control	provoke	supportive
convert	pull	surfacexdasassimilative
convience	pulse	surprising
convulse	pummel	suspenseful
cool	punch	suspensive
cool_down	punish	tempting
copy	purge	terrible
correct	purify	tetanic
crack	push	threatening
crash	put_down	thunderous
craze	put_off	thundery
create	put_out	tickling
crimp	put_to_work	timexdassaving
cross-fertilise	put_together	tingling
cross-fertilize	quieten	titillating
crush	raise	transeunt
crystalise	ram	transient
crystalize	rap	troublesome
crystallise	rattle	unbelieving
crystallize	reactivate	uneasy
cure	rear	unequalised
curl	reconstruct	unequalized
curtail	recycle	unhealthy
cushion	reduce	unreassuring
cut	reheat	unrelated
cut_down	reinforce	unsurprising
dampen	reinvigorate	uplifting
darken	rejuvenate	useful
daunt	relax	vasomotor
dawn	release	vesicant

deactivate	relocate	vesicatory
deafen	remind	virulent
debone	remit	weakening
decorate	remove	worrisome
decrease	rend	zymolytic
deepen	render	zymotic
defrost	reorient	
dehumidify	repair	
dehydrate	repel	
delete	repercuss	
delight	repose	
demoralize	repulse	
demulsify	reshape	
densify	resolve	
deoxidise	resonate	
deoxidize	restrict	
depress	result from	
destroy	result in	
desynchronise	resuscitate	
desynchronize	retire	
determine	reveal	
detonate	revive	
detoxify	reward	
detribalise	ring	
detribalize	rinse	
develop	rip	
diffuse	ripen	
diminish	roast	
direct	roll	
disable	root	
disabuse	rot	
discharge	rotate	
disclose	rouse	
discolor	rub	
discombobulate	ruin	
discomfit	rule	
discompose	rumpus	
disconcert	run_aground	
disconnect	rupture	
discourage	rush	
discover	rustle	
disharmonize	sack	
disintegrate	sadden	

disjoin	satisfy
disjoint	saturate
dismantle	scare
disorient	scent
disorientate	scratch
disperse	season
displace	seat
displease	secure
disqualify	seesaw
dissect	send
disseminate	sensitise
dissimilate	sensitize
dissolve	separate
dissonate	set_off
distort	set_up
distress	settle
distribute	shake
disturb	shame
disunite	sharpen
divide	shatter
divulge	shift
do_drugs	shine
douse	shorten
dovetail	shove
drag	shred
draw	shrink
drench	shut
drip	shut_up
drive	sicken
drive_in	silence
drop	simplify
drug	sink
dry	sink_in
dry_out	sinter
dull	sit
ease	sit_down
educate	slacken
effect	slam
effectuate	slap
elate	slash
electrocute	slice
elevate	slide
eliminate	slip

elongate	smack
emaciate	smash
embarrass	smell_up
embitter	snafu
embolden	soak
embrown	soften
employ	solidify
empty	solvate
emulsify	sound
enable	souse
enable	spark
encourage	spark_off
end	spear
enervate	splatter
engender	splinter
enhance	split
enlarge	spray
enlighten	spread
enliven	sprinkle
enrage	spur
ensure	square
entangle	squash
entertain	squeeze
enthuse	squirt
envenom	stab
eradicate	stain
erase	stall
erect	stampede
erode	stand
escalate	stand_up
establish	staple
eternize	start
evacuate	start_up
even	starve
even_out	stem from
exacerbate	step
excite	stick_on
exercise	stiffen
expand	still
explode	stimulate
export	sting
expose	stink_out
exterminate	stink_up

extinguish	stir_up
extort	stone
extravasate	stop
fag	straighten
fag_out	strain
fall_into_place	strand
famish	strangle
fascinate	streamline
fasten	strengthen
fatigue	stretch
fatten	strike
feed	strike_down
fell	strike_out
ferment	subject
fill	suborn
fill_up	suffer from
fire	suspend
fit	swamp
fix	sweep
flatter	sweeten
flavor	swell
flavour	swing
fling	swirl
flip	take_down
flog	take_out
flow	tarnish
fluctuate	teach
flush	tear
fluster	tense
fly	tense_up
focalise	terminate
focalize	terrorize
fold	thicken
follow	thin
forbid	threaten
force	throw
force	thrust
form	thud
fortify	thump
fracture	thwack
fragment	tickle
free	tide
freeze	tighten

fret	ting
fright	tingle
frighten	tinkle
fruit	tip
fulminate	tip_over
fund	tire
fuse	tire_out
gag	titillate
gather	topple
generate	torment
get	torture
get_across	toss
get_down	touch_off
get_through	transduce
get_together	transfer
get_up	transform
give	transition
give_away	transmit
gladden	trap
glide	treat
glue	trigger
graduate	trigger_off
grain	trim
granulate	trip
graze	trip_up
grieve	trouble
ground	tug
haemagglutinate	tumble
hale	tumefy
hang	tump_over
hang_up	turn_off
harden	turn_over
harm	twirl
harry	twist
harvest	twitch
hasten	unbotton
haul	unfasten
have	unfold
hearten	unify
heat	unionise
heat_up	unionize
heighten	unite
help	unlax

hemagglutinate	unleash
hit	unlock
hook	unstrain
humidify	unteach
hurl	untune
hurry	untwist
hurt	unwind
hush	unwrap
hush_up	upend
hydrate	uplift
hydrolise	upset
hydrolize	urge
ignite	urticate
immerse	utilise
impact	utilize
impair	vary
impale	vellicate
implement	vex
impose	vibrate
impress	volatilise
improve	volatilize
incite	wake
increase	warm
induce	wash
indurate	waste
infect	weaken
infiltrate	wear
inflate	wear_down
influence	wear_out
injure	wear_upon
inspire	weary
inspissate	weather
instigate	wet
instill	whip
instruct	whiten
intensify	widen
interconnect	wise_up
interlink	work_out
intermix	worry
intoxicate	worsen
intrigue	wound
invade	wreak
	wreck

	wring_from
	yank
	yield

APPENDIX B

ACADEMIC WRITING COURSE SYLLABUS

Course Syllabus for ENGL 101C
Fall 2014 – Section 1
MW, 9.00-9.50am, Pearson 2016; Lab sessions will meet F, 9.00-9.50am, Ross 0037;
Instructor: Aysel Saricaoglu
E-Mail: aysels@iastate.edu
Office: 311 Ross Hall
Office Hours: Mondays 11.00-12.00 & 1.00-2.00pm or by appt.

Goals

Upon completion of this course, students will be able to:

- ✓ Understand the demands of written assignments in their courses
- ✓ Engage in discussion, provide commentary, and contribute to dialogue and consensus in small and large groups
- ✓ Think critically; perform analysis, critique, synthesis, and evaluation
- ✓ Perform close readings of written and multimedia texts
- ✓ Use the process of multiple drafts and feedback to revise and improve composition
- ✓ Be independent writers who can identify weaknesses, evaluate effectiveness, and revise compositions
- ✓ Proofread, edit, and correct drafts for common errors of syntax, mechanics, and word choice

General Requirements (details follow)

- ➢ All 5 major assignments plus the Final Exam must be completed: Missing any results in failing the course.
- ➢ Attendance and participation must be maintained: absences or lack of preparation will lower your grade and can result in a failing grade.
- ➢ The textbook is REQUIRED and each student must have his or her own copy of the textbook to bring to class.
- ➢ Minor assignments practice the skills needed to fulfill major assignments and are required for passing the course.
- ➢ The course website contains essential information and must be actively used.
- ➢ The class format is a workshop style, which means students will arrive prepared to work actively while in class.

Required Course Materials:

Textbook: *Engaging Writing 2, 2nd Ed.*, Fitzpatrick, M., 2011

Website: create an account at http://courses.isucomm.iastate.edu/

Additional material posted for student reading and use.

Major Assignments

Weeks 1 –2 Unit 1
Admirable Characteristics: Expository Writing

Weeks 3 – 5 Unit 2
Identity, Ethnicity, and Culture: Interview and Analysis Report

Weeks 6 – 8 Unit 3
Families in the Movies: Group Critique and Multimedia Wiki

Weeks 9-12 Unit 4
Global Economics: Joining the Discussion with Summary and Response

Weeks 12-15 Unit 5
Current Events: Synthesis of Problem and Solution Articles

Week 16 – Dec 15-19

Final Exam **– REQUIRED**
December 16, 2014: 7.30-9.30am

There are five major writing assignments during the semester plus a written final scheduled by the University (see http://www.registrar.iastate.edu/students/exams/fallexams). To complete the first five, you will submit a first draft, participate in writing workshops and exercises for revising the draft, and submit a final draft for the assignment grade. You may have to do more than one revision before the assignment is complete depending on peer and instructor feedback.

Major Assignment Category	Theme	Due	Weight
#1 Expository Description	Role Models	Week 2	10%
#2 Interview and Analysis	Culture and Identity	Week 4	20%
#3 Group Film Critique Wiki	Families in the Movies	Week 8	20%
#4 Summary and Response	Global Economics	Week 11	20%
#5 Article Synthesis	Global Economics	Week 15	20%
Final Exam – Timed Writing		Dec 15-19	10%
Total Weight for Course Grade	**70%**		

Due dates and detailed requirements of each draft of the major assignments are specified on the assignment sheets. Make sure you have a backup electronic copy of all work before you turn it in to be graded. Major Assignments can be penalized one letter grade (e.g., from B to C) for each class period they are late.

Minor Assignments – Coursework, Attendance, and Participation

Daily coursework and homework are part of what we learn in this course. There is no substitute for doing the work and practicing the skills involved. Coursework consists of:

Textbook and other reading assignments: Readings must be completed before class and reading responses, discussions, and exercises are frequent.

Quizzes and other class activities, discussions, or postings: Your thoughts and commentary are required contributions to the class. Be ready to use the course website or class discussions to interact and contribute. Be prepared for class.

Group and Partner Work: When you are asked to work with your classmates, you are responsible to make it a successful collaboration even when you might prefer to work alone.

Attendance: Much of what we do in English 101 cannot be rescheduled for you individually, made up, or accepted late, regardless of your reason for missing class. Therefore, the Coordinator of 101C mandates that the following policy be enforced in all sections of English 101:

- **Missing more than four classes (MWF)** will lower your grade, and excessive absences can result in a failing grade for the course. Specifically, absences after four (MWF) will reduce your class grade by a step (a B+ becomes a B; a C- becomes a D+), and after a total of eight (MWF) absences, or if you miss more than four (MWF) in a row, you must drop the course or you will receive an F. Class meets for the Final Exam period scheduled by the Registrar's Office the week of December 15-19. See http://www.registrar.iastate.edu/students/exams

- Even with a valid reason to miss, you can accumulate so many absences in a semester that your work and classroom experience are too compromised for you to remain in the class. If you have too many absences to remain in English 101, **you may be advised to drop the class** and take it in a semester when you can attend regularly.
- 3 late arrivals and/or departures count as one (1) absence. Late arrivals not only show disrespect to your teacher and classmates, but they also interrupt the class flow.
- **If you are 15 minutes late** to class, or more, you should still come to participate, but you **will be counted absent**.
- When conferences are scheduled, missing or not scheduling an individual or group conference counts as an absence.
- Your advisor may be notified of attendance or coursework issues that threaten your ability to pass the class or you may receive a poor midterm grade report.

Participation not only includes the above homework and coursework preparation and contributions, but also requires you to use common courtesy, including the following rules:

- You must bring your textbook to class every day.
- You must be prepared to participate in the class activities. 10% of your minor assignments will come from participation based upon daily class work, group work, pair work, and quantity of your oral participation in class activities. Absent students will automatically lose the participation points for that day/those days.
- You must do all the assignments by the due dates. Moodle submissions will be off by the due date. If you miss the due, but still want to get some points from the assignment, you must send your assignment to your instructor through email. For every hour that your assignment submission is late, you will lose 10% of your grade for that assignment. For special conditions, you may contact your instructor and ask for permission for an extension beforehand if you do not want to lose points.
- **NO FOOD** is ever allowed in the media classrooms. You may bring drinks only to the regular classroom.
- All electronic devices including cell phones and electronic dictionaries must be turned off and put away throughout the class period. **Unauthorized use of electronic devices during class counts as an absence**.
- **Use of computers in the classroom is strictly limited** to the classroom activity only. Use of computers during non-designated times or for non-designated purposes results in an absence for the day.
- You are counted as absent if you do not **actively speak, listen, and contribute to class activities IN ENGLISH,** or have not done the reading in advance of class, you do not have your textbook, or are engaged in non-course related activities.

- You are the only one responsible for making sure you know what the assignments and due dates are and for keeping track of whether or not you have done the work. If you don't know or don't understand, you are the one who must find out where to get the answers. KEEP copies of all your work.

Grade Scale Values		
High	**Low**	**Letter**
100%	93%	A
92%	90%	A-
89%	87%	B+
86%	83%	B
82%	80%	B-
79%	77%	C+
76%	73%	C
72%	70%	C-
69%	67%	D+
66%	60%	D
59%	0%	F

Grading and Evaluation

The work required of you at the university is often more difficult than what you did elsewhere. Expectations and standards are also higher since you are now pursuing a university degree in a language other than your native language. Therefore, earning As and Bs at ISU requires strong, consistent effort.

Your assignment sheets in English 101C include evaluation criteria to help you understand the required work. Be realistic about what it takes to get good grades; start assignments early and work steadily to avoid last-minute rushing; make an appointment with your instructor or the Writing and Media Center for support (http://www.dso.iastate.edu/wmc) before you get into difficulties.

Academic Honesty

Plagiarism is using someone else's work, turning in work you did not do, or using someone else's words or ideas and presenting it without citing the source, or using cited sources without sufficient paraphrasing. It is unacceptable and irresponsible. Understanding what constitutes plagiarism and academic dishonesty will help prevent you from committing these acts inadvertently and will strengthen your writing.

Plagiarism is a serious legal and ethical breach, and is treated as such by the university. Detecting plagiarism in English 101 is often easy for an instructor who is familiar with your work, and once detected, it is mandatory that the ENGL 101C Coordinator be notified and consulted about consequences.

You MUST NOT do the following:

- Find some information on an online website, and copy and paste the information you need into your assignment without any references. If you need to use some information from any source, you need to give credit to the author or the source of that information in the appropriate citing format (please check https://owl.english.purdue.edu/owl/resource/560/01/.) Otherwise, you are stealing information and showing no respect to others' work.
- Ask somebody to write any part of your assignment; this is also considered academic dishonesty.

If you have questions about using outside sources, see your instructor or the **Writing and Media Center** before you turn in an assignment. The Library also can help you, http://instr.iastate.libguides.com/content.php?pid=10314.

Diversity Affirmation

Iowa State University does not discriminate on the basis of race, color, age, religion, national origin, sexual orientation, sex, marital status, or disability. An effective learning environment not only values but also welcomes and supports diversity and the open discussion of diverse thought. The environment in the classroom is a safe place to discuss any topic: All perspectives must be allowed. Anyone who negatively impacts the comfort or safety of open discussion will be referred to Student Services for diversity training and support. Your instructor promises to help maintain the comfort and safety of all.

APPENDIX C

ASSIGNMENT SHEET FOR ASSIGNMENT 1

Topic

In both developed and underdeveloped countries, the wealth derived from economic activity is not shared equally among the population. Economic development and globalization of markets may be improving income disparity, or may be causing it to worsen. The environmental cost of development can create more poverty or degrade living standards even while it generates capital. Some say that any economic growth is good, no matter what the environmental or social cost may be or how the profits are distributed. Whatever the case, it is important to look at the causes and effects of economic development and to be able to discuss the factors involved.

Your task is to join the discussion of macroeconomics that we read about in major newspapers. You must analyze the reasons and results given in an article you find, summarize and explain them in your paper, and discuss your own thoughts on the topic. You must EXTEND the discussion by RESPONDING to the reading. **Search in the resources given by your instructor for a recent article (within the last 6 months) about one of the following (or related) areas:**

1. The effects of globalization on a country, region, or city.
2. The reasons why a certain country has a strong or weak economy.
3. The effects of a specific event that brought about positive, negative, or mixed economic results in a country, region, or city. Events can be something like a trade agreement, a banking scandal, a development project, a natural disaster, or anything that causes a major effect in the economy.

Audience and Purpose

We need to know the reasons and consequences given in the article you read. We need you to summarize the main points, and choose specific supporting details from the article to explain those points. We do not want you to copy the words and ideas of the author; **we want you to understand the topic so that you can explain it in your own words.** We also want you to add your thoughts to extend the conversation.

Readings:

Ch. 3, pp. 73-112, and Part II pp. 190-213, *Engaging Writing 2*, 2nd Ed., Fitzpatrick, M., 2011;

Steps to completing this assignment:

– Do the assignments in Ch. 3 and Part II and select an article for summarizing and discussing. Plan the best structure and apply the language and grammar points of Ch. 3 and summarizing of Part II.

- Read the evaluation criteria on this sheet to help you write a successful draft.
- Do all Revision Checkpoint activities in Ch 3 and apply those to the draft. Submit your first draft for Peer Review by due date: **October 27, Monday**
- Conduct a thorough Peer Review of a classmate's paper and submit your comments by: **October 28, Tuesday**
- Read the Peer feedback carefully and REVISE and EDIT the draft to best improve it. Submit first Revision for instructor review by: **November 1, Saturday**
- Read the Instructor feedback carefully and REVISE and EDIT the draft to improve it to match all the evaluation criteria. Submit second Revision for automated feedback by: **November 5, Thursday**
- Read the automated feedback carefully and revise the draft to improve it. Submit your final draft by: **November 10, Monday**

Planning and Drafting - (≈ 700 words)

Following our work in Chapter 3, this assignment focuses on explaining circumstances that lead to specific consequences. Focus your writing on the direct relationships between events and their results so that you explain either the sequence or the main factors of how those results occur. Start with choosing an article that describes the causes and effects of an aspect of global economics that you are very interested in examining. **Remember, it will be very difficult to write this paper if you are not interested in the article you choose, or if you do not understand it very well**. READ and RE-READ the article to digest it before restating it in summary and paraphrase. LEARN HOW TO AVOID PLAGIARISM.

After describing in your own words what the article explains, you need to have a response to add to the discussion. You should extend the discussion on every aspect of the original article. You join the academic community when you contribute your position to the discussion. Your instructor will guide you to appropriate resources for articles. These will be credible world news outlets.

Create a file name with information that will help you keep track. For example: "YOURLASTNAME_Firstname _Assig4_FirstDraft.docx" and then change the FirstDraft to RevisedDraft, etc.

The total grade for Major Assignment #4 is earned as follows:

1. First Draft –10pts based on timeliness and completeness.
2. Peer Review –REVIEWER 10 pts based on REVIEWER input on to another's essay.
3. 2nd Draft – 20pts based on change from 1st Draft, and the application of revision checkpoints and assignment goals.
4. 3rd Draft – 20pts based on change from 2nd Draft.
5. Final Draft - 40pts based on fulfillment of Evaluation Rubric Criteria. TOTAL: 100 pts.

Evaluation and Grading Criteria

Context
Full introduction sets the context (time period, people, place) and introduces the major factors involved (pp. 90-91)
A thesis states the causes and effects of the phenomenon discussed in the essay
Substance
The original article is explained and developed fully with sufficient examples
Information is summarized and paraphrased into your own words, not copied from the original (p. 198 – 213)
Includes an extended discussion of the points made in the original article (p. 196-197)
Unity of topic is maintained by eliminating unrelated material and keeping only connected ideas (pp. 96-99)
Organization
A logical order is followed and cohesion is created– either time, sequence, or order of importance of the factors (p. 94)
Extended commentary is integrated into the paragraphs as a unified part of the whole discussion and conclusion
Style
AVOIDS PLAGIARGISM – (pp. 198-213)
Verb tense is correct and consistent.
Cause and Effect vocabulary structures are used (pp. 103-111 & automated feedback)
Problems with grammar and mechanics are minimal and do not distract the reader.
PROVIDES an ACCURATE APA or MLA citation of the article
Uses required document formatting.

APPENDIX D

ASSIGNMENT SHEET FOR ASSIGNMENT 2

Topic

In Major Assignment #4, you looked at some of the causes and effects of economic activity and the factors involved. Those factors and their effects can present problems for some people or can be solutions for others. Or, those activities can present the possibility for both problems and solutions.

Following the idea, find a new topic on economics. Look for a discussion of what problems or solutions.

Your task is to choose one main article and present a summary of that article and then add 3-4 other articles to the discussion by adding what other news articles say should be done about that topic.

- **Find a main article (published in the last 6 months) to summarize the context and make an introduction to the topic.**
- **Find 3-4 more articles (published in the last 6 months) that discuss the problems and solutions of the same topic. Summarize the main ideas of those articles.**
- **Choose which aspects of the secondary articles to present in this paper. Organize those ideas under clear topic sentences.**
- **Devise a thesis for this paper that names the main problems and/or solutions you will present for discussion here.**

Audience and Purpose

We want to find out more about the issues of your topic by hearing different sides of the conversation. Explain to us what people think should be done about the problems, **and why** they think the solutions are good ideas. We do not want you to copy the words and ideas of the authors; **we want you to understand their positions so that you can explain them to us in your own words.**

Steps to completing this assignment:

- Select your main article and 3-4 supportive articles.
- Submit your first draft for instructor review by: Nov 21, Friday, 11:55pm
- Read the Instructor feedback carefully and REVISE and EDIT the draft to improve it. Submit your second draft for automated feedback by: Dec 3, Wednesday, 11:55pm
- Read the automated feedback carefully and REVISE and EDIT the draft to improve it. Submit your final draft by: Dec 12, Friday, 11:55pm

Planning and Drafting - (≈ 700 words)

This assignment is an extension of MA#4. Start a main article that describes the causes and effects of an aspect of global economics. Provide a summary of the main points of that article. Now, instead of adding your own thoughts and ideas, search for at least two to four more news articles, editorials, opinion essays, and blogs on the same topic that discuss the problems and/or solutions for that topic.

Your body paragraphs will discuss what was reported in the first article and introduce the ideas and opinions from the new articles. You will have to decide the main points you are going to share with us, and organize your paragraphs according to a thesis. You may need to use three or four articles to find enough to say about it, depending on your topic, but you must use at least two in addition to the first one.

Academic writing often asks you to present more than one source to support your writing. Your instructor will guide you to appropriate resources for articles. These will be credible world news outlets. You will need to cite these sources correctly in-text and at the end of the text in a work cited page.

Create a file name with information that will help you keep track. For example: "YOURLASTNAME_Firstname _Assig5_FirstDraft.docx" and then change the FirstDraft to RevisedDraft, etc.

The total grade for Major Assignment #5 is earned as follows:

1. 1st Draft –20pts based on timeliness and completeness.
2. 2nd Draft – 40pts based on change from 1st Draft, and the application of revision checkpoints and assignment goals.
3. Final Draft - 40pts based on fulfillment of Evaluation Rubric Criteria. TOTAL: 100 pts.

Evaluation and Grading Criteria

Context
Full introduction sets the context (time period, people, place), introduces the major factors you will discuss in the paper, and names the article, author, and publication of the primary article. A thesis states the main problems and solutions found in the secondary sources.
Substance
The main points of the articles are explained and developed fully with sufficient examples. Information is summarized and paraphrased into your own words, not copied from the original (p. 198 – 213) Uses secondary sources to discuss the problems and solutions presented by the primary article (p. 196-197) Each secondary source is clearly attributed to its source with a signal phrase and subsequent in-text citations (p. 214) Unity of topic is maintained by eliminating unrelated material and keeping only connected ideas (pp. 96-99)
Organization
A logical order is established for presenting the primary and secondary source information in clear paragraphs. Ideas are presented logically within paragraphs, using cohesion to maintain the logical order. (Controlling idea)
Style
AVOIDS PLAGIARGISM – (pp. 198-213) through proper paraphrasing. Quotations are minimal. Verb tense and word form is correct and consistent. Problems with grammar and mechanics are minimal and do not distract the reader. PROVIDES an ACCURATE APA or MLA citations of all 3-5 articles at the END-OF-TEXT (p. 215) PROVIDES an ACCURATE APA or MLA citations of the articles IN-TEXT wherever source material is used (p. 214) Uses required document formatting.

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