Community College Writers' Metaknowledge of Effective Writing

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Abstract: The purpose of the present study was to examine students' metaknowledge of Procedural Knowledge (effective writing procedures) and Declarative Knowledge (knowledge of the characteristics of effective writing) with community college students through two open-response questions. Additionally, we examined common patterns of writing metaknowledge among responses to determine how these impacted their writing, utilizing the results from Coh-Metrix analyses of their writing samples. A total of 249 students from a large community college in Southwestern United States participated in the study.

Analysis of their results showed participants reported commonly acknowledged ideas regarding metaknoweldge of effective writing in terms of Procedural and Declarative knowledge. Students focused on goal setting/planning, establishing purpose, writing, and revising when discussing Procedural Knowledge of writing and clarity, audience, grammar, and spelling when discussing Declarative Knowledge. A Latent Class Analysis (LCA) of a smaller group, consisting of 146 L1 English students, showed that students' responses regarding Procedural and Declarative Knowledge did not significantly affect written performance, leading us to question students' consistent application or understanding of writing metaknowledge. Instructional implications include encouraging students to examine their metaknowledge of writing and how it directly relates to the written product, to identify misuse or misconceptions and focus instruction.

Keywords: Community college, Writing metaknowledge, Procedural and Declarative Knowledge in writing, Coh-Metrix

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1. Introduction

Academic literacy skills, and writing in particular, are a vital instructional priority for Kindergarten through post-secondary school in the United States (U.S.). Analytical and expository writing are essential to academic learning and career success. For instance, a survey by the Association of American Colleges and Universities found writing was rated as one of the most critical skills for students, necessitating more emphasis on communication skills (Association of American Colleges and Universities, 2011). The National Association of Educational Progress (NAEP) reported that 21% of twelfth grade students performed below the Basic level in writing, while 52% performed at the Basic level (National Center for Education Statistics, 2012). Students at the Basic level of writing have partial mastery of the prerequisite knowledge and skills required to produce proficient work for their grade level. For example, students at the Basic level in Grade 12 would be able to present ideas relevant to the topic, use appropriate supporting detail, remain mostly focused on the topic, and demonstrate some variety in sentence structure, with a few distracting errors. Postsecondary educational institutions are enrolling first year students who are at the Basic level or below who often need developmental English courses. In 2011-12, 41% of students at public 2-year institutions reported taking a remedial course (Skomsvold, 2014), meaning nearly half of students entering community colleges may be ill-prepared to meet academic standards in written assignments.

Students who enroll in community colleges may be pursuing a two-year credential, increased career opportunities, and/or matriculation to a four-year institution yet, poor writing skills hinder matriculation or restrict employment and earnings potential (National Commission on Writing, 2006). Writing is a complex task that necessitates an understanding of mechanics, organization, purpose, audience, genre-specific requirements, as well as fluent language generation and knowledge of subject matter (Chenoweth & Hayes, 2001; Hyland, 2007; McCutchen, 2000; Wong, 1999). To improve one's writing skills and become an effective writer, an awareness of the processes involved and the characteristics of effective writing are beneficial. Skilled writers must also know how to prioritize and execute these tasks. Knowledge or awareness of one's cognitive processes, such as prioritizing and executing tasks, is known as metacognitive knowledge. For writing, this involves knowledge of purpose, process, and self-regulation.

1.1 The Impact of Metaknowledge of Writing

Writing instruction in the United States, prior to the 1980s, focused primarily on product with instructor feedback seen as mainly prescriptive. During the 1970s and 1980s, the focus shifted to understand and include the role of the process of writing, along with product (Pritchard & Honeycutt, 2006). The seminal work of Hayes and Flower (1980) and Scardamalia and Bereiter (1987) strengthened the idea of writing as

a complex, non-linear process. Proficient writers are more knowledgeable about the writing process than their less skilled peers (Graham & Harris, 2005; Olinghouse & Graham, 2009). The National Assessment of Education Progress Data from the 1992 National Assessment of Educational Progress (NAEP) in Writing demonstrated that students averaged higher performance on the NAEP writing assessment when teachers encouraged certain aspects of process writing (Goldstein & Carr, 1996). These aspects included skills such as planning, outlining, defining purpose and audience, using resources other than text, and composing more than one draft.

As writers develop proficiency, their metacognitive knowledge and skills are developed and modified. For example, younger beginning writers, when compared to older, more adept writers, plan, reflect, and revise at a basic level before starting the writing task, focusing on learning to write letters, to spell, and create short texts (Graham & Harris, 2000). By fourth grade, their writing becomes a way of learning about a topic (Berninger, Abbott, Whitaker, Sylvester, & Nolen, 1995). Hence, students transition from learning to write to writing to learn. As they become more proficient, writers increase their skill with the metacognitive self-regulation practices of planning, drafting, revising, and editing; less proficient writers lack this metacognitive knowledge and focus more on form, such as mechanics, and less on function, such as purpose and substance (Lin, Monroe, & Troia, 2007; Saddler and Graham, 2007). Increasing students' writing knowledge can lead to improved writing performance (Donovan & Smolkin, 2006; Fitzgerald & Markham, 1987; Saddler & Graham, 2007). Schunk and Swartz (1993) found that a modeled strategy instruction, coupled with goal setting, improved elementary children's writing skills, self-efficacy, and maintenance, and generalization of the strategy. Graham and Perin's (2007) meta-analysis, intended for identifying effective instructional practices for teaching writing to adolescents, yielded several recommendations to include: teaching strategies for planning, revising, and editing their compositions; encouraging adolescents to work together to plan, draft, revise, and edit; and, providing good models for writing.

Studies examined at the postsecondary level include the impact of metacognitive knowledge as well as students' beliefs with regard to the writing process and product, task perception, and rhetorical choices. Students who composed one or more drafts were more knowledgeable about their topic and were more successful writers (Albin, Benton, & Khramtsova, 1996; Mahalski, 1992; Norton, 1990), while those with a deep approach to writing revised more, recognized the role of audience, displayed an awareness of the writing process and its relation to the product, and self-reported as reflective and metacognitive (Lavelle & Zuercher, 2001). Beach (1976) studied revision in the writing of undergraduate pre-service English teachers and classified them as either extensive revisers or non-extensive revisers. The extensive revisers expected that their revisions would make a significant difference in the substance of the first draft and viewed their revisions more holistically, incorporating revisions across all drafts. In contrast, the non-extensive revisers made minor revisions to form and individual sentences and viewed each draft as a separate text. Studies of college freshman found

they comprehended the revision process as fixing errors rather than an opportunity to re-work content, while more advanced writers viewed revising as an opportunity to discover content, refine their argument, and change meaning (Faigley &Witte,1981; Sommers, 1980).

Studies concerning metacognitive knowledge of the planning process found successful writers used several planning strategies throughout the writing process (Kaufer, Hayes, & Flower, 1986) and that their conceptualization of the writing process and the type and purpose of the strategies influenced writing quality (Campbell, Smith, & Brooker, 1998; Mahalski, 1992). An orientation towards audience, in addition to the use of revising and reviewing, has also been positively correlated with writing performance in college undergraduates (Sanders-Reio, Alexander, Reio, & Newman, 2014). Students with higher Metacognitive Strategy Knowledge (MSK) demonstrated better planning, selection of strategies and application of those strategies successfully in their writing, though self-reported quality and diversity of strategy use were not associated with students' implicit theory, measured by responses regarding their own writing ability (Karlen & Compagnoni, 2017).

Negretti's (2012) research with community college writers suggested a link between task perception and conditional metacognitive awareness (the "why" and "when" of writing strategy use) and that self-evaluation of writing aided students' ability to adapt their skills to their own writing needs as well as rhetorical requirements. Student writers perceived that their writing strategies and quality improved and were more likely to make revisions after receiving automated feedback and recommendations (through an Intelligent Tutoring System), while teaching planning, drafting, evaluating, and revising strategies, along with self-regulation strategies, enhanced overall quality of writing and increased students' beliefs about the importance of substantive factors (MacArthur, Philippakos, & Ianetta, 2015; Roscoe, Snow, & McNamara, 2013). Students' beliefs have demonstrated an influence on writing quality and the writing process, (White & Bruning, 2005) and were found to predict differences in text quality, the extent of revision, and the development of students' understanding during writing (Baaijen, Galbraith, & de Glopper, 2014). This latter study supported Galbraith's dual-process model (2009) which proposes that effective writing depends on a combination of two unique processes, high-level problem solving and spontaneous text production, and that writing beliefs influence how these two processes are utilized. By contrast, students' beliefs about good writing, specifically regarding revision (recursive writing) and accurately portraying source knowledge (transmission), were found to have no significant effects on writing quality (Johnson, Wilson, & Roscoe, 2017). Overall, however, the literature demonstrates college students' metacognitive knowledge, particularly substantive procedures, as well as their beliefs about writing, have distinctly impacted their writing.

The aim of the current study was to examine what community college students' know about effective writing. We use the term metaknowledge of writing to portray the data collected on students' knowledge of effective writing. Few studies focus solely on

community college students and their metaknowledge of writing, categorized in terms of substantive and production procedures. Further, our approach was unique in that we wanted to discern the common patterns of writing metaknowledge among their responses (idea units) and determine how these impacted their writing, utilizing the results from Coh-Metrix analyses of their writing samples.

For the purposes of this study, metaknowledge of effective writing will be discussed in terms of Procedural Knowledge, the knowledge necessary to carry out the procedure or the process of writing, and Declarative Knowledge of the characteristics of effective writing such as the writer's knowledge of self, the task, and the strategies needed to successfully complete the writing task (Harris, Graham, Brindle, & Sandmel, 2009). Within these two types of knowledge, we discuss substantive procedures (the process in writing) and production procedures (the form of writing).

The following research questions guided this study:

1. What is community college students' metaknowledge regarding effective writing?
2. What are the common patterns of metaknowledge among groups of community college students who speak English as their first language (L1 English)?"
3. If L1 English students' metaknowledge can be classified into different groups, do the patterns of metaknowledge in each group impact the written product?

In light of concerns surrounding secondary and postsecondary writing aptitude, we investigated all students' reported metaknowledge of effective writing. We then focused solely on the writing of a sub-group of L1 English students, to investigate common patterns of metaknowledge and how these affected their writing. We chose to focus on L1 English language students for the second and third research questions in keeping with the perspective of L1 English language writing in our literature review and to limit the influence of the effects of L2 English language writing on our results.

2. Methods of Discerning Patterns of Metaknowledge and their Impact on Writing Production

2.1 Participants

Participants were recruited from 15 classrooms (*N*= 249) in the disciplines of Child Development and Teacher Education at a large community college in the Southwestern United States. This was a largely female population, many of whom worked or intended to work in early childhood education or planned to become teachers at the elementary, middle, and secondary levels, and who were enrolled in courses that required college-level academic writing skills. Some were either currently enrolled in or had completed English Composition I, while others had not yet completed it.

2.2 Materials and Procedure

Data collection took place during the school year and involved one set of materials and uniform procedures for use during class time. Writing samples, collected by the discipline's instructors at the beginning of the semester, were required as part of a one-hour, in-class assignment. After the samples were completed, a brief biographical survey was distributed, designed to solicit additional information that would determine students' classification as L1 English or L2 English students, to address our second and third research questions. An explanation of the study, directions, the survey, the writing assignment prompt, and two open-response questions were read aloud by the researcher or class teacher, using a script; which was available simultaneously to students in written form. The participants wrote their responses to all questions on paper provided by the researcher.

After identification of surveys as L1 or L2 English language students, the corresponding writing samples were typed into Word documents, and entered individually in the online tool, Coh-Metrix, for analysis. Coh-Metrix is an online tool used to analyze the linguistic features of text (McNamara, Graesser, McCarthy, & Cai, 2014). The tool is available for the public to use online and free of charge (available at http://tool.cohmetrix.com). Although Coh-Metrix is capable of producing 108 writing-related indices on a sample of text, we focused on 16 Coh-Metrix variables previously validated for distinguishing lexical, syntactic, and cohesion characteristics of L1 English and L2 English students' writing and characteristics commonly associated with effective writing, in addition to the Coh-Metrix variable of word count. A number of studies validate the ability of the Coh-Metrix indices to process and analyze lexical diversity, cohesion and syntactic complexity in L2 reading texts, distinguish the linguistic features of L2 students' writing, and detect the differences in high and low cohesion texts (Crossley, Salsbury, & McNamara, 2009; McCarthy & Jarvis, 2010; McNamara, Louwerse, McCarthy, & Graesser, 2010; McNamara, Ozuru, Graesser, & Louwerse, 2006).

The two open-response questions were designed to assess students' metaknowledge about effective writing. These questions were initially designed by Graham, Schwartz, and MacArthur (1993) and similar to those used in previous studies to examine the writing knowledge of elementary students (Graham et al., 1993; Olinghouse & Graham, 2009; Zumbrunn & Bruning, 2012). The questions were: (1) What do effective writers do when they write? and (2) Suppose you were the teacher of this class today and a student asked you "What is effective writing"? What would you tell that student about effective writing? Each question was analyzed separately and responses were individually read. Each response was divided into idea units which are specific unique ideas within each student's response (Graham et al., 1993). For example, the response "Effective writing is how to write down your ideas or answers to a question in the best way possible" was equal to one idea unit. The response "In other words, it's worked on and revised writing that has taken time and not just put together in the last minute" was divided into two idea units labeled (a) Reviewing, Evaluating, and Revising, and (b)

Time and Effort. In some cases, a student expanded upon an idea unit without adding any additional information and, therefore, the response was not scored as a new idea. For example, "It's a way to keep your paper in a structural mode rather than jumping from one idea to the next and then back to the same idea" was scored as a single idea unit. This scoring system was based upon those developed and used by Graham et al. (1993) and subsequently used by Olinghouse and Graham (2009).

Table 1: Categories and Subsets for Question Responses

Category	Definition/Example
I. Production Procedures	Responses referring to the written product
Grammar and Spelling	"…proper formatting and grammar"; "using correct spelling and grammar"
II. Substantive Procedures	Responses referring to the writing process
Information Generation	Responses referring to brainstorming and information/notes gathered beforehand
Research	"…well thought-out, researched"; "I think effective writers do research. Gather as much material as needed"
Goal Setting/Planning	Responses referring to arrangement of content or establishing goals
Purpose	"…every time they write, their purpose should be strong and clear"
Planning and Organizing Thoughts	"Map out writing"; "Multiple processes you can use to organize your information, such as outlines"
Writing and Drafting	Responses referring to the act of writing
Clarity and Focus	"Be clear on what you are saying"; "Focus on one point at a time"; "…should flow from one topic to another"
Audience	"…and good writers engage the audience"; "think about who the reader is going to be"
Expression of Thoughts and Emotions	"It's all about expressing how you feel"
Details and Descriptions	"They gather ideas first, get details second…"
Time and Effort	"This may take a lot of time and effort in reading, writing, editing"
Reviewing, Evaluating, Revising, Re-read	Responses referring the process of revising
III. Other	Responses unrelated to questions and not scored

Note: Categories adapted from Graham et al., 1993

As themes emerged from the idea units, a list was created. Two trained raters, one a graduate student in English, the other a community college professor, independently read a random sampling of responses, created themes, and compared their themes with those of the primary researcher. The themes were then refined and developed into categories. For the purposes of comparison and reporting, the themes were classified into the categories of substantive and production procedures, used by Graham et al. (1993) and shown in Table 1. Students' responses in the current study necessitated the addition of Purpose under Goal Setting/Planning and Audience under Writing and Drafting. The category of Other was assigned to responses that could not be classified in any other category, such as responses related to characteristics of a story or feelings about writing.

All idea units were then coded, according to category names and were evaluated by the raters. A training session for a set of twenty-five randomly-chosen responses was completed to ascertain each rater was in agreement with the interpretation of the codes. When raters disagreed on a code, reasons for their disagreements were discussed and rectified, identifying and correcting all discrepancies. The reasons for the discrepancies included problems such as unclear category definitions or varying perspectives on the classification of an idea unit. Upon completion of coding all idea units, inter-rater reliability was established using Cohen's Kappa to increase confidence in the coding results and to determine raters continued to correctly interpret the coding system. The Kappa coefficient was a value of .90 for Questions 1 and 2, indicating a high level of inter-rater agreement.

3. Results of Analyses

3.1 Percentage Distribution for Question Responses

The first part of our analysis depicts the results of students' responses regarding metaknowledge of effective writing, in terms of Procedural Knowledge and Declarative Knowledge.

Procedural Knowledge

Questions 1, "What do effective writers do when they write?" sought information on students' metaknowledge of effective writing procedures. Responses were categorized as either substantive factors that involved the process of writing, or production factors that focused more on mechanical processes such as spelling and grammar (see Table 2). The category of "Other" contained 5% of the responses and included idea units such as "love writing", "highlights", and "reads context clues".

Table 2: Response Frequency for Question 1: Procedural Knowledge

Response Category	Frequency	Percentage
I. Production Procedures		
Grammar and Spelling	18	3
II. Substantive Procedures		
Information Generation	2	0.6
Research	9	2
Goal Setting/Planning	135	26
Purpose	57	12
Writing and Drafting	162	30
Audience	50	7
Revising, Review, Editing	70	14
III. Other	23	5

Declarative Knowledge

The second question was "Suppose you were the teacher of this class today and a student asked you 'What is effective writing?' what would you tell that student about effective writing?" This question probed students' metaknowledge of Declarative Knowledge of the characteristics of effective writing such as the writer's knowledge of self, the task, and the strategies involved with generating effective writing (see Table 3).

Table 3: Response Frequency for Question 2: Declarative Knowledge

Response Category	Frequency	Percentage
I. Production Procedures		
Grammar and Spelling	61	13
II. Substantive Procedures		
Goal Setting/Planning	46	9
Purpose	32	7
Writing and Drafting		
Clarity and Focus	95	20
Audience	84	18
Expression of Thoughts and Emotions	44	9
Details and Descriptions	19	4
Time (amount and how used) and Effort	24	4
Revising, Review, Editing	31	7
III. Other	30	5

The category of "other" contained 6% of the responses and included idea units such as "showing illustrations or giving a guide regarding the topic", "enjoy writing", "almost like painting and not everyone can do it", and "proud of the final draft".

As presented in Table 4, the 3-class models for both Procedural and Declarative Knowledge models are suggested. Specifically, based on the LMR results, the 3-class model was a better fit than the 2-class model (Procedural Knowledge: $\Delta 2LL$=20.94, p =.03<.05; Declarative knowledge $\Delta 2LL$=23.64, p =.006<.05). However, no evidence suggested any improvements when adopting the 4-class model to replace the 3-class model (Procedural Knowledge $\Delta 2LL$=9.94, p =.599>.05; Declarative Knowledge $\Delta 2LL$=-0.80, p =.527>.05). Also, the 3-class models had the lowest adjusted BIC values, indicating a better fit than other models. Therefore, we concluded that the two 3-class models may be the most appropriate and efficient models to choose.

Table 4: Determining Number of Classes

	For 1 (H0) Versus 2 Classes	
	Procedural Knowledge (Q1)	Declarative Knowledge (Q2)
Δ-*2LL*	52.96	43.62
P-Value of Δ-*2LL*	.003	.11
Adjusted BIC (1-class)	1074.09	1352.97
Adjusted BIC (2-class)	1038.37	1328.66
	For 2 (H0) Versus 3 Classes	
	Procedural Knowledge (Q1)	Declarative Knowledge (Q2)
Δ-*2LL*	20.94	23.64
P-Value of Δ-*2LL*	.03	.006
Adjusted BIC (3-class)	1029.07	1324.50
	For 4 (H0) Versus 3 Classes	
	Procedural Knowledge (Q1)	Declarative Knowledge (Q2)
Δ-*2LL*	10.9	-0.80
P-Value of Δ-*2LL*	.599	.527
Adjusted BIC(4-class)	1035.28	1347.44

Figures 1a and 1b show the distribution of idea units for Procedural and Declarative Knowledge models. The Y-axis reflects the idea unit categorizations and the X-axis indicates the probabilities (as reflected by percentages) of students reflecting that idea unit in their responses. For Procedural Knowledge (Figure 1a), by observing the trends,

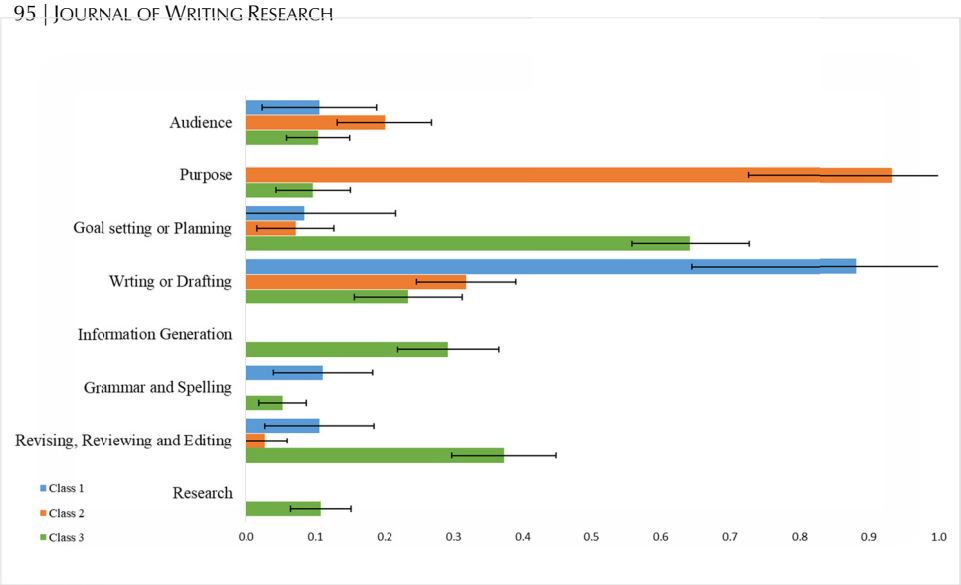

Figure 1a. Plot of class membership as reflected by the Procedural Knowledge question.

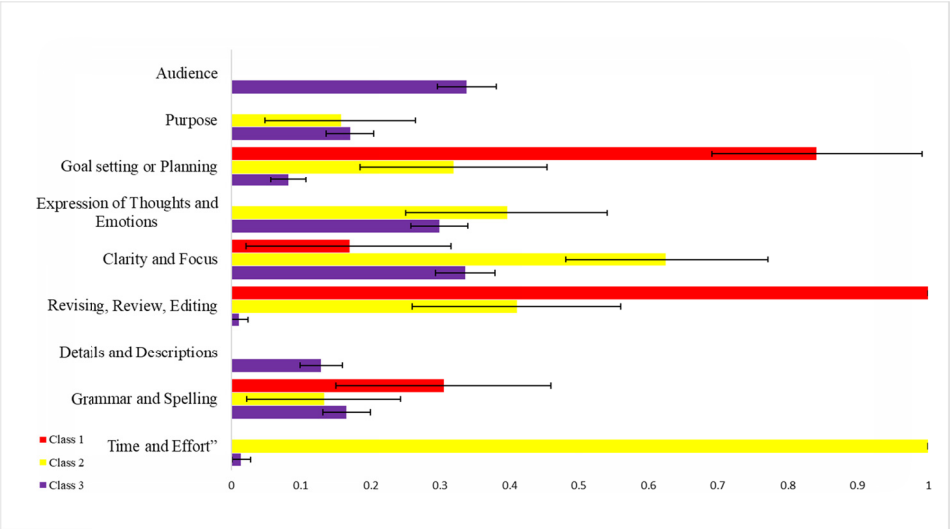

Figure 1b. Plot of class membership as reflected by the Declarative Knowledge question.

we named the three classes as "Writing/Drafting oriented" (class 1), "Purpose oriented" (class 2) and "Plan and Review oriented" (class 3); each class contains 31, 49 and 66 students, respectively. Class 1--"Writing/Drafting oriented group" showed a low probability of reflecting other writing metaknowledge ideas. Class 2---"Purpose oriented

group" had a low probability of reflecting Plan or Review and had 0 probability of reflecting Grammar/Spelling. Class 3---"Plan and Review oriented group" demonstrated little attention for Purpose or Grammar/Spelling.).

For Declarative Knowledge, classes were labeled as Class 1: "Plan and Review oriented", Class 2 "Time and Clarity oriented", and Class 3 "Audience oriented", and contained 10, 13 and 123 students, respectively. In Class 3, the "Audience oriented group", the Audience idea unit was primarily reflected when compared to other classes. Also, few members in the "Audience group" attended to Time or Review. Class 2, the "Time and Clarity oriented" group who showed Time as important also tended to focus on Clarity and Focus. Moreover, Class 1, the "Plan and Review oriented" group, focused on Plan and Review as important, yet did not attend to Purpose, Expectation, Detail and Time.

3.2 Membership and the Written Product

We also applied the BCH approach (Bolck, Croon, & Hagenaars, 2004) to analyze how latent class membership influences the written product. The BCH approach considers the measurement error of each class when estimating the means for a new variable that was not used in the initial classification, and performing multiple group (class) mean comparison analysis. Table 5 presents the estimated means and 95% CIs of the 15 writing performance measures. Most comparisons generated nonsignificant results (i.e., *p*s > .05). Only two comparison results were significant: among writing procedure responses, the Writing and Drafting oriented classes group had a notably lower amount of words used before the main verb, when compared with their counterparts in the Plan and Review group (Mean = 3.05 vs. Mean =3.81; chi-square=6.55; *p*=.001). In the Declarative Knowledge groups, student responses that were more Time and Clarity oriented had a significantly lower rate of overlapping nouns when compared with the group whose responses were more Audience oriented (Mean= 0.13 v. Mean=0.20; chi-square=8.15; *p*=.015).

4. Discussion

The current study investigated community college students' metaknowledge of what constitutes effective writing, in terms of Procedural and Declarative Knowledge of writing. Results for each research question are discussed below.

With regard to our first research question, students' metaknowledge of Procedural Knowledge, answers focused primarily on the Writing/Drafting act itself, followed closely by Goal Setting/Planning. Revising/Reviewing/Editing and establishing a Purpose were somewhat important to students, yet revision features prominently in the writing models of Hayes and Flower (1980), Scardamalia and Bereiter (1987), and Kellogg (2008) and is seen as fundamental to the entire writing process. In this study, it was unclear from students' responses whether they perceived the Revising/

Table 5: Estimated Means (with 95% CI) of Distal Outcome Variables in Different Classes

	Metaknowledge of Procedural Knowledge (Q1)			Metaknowledge of Declarative Knowledge (Q2)		
	Writing Oriented (*N*=31; 21.23%)	Purpose Oriented (*N*=49; 33.56%)	Plan /Review Oriented (*N*=66; 45.21%))	Plan/Review Oriented (*N*=10; 6.85%)	Time/Clarity Oriented (*N*=13; 8.90%)	Audience Oriented (*N*=123; 84.25%)
Referential Cohesion Measures						
Noun overlap in adjacent sentences	0.21 [0.14, 0.28]	0.23 [0.19, 0.27]	0.25 [0.20, 0.30]	0.27 [0.15, 0.39]	0.19 [0.13, 0.25]	0.24 [0.21, 0.26]
Noun Overlap in all sentences	0.19 [0.13, 0.26]	0.20 [0.17, 0.23]	0.19 [0.16, 0.23]	0.20 [0.14, 0.25]	0.14 [0.10, 0.17]	0.20 [0.18, 0.22]
Argument overlap, adjacent sentences	0.68 [0.63, 0.73]	0.69 [0.65, 0.73]	0.69 [0.64, 0.75]	0.67 [0.57, 0.76]	0.62 [0.52, 0.72]	0.70 [0.67, 0.73]
Overlap, all sentences	0.63 [0.58, 0.69]	0.62 [0.59, 0.66]	0.62 [0.57, 0.67]	0.60 [0.51, 0.68]	0.61 [0.53, 0.69]	0.63 [0.60, 0.65]
Lexical and Word Information						
Lexical Diversity	0.54 [0.52, 0.56]	0.52 [0.51, 0.53]	0.51 [0.49, 0.52]	0.52 [0.47, 0.56]	0.52 [0.48, 0.56]	0.52 [0.51, 0.53]
Textual Lexical Diversity	77.00 [71.14, 82.85]	75.39 [70.78, 79. 80]	74.20 [70.15, 78.26]	75.79 [66.18, 85.40]	78.47 [68.93, 88.01]	74.85 [72.31, 77.39]
Pronouns	168.13 [153.82, 182.872]	157.22 [148.74, 165.70]	153.63 [145.53, 161.73]	146.06 [122.35, 169.78]	154.653 [136.29, 173.02]	159.24 [154.13, 164.36]
Word Frequency, all	3.10 [3.07, 3.13]	3.12 [3.10, 3.12]	3.12 [3.098, 3.142]	2.55 [2.45, 2.65]	2.51 [2.40, 2.62]	2.55 [2.53, 2.57]
Familiarity, content words	584.58 [582.72, 586.43]	583.12 [581. 63, 584.16]	584.00 [582.53, 585.43]	582.21 [577.49, 586.94]	583.33 [579.66, 586.99]	584.00 [583.21, 584.80]
Word Meaningfulness, content words	430.05 [425.13, 434.96]	432.48 [429.00, 435.96]	432.00 [428.80, 435.21]	432.94 [424.27, 441.61]	430.303 [425.56, 435.05]	431.78 [429.72, 433.84]
Word Polysemy	4.50 [4.30, 4.70]	4.47 [4.37, 4.57]	4.64 [4.50, 4.79]	4.86 [4.43, 5.29]	4.54 [4.28, 4.79]	4.53 [4.46, 4.61]
Syntactic Complexity and Pattern Density						
Number of words, left-embedded	3.05 [2.66, 3.43]	3.27 [2.63, 3.90]	3.81 [3.44, 4.19]	3.31 [2.82, 3.803]	3.64 [3.11, 4.16]	3.46 [3.16, 3.75]
Number of modifiers in noun phrase	0.61 [0.56, 0.67]	0.68 [0.63, 0.72]	0.67 [0.64, 0.71]	0.70 [0.60, 0.790]	0.69 [0.63, 0.76]	0.66 [0.63, 0.68]
Noun phrase density	358.80 [348.48, 369.12]	362.46 [355.47, 369.45]	362.37 [355.17, 369.58]	354.74 [334.22, 375.26]	368.25 [353.25, 383.25]	361.50 [357.31, 365.68]
Verb phrase density	257.09 [242.03, 272.18]	252.28 [242.65, 261.91]	247.04 [238.91, 255.18]	248.97 [226.41, 271.53]	234.38 [220.59, 248.16]	252.78 [247.20, 258.36]

Estimated Means (with 95% CI) of Distal Outcome Variables in Different Classes

Rewriting/Editing process as a distinctly different process, occurring only at the end of writing, or, as part of the on-going process of writing.

The majority of students' responses regarding Procedural Knowledge, "What do effective writers do when they write?" were categorized as Substantive Procedures (goal setting and planning, drafting, reviewing and revising) as opposed to Production Procedures (grammar and spelling). These responses are part of the knowledge transformation phase (Scardamalia & Bereiter, 1987), where writing is like a problem to solve and reviewing, planning, and strategy use are elemental to the writing process. The writer's knowledge is retrieved and then transformed, text is generated and reviewed, using the writer's own knowledge of a given writing task. Grammar and Spelling were rarely mentioned, supporting the notion that these are insignificant for more experienced writers, as opposed to younger beginning writers who stress form and appearance (Graham et al.,1993; Lin et al., 2007).

Students' responses to the question regarding Declarative Knowledge, "What is effective writing"? centered on the act of Writing/Drafting itself with an emphasis on the subsets of Clarity and Focus and Audience. Knowing or addressing one's Audience was also found to be a significant response category (18%). Audience, along with purpose and genre, is a component of rhetorical context in a primary trait analysis, used by some instructors to evaluate students' papers (Leahy, 2002). The writer must understand who the audience is and what they know and believe. Audience orientation is seen in both the Hayes and Flower model (1980) and in Kellogg's (2008) knowledge crafting, though in the later it is normally associated with older, more experienced writers, as the ability to read the text from another's perspective is quite different from simply being aware of an imagined audience. However, attempts to craft an ideal paper from the audience or reader's perspective has predicted the writing of undergraduate students and has been associated with expert writing practices (Lavelle & Zuercher, 2001; Sanders-Reio et al., 2014).

Grammar and Spelling, as well as Expression of Thoughts and Emotions, were reported as somewhat important, while processes that take place before and after, such as Planning and Revising, were much less important. Grammar and Spelling was the third highest response under Declarative Knowledge, suggestive of students' focus on the finished piece, effectively written and polished and compelling more grammar and spelling corrections. This may also represent students' generic concern with a completed, graded writing assignment where grammar and spelling errors are tallied by instructors, and/or an emphasis by instructors on grading rubrics that may focus less on writing as a means of expressing meaning and more as an exercise in mechanics (Melzer, 2009).

Overall, this cohort of students' metaknowledge of both Procedural and Declarative Knowledge seems to align with previous findings in the literature, though regarding Declarative Knowledge, they may be overly focused on Production Procedures with insufficient emphasis on Revising, Review, and Editing. Again, this focus may be a result of concern with the graded product.

The second research question explored common patterns of metaknowledge among groups of community college students who speak English as their first language (L1 English). Students' responses to Procedural Knowledge resulted in three distinct classes. Students in the Writing/Drafting oriented group (Class 1, n= 31), tended to reflect upon writing or drafting knowledge with no attention to Purpose or Research. This scant attention to Research may be attributed to students' conceptualization of "writing" in response to these questions. Responses indicated some students addressed the concept of writing as persuasive, while some saw it as creative, and a few others as research-based. Only 2% of responses were categorized as Research when students answered the question "What do effective writers do when they write?" (see Table 2). The second highest membership of students, the Purpose-oriented group (Class 2, n= 49) showed little concern with Planning and Reviewing, with no regard to Grammar/Spelling. The majority of students were members in the Plan and Review oriented group (Class 3, n= 66) and demonstrated little attention to Purpose and Grammar/Spelling. Previous studies have indicated that students at the level of Knowledge Transformation may perceive review to be more global, refining content and meaning, as opposed to local, or a focus on spelling/grammar (Faigley & Witte, 1981; Sommers, 1980). Students' tendency toward Plan and Review may indicate they see these as integral to the writing process.

Students' responses to Declarative Knowledge were also divided into three classes. First, a Plan and Review oriented group (Class1, n= 10) focused on Plan and Review as important, while Purpose, Expectation, Detail and Time were not. The Time and Clarity oriented group (Class 2, n= 13) attended to Time as important as well as Clarity and Focus. Most students tended toward the Audience oriented group (Class 3, n= 123), attending very little to Time or Review. Students' responses here revealed the majority of students oriented toward Audience, a factor outside of the writer that influences writing (Hayes & Flower, 1980), associated with older, more experienced writers and with expert or deep writing practices (Kellogg, 2008; Lavelle & Zuercher, 2001). Writing ability and experience with writing were not measured in this study and these may have contributed to students' responses.

Our third question examined whether L1 English students' metaknowledge can be classified into different groups, and, if so, do the patterns of metaknowledge in each group impact the written product (the Coh-Metrix variables commonly associated with effective writing). Only one set of comparison across classes was significant in each model. However, as we conducted separate mean comparison tests for each distal outcome, the significant results may have been caused by multiple testing errors. Therefore, our primary conclusion was that the metaknowledge variations did not impact students' written product.

Most important among the findings for our final research question was the lack of significant effect on the written product. Our results demonstrated that for this population, primarily female education students attending community college, students' metaknowledge of Procedural Knowledge and Declarative Knowledge did not appear

to significantly impact the written product. Previous studies that have examined the effect of college students' writing beliefs have demonstrated an impact on their writing (Campbell, Smith, & Brooker, 1998; Karlen, & Compagnoni, 2017; Mahalski, 1992; White & Bruning, 2005) and predicted differences in text quality (Baaijen, Galbraith, & de Glopper, 2014). These studies used human raters to evaluate students' written product and/or various inventories to survey students' beliefs or knowledge of writing strategies. By contrast, our study did not directly survey established beliefs or conceptions about writing, which may have allowed for more freedom and variety in students' responses. Given 2 question prompts regarding writing metaknowledge, students in this study generated their own ideas about writing, rather than utilizing pre-established inventory responses. This resulted in a wide variety of categories, which were then coded and categorized as either Procedural or Substantive knowledge. Our study also specifically focused on participants' metaknowledge of effective writing in terms of Procedural and Declarative Knowledge and the relationship of these to the written product, in contrast to those studies which focused on participants' transactional beliefs about the process of writing and transmissional beliefs about the source of the content and the relationship of these beliefs to writing performance (Baaijen, Galbraith, & de Glopper, 2014; White & Bruning, 2005).

Our study took the latent class analysis approach and examined these categorized responses for common patterns shared by a sub-category of L1 English students, then assessed the impact of these patterns of metaknowledge on students' written product using the BCH method. These procedures controlled the measurement errors while regression analyses as used in previous studies did not. Moreover, the students' written product was not analyzed by human raters for quality; rather, each writing sample was analyzed for the variables or characteristics commonly associated with effective writing, using an online automated writing evaluation tool, Coh-Metrix, with either frequency counts, word types, or number of words before the main verb. The measures of writing beliefs and products, coding procedures, evaluation instrument as well as the data analyses methods are not the same when compared with previous studies and may be the reasons for our different conclusions. However, as we have controlled human and measurement errors, our study should offer useful implications to future research. Thus, although students reported relevant Declarative Knowledge and Procedural Knowledge, no relationship was demonstrated between their patterns metaknowledge and the chosen Coh-Metrix variables commonly associated with effective writing such as: referential cohesion, lexical diversity, syntactic complexity and pattern density (see Table 5 variables).

5. Future Research and Implications

Future research should attempt to replicate the study with a variety of cohorts, to include those who do not speak English as their first language (L1), utilize other written assignments, and consider the addition of a third question regarding conditional

knowledge, or the "why" of their written response. These "why" responses could then be compared with those of Procedural and Declarative Knowledge to provide a richer, deeper picture of the students as writers and the reasons behind their responses of writing metaknowledge. This could be done in follow-up interviews which may provide answers not constrained to writing skill or time.

Students' responses of writing metaknowledge revealed responses similar to those found in the extant literature investigating college writers, yet, contrary to the majority of those findings, students' responses had little impact on their writing. Findings from our study provide insight into a cohort of community college students' writing metaknowledge, the common patterns among their responses and the lack of influence this metaknowledge appeared to have on written performance. Awareness and application of metacognitive strategies have demonstrated a significant role in students' writing, but may not have the long-term influence or benefit that instructors ultimately wish to see. Instructors may wish to broaden instruction, to determine and if and how students are applying and connecting their metaknowledge of writing, and repeatedly model recognition and application of strategies during the writing process. The development of conditional metacognitive awareness was found to be critical to self-regulation and students' development of individual writing approach (Negretti, 2012). Therefore, in replication of Negretti's study, journal writing may well provide keen insights into community college students' metaknowledge of Procedural and Declarative Knowledge in writing and its impacts on writing for academic and personal purposes. In the implicit theory of writing, with the belief that an ability can be improved, a student may feel more control over their own learning and, consequently, increase engagement with their writing and application of metacognitive strategies (Karlen & Compagnoni, 2017). Encouraging students to examine their writing metaknowledge and how this relates to their written performance could be beneficial for identifying misconceptions or misuse of metacognitive strategies, and, therefore, focus instruction. Teaching planning, drafting, evaluating, and revising strategies and automated, specific feedback (through an Intelligent Tutoring System) may also contribute to improving students' revisions and writing quality, as well as increase their belief in the use of substantive procedures (MacArthur, Philippakos, & Ianetta, 2015; Roscoe, Snow, & McNamara, 2013). Ultimately, community college students are learning to write as they write. The challenge for instructors is to ascertain whether students' metaknowledge about effective writing is accurate and support students as they transfer effective writing metaknowledge to their written work, while developing their use of writing to reflect upon and assimilate their learning.

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