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Critical thinking or critical creativity: applying De Bono's six thinking hats to speech-language pathology education and practice.

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CRITICAL THINKING OR CRITICAL CREATIVITY: APPLYING DE BONO'S SIX THINKING HATS TO SPEECH-LANGUAGE PATHOLOGY EDUCATION AND PRACTICE

By

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April 8, 2022
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DEDICATION

To my husband, Lucas, for your endless support, and to my parents for instilling in me the value of education.

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ABSTRACT

CRITICAL THINKING OR CRITICAL CREATIVITY: APPLYING DE BONO'S SIX THINKING HATS TO SPEECH-LANGUAGE PATHOLOGY EDUCATION AND PRACTICE

Samantha Hahn

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Decision-making is a fundamental skill that health care professionals use daily which involves the interaction of many cognitive systems. Critical and lateral thinking are two approaches to decision-making often cited in literature. Critical thinking emphasizes reasoning and systematic analyzation, while lateral thinking encompasses imagination and creativity. Speech-language pathology (SLP) is a prime example of a profession that amalgamates creative processes with organized methodologies. Edward de Bono described six styles of lateral thinking – each style is equated to a colored "hat". This study sought to determine if an association exists between a given SLP student's level of clinical experience and their lateral thinking style. This study used a survey to classify students' preferred lateral thinking style based on de Bono's six hat colors. Students' level of clinical experience was measured by their number of observation hours and clinical clock hours (simulated and/or face to face). The results evidenced statistically significant associations between students' average observation hours and

clock hours and both emotional (red hat) and logical/negative (black hat) lateral thinking styles, as well as between students' average clinical clock hours and the process/control (blue hat) lateral thinking style. The purpose of this study was to begin the conversation of the potential value of lateral thinking for SLP education and practice. These results reveal patterns that may be worthy of additional research.

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CHAPTER 1

INTRODUCTION

Decision-making is a fundamental skill that professionals use on a daily basis. The processes are complex with tenets that require identification of the problem, generating alternatives, evaluating alternatives, choosing an alternative, implementing the decision, and evaluating the effectiveness of the decision (Lunenburg, 1987). There are many cognitive and strategic practices associated with successful decision-making (Dean & Sharfman, 1996). Two approaches that are often cited in the literature are critical thinking and lateral thinking (Hauser & Feinberg, 1977; Lamb et al., 2019). Critical (or vertical) thinking emphasizes reasoning and systematic analyzation, while lateral thinking encompasses imagination and creativity (Hauser & Feinberg, 1977). Critical and lateral thinking are necessary systems in higher-level thinking (Lamb et al., 2019). While both approaches are valuable in the decision-making process, their tenets may be used in combination. Speech-language pathology (SLP) is a prime example of a profession that amalgamates creative processes with organized methodologies (Neate et al., 2019). Speech-language pathologists (SLPs) work with people throughout the lifespan to "prevent, assess, diagnose, and treat speech, language, social communication, cognitive-communication, and swallowing disorders" (*Speech-Language Pathologists*, n.d., para. 1).

The Foundation for Critical Thinking defines critical thinking as "the intellectually disciplined process of actively and skillfully conceptualizing, applying,

analyzing, synthesizing, and/or evaluating information gathered from, or generated by, observation, experience, reflection, reasoning, or communication, as a guide to belief and action" (Scriven & Paul, 1987, para. 3). Critical thinking is a necessary step for successful decision-making in health care professions so as to avoid critical errors and to ensure provision of high-quality care (Huang et al., 2014; *Step 4: Make Your Clinical Decision*, n.d.). As such, critical thinking is increasingly becoming a required skill set for SLPs and not just an advanced skill (Dalessio et al., 2021). This is an especially important consideration given the role critical thinking and problem solving play within the framework of the 21st century educational setting (Belecina & Ocampo jr, 2018).

The development of critical thinking skills is a paramount prerequisite for SLP students in higher education training programs. Schneider-Cline (2017) discussed the importance of critical thinking when developing clinical writing skills in SLP students, as clinical writing/documenting is a fundamental skill for practicing clinicians. Clinical writing involves high level thinking skills for the ongoing evaluation of available information, consideration of differing perspectives, selection of word-choice, and presenting the material in a concise and comprehensive manner (Schneider-Cline, 2017). Evidence-based practice (EBP) is another area cited within the literature that requires application of critical thinking methodologies (Finn, 2011; Morris et al., 2018). EBP is based on three factors: the clinician's experience, evidence or research, and the patient's perspective (*Step 4: Make Your Clinical Decision*, n.d.). These elements must be incorporated into a clinician's practice in order to provide well-informed and high-quality care (*Report of the Joint Coordinating Committee on Evidence-Based Practice*, 2004).

Moreover, SLP clinicians must ensure that there is adequate evidence to support their evaluation methodologies and treatment techniques (Morris et al., 2018).

Critical thinking is a skill that may require explicit instruction in formal education. Explicit instruction "provides needed supports for successful learning through clarity of language and purpose, reduction of cognitive load, active student engagement, appropriate affirmative and corrective feedback, as well as purposeful practice strategies" (Hughes et al., 2017, p. 143). One study by Dudding & Pfeiffer (2018) analyzed whether critical thinking skills in SLP students would improve throughout graduate school simply from coursework and clinical experience, or if critical thinking should be explicitly taught. This study followed eight graduate students and used clinical simulations to determine if their critical thinking and decision-making skills changed before, during, or after completion of their training programs. The authors found that there was no significant change in students' performance on clinical simulations by the end of the study, suggesting that students may not develop critical thinking skills solely as a result of completion of graduate coursework and obtaining varied clinical experiences (i.e., clock hours). The authors noted a significant limitation of the study in that the sample size was small, but the study itself might be useful in determining future research designs (Dudding & Pfeiffer, 2018). Battaglia (2020) also investigated an explicit method of teaching critical thinking to SLP students. Six activities were embedded throughout a required graduate level course that were intentionally designed to teach different critical thinking skills. A survey was administered before and after the course to examine each participants' view on critical thinking. The study found that participants reported positive change in their critical thinking abilities after enrolling in the course (Battaglia, 2020).

Research suggests that in addition to critical thinking, proficiency in lateral thinking—sometimes called parallel thinking—is also necessary in order to establish adaptive expertise in clinical reasoning (Croskerry, 2018). Lateral thinking was first coined by Edward de Bono to describe an approach to problem solving that embraces creative thinking and development of new ideas as opposed to vertical thinking which is more systematic and logical (1992). In his book, *Six Thinking Hats* (1999), De Bono describes six styles of lateral thinking; each of the six lateral thinking styles are equated to a colored "hat". Melnychuk and colleagues (2019) described each "hat" as follows: white is interested in facts and information about what is known; red is concerned with feelings and intuitions about the issue; black is cautionary and critical, identifying risks; yellow considers the positive side and possible benefits; green is about generating new ideas and alternatives; and finally, blue oversees the decision-making process. According to Kivunja (2015), de Bono's six thinking hats is a model that can "immensely augment critical thinking and create opportunities for solving any problems that might be confronted" (p. 382).

The "six thinking hats" method has been used to help students improve their decision-making skills. Hernandez & Varkey (2008) suggest that traditional training for medical professionals may hinder their ability to resolve complex problems due to the emphasis on vertical thinking rather than lateral thinking. However, lateral thinking promotes the formation of novel ideas, that may provide innovative solutions to complex problems (Hernandez & Varkey, 2008). In a study by Karadag and colleagues (2009), the six thinking hats method was taught to nursing students and the students' opinions of the method were analyzed using a survey. The authors found that the six thinking hats

method helped the nursing students empathize with the patient, have a more holistic view of the situation, come up with creative solutions, and develop their thinking skills (Karadag et al., 2009). Ghandi & Deardorff (2014) examined the effects of implementing lateral thinking and the six thinking hats method in an engineering curriculum. In their study, these methods were taught to engineering students in an entrepreneurship and innovation management course through guest lectures by experienced industry professionals; the students were instructed to use these methods in putting together their final presentation. Gandhi & Deardorff used a survey to analyze how helpful the students found each method. The results of their survey showed that students found both the six thinking hats and lateral thinking methods helpful in preparing their final presentation. Consequently, methods teaching innovative and creative thinking should be included in future curriculum for engineering students (Gandhi & Deardorff, 2014). Another study found that when split up into two teams based on either the 6 hats method or the Meyers Briggs Type Indicator, the team formed with the 6-hats strategy was more effective overall (Jensen et al., 2000). Lastly, a study by Kaya (2013) assessed the difference between the performance of students in a geography class who were taught the six thinking hats technique versus students who participated in the normal curriculum. He found that the students who were taught the six thinking hats technique were more successful due to their ability to problem solve and think about a problem from different perspectives. These studies demonstrate how the six hats may be a beneficial method for the instruction of lateral thinking skills to students in a variety of disciplines.

In addition to the types of approaches that may be used in the decision-making process, it is important to consider how these higher-level thinking skills may be

acquired. In 1956, Benjamin Bloom created and published *Taxonomy of Educational Objectives* in order to "aid in developing a precise definition and classification of such vaguely defined terms as 'thinking' and 'problem solving'" (Bloom, 1956, p. 10). The purpose of Bloom's work was to better understand students' learning processes as well as to provide a foundation for making teaching curriculum more effective. Bloom outlined six categories of cognitive processes involved in the learning process. The six categories include: knowledge, comprehension, application, analysis, synthesis, and evaluation. Bloom emphasized that these categories are hierarchical, and each category builds off of the previous category. The categories represent educational objectives that a learner needs to progress through in order to successfully learn material (Bloom, 1956). To that end, Bloom's Taxonomy has frequently been cited as a framework for understanding how people learn (Agarwal, 2019; Bibi et al., 2020; Kadiyala et al., 2017; Krathwohl, 2002).

In 2001, Anderson and Krathwohl led a group of cognitive psychologists, curriculum theorists, instructional researchers, and assessment specialists in a revision/adaptation of Bloom's original taxonomy in effort to create an updated and more practical framework. The impetus to update the theorem was based on the changes in society's knowledge and thought concerning educational practices since 1956 (Anderson et al., 2001). Anderson & Krathwohl's updated Bloom's original six levels of thinking that learners advance through to progress to higher-level thinking about a selected topic. Their updated levels are remembering, understanding, applying, analyzing, evaluating, and creating. Similar to Bloom's original taxonomy, the levels represent specific objectives which aid a learner in successfully mastering a given subject (Anderson et al., 2001). The revised taxonomy may clarify which educational experiences and curricula

most aid SLP graduate students in the development of higher-level critical thinking skills necessary for success in clinical practice. Moreover, Clinard (2020) suggests that both educational and clinical methodologies utilize consistent measures in terms of evidence-based practices.

According to the revised Bloom's taxonomy, being able to apply one's knowledge is an important part of mastering information (Anderson et al., 2001). Oftentimes, curriculum and instruction focus solely on the simply remembering without progressing to the more complex skills; however, being able to understand and apply learned information is typically considered more important than simply recalling information (Bibi et al., 2020; Krathwohl, 2002). Accredited SLP graduate training programs are required to provide students with varied opportunities to acquire knowledge and skills in sufficient breadth and depth for entry into independent professional practice. To become a licensed SLP under the American Speech-Language-Hearing Association (ASHA), students must complete graduate coursework addressing the nine major areas under the SLP scope of practice: speech, language, swallowing, fluency, cognition, voice, hearing, augmentative/alternative, and social aspects of communication (*2020 Standards and Implementation Procedures for the Certificate of Clinical Competence in Speech-Language Pathology*, 2020). Students also must have a minimum of 400 supervised clinical clock hours including at least 25 hours of observation and 375 hours of direct patient contact (*2020 Standards and Implementation Procedures for the Certificate of Clinical Competence in Speech-Language Pathology*, 2020). A study by Sheepway, Lincoln, & McAllister (2014) illustrated the importance of the clinical practicum experience in SLP graduate education. Their research confirmed that clinical competency

is developed throughout the progression of SLP graduate students' clinical placements regardless of the different types of placements each student may experience. However, research specifically focusing on how clinical experience affects SLP students' thinking skills is limited. The aim of this study is to determine if an association exists between a given SLP student's level of clinical experience and their lateral thinking style. It is hypothesized that there will be an association between a given SLP student's level of clinical experience and their lateral thinking style.

CHAPTER 2

METHODS

Participants

This non-experimental study utilized a convenience sample (N = 282) to investigate associations between a given student's lateral thinking style (i.e., de Bono's hat colors) and their level of clinical experience as measured by the number of clock hours obtained via observation and/or face-to-face/simulated means. The study used a within groups design with three groups represented from across the United States: undergraduate SLP students, first year SLP graduate students, and second year SLP graduate students.

Respondents were asked to complete an online survey that included demographic-based questions, approximated number of observation and/or clinical clock hours, and opinionated responses to several statements based on de Bono's six-thinking hats. The survey used a five-point Likert scale with answers ranging from "*does not describe me*" to "*describes me extremely well*". Approval for the study was granted by the Institutional Review Board (IRB) of the University of Louisville (#21.0267).

The researchers recruited participants through their academic program directors via email. Each director received an explanation of the current study and a link to the survey instrument via Qualtrics. Participating programs forwarded the link to their students on a voluntary basis. The email included possible risks or benefits of the study

and the informed consent. A total of 312 responses were received between April 15, 2021 and May 15, 2021.

Inclusionary criteria included enrollment as an undergraduate, first year graduate student, or second year graduate student attending an accredited (if graduate student) SLP training program. There were no gender, age-related, ethnic background, or health status requirements per this study. This study excluded all other therapy and non-therapy disciplines. Faculty personnel and staff members were also excluded from participating. After data screening, 30 responses were excluded, with 282 eligible responses remaining. The sample (N = 282) consisted of 90 undergraduate students (32%) and 192 graduate students (68%), most of whom were white (85.5%) and female (95.7%).

Setting and Instrumentation

Undergraduate and graduate students completed the online survey via the Qualtrics platform. The survey was accessible by tablet, laptop, smartphone, or desktop computer, and was designed to take 15 minutes or less. The survey was open for approximately one month; respondents were asked to complete the survey once. Prior to accessing the survey, participants were informed of the possible risks and benefits of the study, and that the opening, completion, or submission of the survey implied consent for inclusion. Participants were advised that there were no foreseeable risks. The survey requested no personal identifying information. Responses were stored on a password protected computer behind a locked door.

The survey was comprised of demographic probes and forty-two statements inspired by de Bono's Six Thinking Hats (1999) and adapted by Jenson, Feland, Bowe and Self (2000). Demographic questions included those related to gender, age group

range, ethnicity, educational classification (e.g., freshman, first year graduate student), and parent's annual household income range. Two additional questions queried students' approximated number of observation hours logged related to speech, language, and/or hearing evaluation/treatment as well as approximated clinical clock hours (direct and/or simulated contact) logged related to speech, language, and/or hearing evaluation/treatment. The remaining forty-two questions were blocked in six sections of seven and centered on the aforementioned thinking styles (i.e., hat colors). Table 1 provides an overview of the individual hat colors, associated descriptors, and one example statement from the survey. The survey used a five-point Likert scale with answers ranging from "*does not describe me*" to "*describes me extremely well*". The survey instrument is included as Appendix B.

Table 1. Overview of Hat Colors/Example Survey Statements

Hat Color	Descriptors	Example Statements
White Hat	Neutral, Objective	I seek to differentiate between facts and opinions.
Red Hat	Emotional Viewpoint	I listen to my emotions when I make decisions.
Yellow Hat	Logical, Positive	I believe most new ideas have significant value.
Green Hat	Creative, Opportunities	I often generate new ways of thinking about a problem.
Blue Hat	Process, Control	I focus on the big picture, summarize, draw conclusions.
Black Hat	Logical, Negative	I can see quickly why an idea will not work.

Data Analysis

All completed surveys were exported to Microsoft Excel and numerically coded in preparation for analysis. The data were then exported to SPSS Version 27 for statistical

analyses. Descriptive and summary statistics characterized the aforementioned demographic items. Parametric and non-parametric analyses consistent with Pearson’s and Spearman's rank-order correlations respectively were completed for both within and between group items. Interpretation of the correlation coefficients was based on Mukaka (2012).

CHAPTER 3

RESULTS

This study used a convenience sample of undergraduate SLP students, first year SLP graduate students, and second year SLP graduate students attending training programs throughout the United States. Respondents completed an online anonymous survey via the Qualtrics platform that queried their approximated number of observation and/or clinical clock hours, opinionated responses to several statements based on de Bono's six-thinking hats (i.e., lateral thinking styles), along with varied demographic-based questions. Two-hundred and eighty-two (282) participants completed the survey in its entirety; 4.3% (n = 12) were male and 95.7% (n = 270) were female. The vast majority of respondents identified as white (85.5%, n = 241); 14.2% (n = 40) identified as non-white; one participant did not respond to the question. Respondent age ranges are presented in Table 2. Student classification (e.g., freshman) and parent annual household income are provided in Tables 3 and 4 respectively.

Table 2. Participant Age Ranges (N = 282)

Range	Frequency	Percent	Cumulative Percent
18-24 Years	208	73.8	73.8
25-34 Years	66	23.4	97.2
35-44 Years	5	1.8	98.9
45-54 Years	3	1.1	100.0

Table 3. Classification (*N* = 282)

Label	Frequency	Percent	Cumulative Percent
Freshman	4	1.4	1.4
Sophomore	16	5.7	7.1
Junior	36	12.8	19.9
Senior	34	12.1	31.9
Post-Bac.	15	5.3	37.2
First Year Grad.	81	28.7	66.0
Second Year Grad.	96	34.0	100.0

Table 4. Annual Parent Household Income (*N* = 282)

Income ($)	Frequency	Percent	Cumulative Percent
<30,000	13	4.6	4.6
30,000-70,000	62	22	26.6
71,000-100,000	75	26.6	53.2
101,000-200,000	102	36.2	89.4
201,000-999,000	30	10.6	100.0

Tables 5-8 present descriptive statistics regarding respondents' number of observation and clinical clock hours as well as the sum and average lateral thinking style scores inspired by de Bono's colored hats. As the survey used a five-point Likert scale, the min/max sum scores are (0) and (35) respectively while the min/max average scores are (1) and (5) respectively.

Table 5. Observation Hours (*N* = 282)

Mean	33.13
Median	25.00
Std. Deviation	54.45
Range	590
Minimum	0
Maximum	590

Table 6. Clinical Clock Hours (*N* = 282)

Mean	149.60
Median	56.00
Std. Deviation	178.50
Range	1,000
Minimum	0
Maximum	1,000

Table 7. Sum Hat Scores (*N* = 282)

Hat Color	White	Yellow	Green	Red	Black	Blue
Mean	24.40	25.61	23.11	21.25	20.03	23.34
Median	24.00	26.00	23.00	21.00	20.00	23.00
Std. Deviation	3.76	4.88	5.23	4.47	4.54	4.80
Range	19	24	27	26	23	26
Minimum	16	11	8	9	8	9
Maximum	35	35	35	35	31	35

Table 8. Average Hat Scores (*N* = 282)

Hat Color	White	Yellow	Green	Red	Black	Blue
Mean	3.49	3.66	5.78	3.04	2.86	3.33
Median	3.43	3.71	5.75	3.00	2.86	3.29
Std. Deviation	.54	.70	1.31	.64	.65	.69
Range	3	3	7	4	3	4
Minimum	2	2	2	1	1	1
Maximum	5	5	9	5	4	5

Table 9 represents correlations between the demographic and study variables where the independent variables include ethnicity, gender, age, classification, and parental household income. The dependent variables include the average number of observation hours, the average number of clinical clock hours, and the sum lateral thinking style scores. It should be noted that due to skewness of both the observation and clinical clock hour data, the variables were square root transformed. As such, Spearman's

rank-order correlations were used for analysis. Interpretation of correlation coefficients is based on Mukaka (2012).

There was a statistically significant, moderate positive correlation between students' average number of observation hours and their classification status, $r_s(282) = .569$, $p < .001$. There was a statistically significant, high positive correlation between students' average number of clinical clock hours and their classification status, $r_s(282) = .884$, $p < .001$. There were several additional statistically significant correlations between the listed independent and dependent variables; however, their interpretation might be classified as negligible (i.e., ≤ .30).

Table 9. Spearman's Rho Correlation Matrix: Demographics, Hours, Lateral Thinking Sum Totals ($N = 282$)

	Average Obs. Hours	Average Clinical Hours	White Hat Sum	Yellow Hat Sum	Green Hat Sum	Red Hat Sum	Black Hat Sum	Blue Hat Sum
Classification	.569*	.884**	-.034	-.040	-.050	-.251	-.117	-.175
Ethnicity	.048	.079	-.045	.031	.004	-.043	-.097	-.002
Gender	-.044	.048	.142	-.015	.119	-.083	.155	.063
Age	.173	.190	.030	-.041	-.016	-.088	-.088	-.116
Parent Income	.033	.045	-.080	-.147	.046	.045	.002	.097

*. Moderate Positive (Negative) Correlation is significant at $p < .001$ (2-tailed).
**. High Positive (Negative) Correlation is significant at $p < .001$ (2-tailed).

Table 10 represents correlations between the demographic and study variables where the independent variables include ethnicity, gender, age, classification, and parental household income. The dependent variables include the average lateral thinking style scores. Secondary to the skewness of the data, Spearman's rank-order correlations were used for analysis. Interpretation of correlation coefficients is based on Mukaka (2012). As with the data presented in Table 8, there were several statistically significant

correlations between the listed independent and dependent variables; however, their interpretation might be classified as negligible (i.e., ≤ .30).

Table 10. Spearman's Rho Correlation Matrix: Demographics, Lateral Thinking Average Totals (*N* = 282)

	White Hat Average	Yellow Hat Average	Green Hat Average Hat	Red Average	Black Hat Average	Blue Hat Average
Classification	-.034	-.032	-.050	-.251	-.117	-.175
Ethnicity	-.045	.056	.004	-.043	-.097	-.002
Gender	.142	-.006	.119	-.083	.155	.063
Age	.030	-.026	-.016	-.088	-.088	-.116
Parent Income	-.080	-.066	.046	.045	.002	.097

Table 11 represents how well the different subscales per the average and sum lateral thinking style scores correlate with one another. Secondary to normal distribution, the data was analyzed using Pearson product-moment correlation. Interpretation of correlation coefficients is based on Mukaka (2012).

There were statistically significant, low positive correlations between green hat average and white hat sum scores, $r(282) = .346$, $p < .001$; green hat average and yellow hat sum scores, $r(282) = .308$, $p < .001$; blue hat average and green hat sum scores, $r(282) = .463$, $p < .001$; and black hat average and red hat sum scores, $r(282) = .362$, $p < .001$. As with the data presented in Tables 9 and 10, there were several statistically significant correlations between the listed variables; however, their interpretation might be classified as negligible (i.e., ≤ .30).

Table 11. Pearson's Product-Moment Correlation Matrix: Lateral Thinking Sum and Average Totals (N = 282)

	White Hat Average	Yellow Hat Average	Green Hat Average	Red Hat Average	Black Hat Average
White Hat Sum					
Yellow Hat Sum	.251				
Green Hat Sum	.346*	.439*			
Red Hat Sum	-.026	.263	.147		
Black Hat Sum	.265	-.103	.219	.362*	
Blue Hat Sum	.256	.252	.463*	.254	.405*

*. Low Positive (Negative) Correlation is significant at $p < .001$ (2-tailed).

Table 12 summarizes the statistical analyses of the study hypothesis that there will be an association between a student's lateral thinking style (i.e., hat color) and their level of clinical experience as measured by their number of clock hours obtained (whether observation and/or face-to-face/simulated). The dependent variable is consistent with the students' average lateral thinking style. The independent variables include the average number of observation hours and the average number of clinical clock hours. Due to skewness of the data, the variables were square root transformed. As such, Spearman's rank-order correlations were used for analysis. Interpretation of correlation coefficients is based on Mukaka (2012).

There were statistically significant, though negligible, negative correlations between red hat average and average observation hours, $r_s(282) = -.130$, $p = .030$ and black hat average and average observation hours, $r_s(282) = -.142$, $p = .017$. There were also statistically significant, though negligible, negative correlations between red hat average and average clinical clock hours, $r_s(282) = -.211$, $p < .001$; black hat average and average clinical clock hours, $r_s(282) = -.141$, $p = .018$; and blue hat average and average clinical clock hours, $r_s(282) = -.146$, $p = .014$.

Table 12. Spearman's Rho Correlation Matrix: Clinical Hours and Lateral Thinking Sum Totals (N = 282)

	White Hat Sum	Yellow Hat Sum	Green Hat Sum	Red Hat Sum	Black Hat Sum	Blue Hat Sum
Avg. Obs. Hours	-.021	.057	.022	-.130*	-.142*	-.113
Avg. Clinic Hours	-.087	-.002	-.007	-.211**	-.141*	-.146*

*. Negligible Positive (Negative) Correlation is significant at $p < .05$ (2-tailed).
**. Negligible Positive (Negative) Correlation is significant at $p < .001$ (2-tailed).

Summary

The intent of this study sought to investigate possible associations between undergraduate and graduate SLP students' lateral thinking styles (i.e., hat color) and their level of clinical experience as measured by the number of observation and/or clinical clock hours obtained. The results evidenced statistically significant associations between students' average observation hours and both emotional (i.e., red hat) and logical, negative (i.e., black hat) lateral thinking styles. The results also evidenced statistically significant associations between students' average clinical clock hours and emotional (i.e., red hat), logical, negative (i.e., black hat), and process, control (i.e., blue hat) lateral thinking styles. Moreover, as both observation and clinical clock hour numbers increased, scores on the lateral thinking subscales decreased. The tested null hypotheses for the study are presented in Table 13.

Table 13. Summary of Tested Null Hypotheses

Hypotheses	Statement	Results
H_1	There will not be a statistically significant association between students' lateral thinking styles (i.e., hat color) and their level of clinical experience as measured by the number of observation hours obtained.	Reject
H_2	There will not be a statistically significant association between students' lateral thinking styles (i.e., hat color) and their level of clinical experience as measured by the number of face-to-face/simulated clock hours obtained.	Reject

CHAPTER 4

DISCUSSION

Research has shown that effective decision-making is a skill that health care professionals must possess in order to provide high-quality care to their patients (Huang et al., 2014; *Step 4: Make Your Clinical Decision*, n.d.). Successful decision-making is a complex process involving the interaction of many cognitive systems (Dean & Sharfman, 1996; Lamb et al., 2019; Lunenburg, 1987). Two vital types of thought processes involved in decision-making are critical and lateral thinking (Lamb et al., 2019).

An abundance of research has studied the overarching importance of critical thinking in 21st century education (Belecina & Ocampo jr, 2018; Huang et al., 2014), as well as the value and methods of teaching critical thinking to SLP graduate students (Battaglia, 2020; Dalessio et al., 2021; Dudding & Pfeiffer, 2018; Finn, 2011; Morris et al., 2018; Schneider-Cline, 2017). While critical thinking involves systematic reasoning, lateral thinking stresses creativity and imagination (Hauser & Feinberg, 1977). Research has also established the importance of lateral thinking for clinical reasoning and successful decision-making for health care professionals (Croskerry, 2018; Hernandez & Varkey, 2008).

Although speech-language pathology has been cited as a field encompassing both organized and creative methodologies (Neate et al., 2019), little research has sought to study lateral thinking in speech-language pathology. The purpose of this study was to contribute to literature on lateral thinking for students in healthcare training programs,

specifically the field of speech-language pathology education. To that end, this study sought to determine if an association exists between a given SLP student's level of clinical experience and their lateral thinking style. The study utilized a survey to determine what style of thinking a student tends to use. The survey classified students' preferred lateral thinking style based on de Bono's six hat colors (de Bono, 1999; Jensen et al., 2000). Each student's level of clinical experience was measured by the number of clinical clock hours obtained, including observation and simulated hours.

The results of the current study evidence multiple statistically significant associations between a given SLP student's clinical hours and their lateral thinking style. Results revealed negligible, negative correlations between a given student's number of observation and clinical hours and their red hat average. A negative correlation indicates that as the independent variable increased (either a particular student's number of observation hours or their number of clinical clock hours), the dependent variable decreased (the student's average scores for the associated hat colors). Therefore, as students' observation and clinical clock hours increased, their red hat scores decreased. The red hat is an emotional style of lateral thinking: it is concerned with the individual's feelings and intuition when faced with a problem (Melnychuk et al., 2019). This correlation is consistent with a previous study completed with occupational therapy (OT) students. The study revealed that after OT students had completed one or more clinical placements, their scores on an emotional intelligence inventory decreased in the areas of assertiveness, problem solving, impulse control, self-actualization, and stress tolerance (Gribble et al., 2016). While neither the current study nor Gribble and colleagues' (2016) study can evidence the cause of the decline in emotional scores relating to increased

clinical experience, it is important to note that the results from these studies may help substantiate the claim that the variable are connected in some way.

Results also revealed negligible, negative correlations between a given student's number of observation and clinical hours and their black hat average score. The black hat is a logical yet cautionary style of lateral thinking; the individual is critical about potential solutions to a problem and seeks to identify potential risks (Melnychuk et al., 2019). Students' black hat scores tended to decrease as their observation and clinical hours increased, indicating that the logical/critical lateral thinking style is negatively associated with a higher number of both observation and clinical clock hours. There is little research studying the effect of clinical experience on this style of thinking in healthcare students. However, one study found that undergraduate medical students evaluating randomized controlled trials (RCTs) using a risk assessment either overestimated or underestimated the risks involved in the RCTs compared to the experts' assessments of the clinical studies (Buchberger et al., 2018). Buchberger and colleagues (2018) noted that clinical experience seems to be a prerequisite for a deeper understanding and ability to better appraise the literature when using evidence-based medicine (EBM) in their medical practice. Contrary to the current study, Buchberger and colleagues found no clear correlation in students' assessment of risk regarding EBM; however, their study utilized 3rd-year undergraduates and compared those students to experts, whereas the current study assessed students with a variety of clinical experience.

Another study found that medical students tend to experience uncertainty when faced with challenging situations, in part due to their insufficient knowledge and skills (Weurlander et al., 2019). This uncertainty students that students tend to feel may

contribute to the contrasting evidence in literature relating to the black hat style of lateral thinking (negative, logical, and risk-assessing). More research should be done to determine how clinical experience may affect this style of lateral thinking in healthcare students.

Finally, results also revealed negligible, negative correlations between a given student's clinical clock hours and their blue hat averages. The blue hat is concerned with the overall decision-making process and seeks to have control over all other hats (Melnychuk et al., 2019). Students' blue hat average score tended to decrease as their clinical clock hours increased, indicating that the process/control type of lateral thinking is negatively associated with a higher number of clinical clock hours. Research specifically addressing the blue hat type of lateral thinking is scarce. However, the blue hat is generally considered the leader of the group in decision-making, and recent research in the medical field has placed importance on leadership and management skills for medical professionals. Hsiang et al. (2017) emphasized how leadership is an important skill that must be introduced to medical students in order to effectively meet new challenges in the evolving healthcare world. Maini et al. (2020) also stressed the benefits that could be derived from teaching healthcare students coaching and leadership skills in light of the uncertain and complex nature of healthcare due to the Coronavirus Disease 2019 (COVID-19) pandemic. Although these studies do not reveal any correlations between clinical experience and the process/control type of lateral thinking, they highlight a shift in healthcare education toward focusing on developing students' leadership skills. As healthcare education continues to implement more leadership and

management training, the current study may provide a starting point for further research on the subject of how clinical experience affects the blue hat style of lateral thinking.

There were no statistically significant associations identified between average white hat (neutral/objective lateral thinking style), yellow hat (logical/positive lateral thinking style), or green hat (creative/opportunistic lateral thinking style) scores and a particular student's observation or clinical clock hours. The survey did not ask whether or not a student's graduate program explicitly teaches critical or lateral thinking skills. However, these findings complement previous research which states that students' critical thinking skills are not developed solely through the completion of graduate coursework and clinical experiences (i.e., clock hours) (Dudding & Pfeiffer, 2018).

No research has been done specifically on how clinical experience affects a student's lateral thinking skills. However, previous research has established that clinical experience improves healthcare students' clinical competency (Sheepway et al., 2014) and that lateral thinking is necessary to develop adaptive expertise in clinical reasoning (Croskerry, 2018). Therefore, the hypothesis of this study was that there will be an association between a given student's lateral thinking style and their clinical experience. Overall, the findings of this study support that hypothesis, in part, as statistically significant correlations were found between three of the hat colors and the independent variables.

As critical thinking is increasingly being recognized as a required skill for SLPs (Dalessio et al., 2021), the results of this study may bear significance for SLP education and practice. The current study is the first to apply the six thinking hats to speech-language pathology education and practice. According to the American Speech-

Language-Hearing Association, the role of an SLP clinical supervisor includes aiding students in their critical thinking skills, being knowledgeable about different types of learning styles, and helping students in developing a decision-making process (*Clinical Education and Supervision*, n.d.). The results of this study help shed light on what type of creative (lateral) thinking styles SLP students tend to use, and how their thinking style correlates with their amount of clinical experience. Educators in SLP higher education, as well as clinical supervisors for SLP students, could benefit from this knowledge as it could help them understand how students with differing levels of clinical experience tend to approach problem solving and decision-making. This information is important since part of a clinical supervisor's role is to help students develop critical thinking and decision-making skills (*Clinical Education and Supervision*, n.d.). SLP educators, including program directors and faculty, could also use the results of this study to improve their education of SLP students. According to the Council on Academic Accreditation (CAA), SLP programs must provide opportunities for students to learn critical thinking and clinical reasoning to aid in their decision-making skills (*Standards for Accreditation of Graduate Education Programs in Audiology and Speech-Language Pathology*, 2017). As the six thinking hats method has been proven to be an effective way to improve students' critical thinking and decision-making skills (Gandhi & Deardorff, 2014; Hernandez & Varkey, 2008; Jensen et al., 2000; Karadag et al., 2009; Kaya, 2013), SLP educators could use the results of this study and the six hats method to help students understand how they tend to approach problem solving and how they could improve their decision-making skills.

The results of this study provide some insight into how SLP students tend to think. This information could benefit SLP students themselves as they progress throughout their clinical practicums. In clinical settings, it is important for healthcare students to progress beyond the surface-level to a deeper knowledge of problem solving in order to develop clinical competency; one way this can be done is through self-monitoring and reflection (Sheepway et al., 2014). Zhang et al. (2018) implemented the six thinking hats method in the debriefing process following medical residents' and fellows' participation in an emergency medicine simulated case. They found that the participants in the study concurred that the six thinking hats method was a successful method for promoting open, non-judgmental conversation about the simulated cases. Since the six thinking hats has been shown to be an effective way for students to reflect on their clinical performance (Zhang et al., 2018), SLP students may benefit from using the results of this study to be aware of their own lateral thinking styles and how their decision-making process might change as they progress throughout their clinical experiences. The survey utilized in this study (adapted by Jensen et al., 2000) which categorized students' preferred style of lateral thinking, would be beneficial for students to understand what lateral thinking style they tend to favor. It is worth noting that de Bono also suggests that a person (or a team) should be able to switch hats as needed in order to solve a problem (de Bono, 1999). Becoming aware of one's preferred lateral thinking style is important so that an individual can also be mindful of what styles they tend to neglect.

This study may influence how SLP graduate programs train their students. As previously stated, EBP is one of the most important components of an SLP's practice

(*Step 4: Make Your Clinical Decision*, n.d.). This study showed that graduate students' emotional reactions to problems/decisions (the red hat style) tended to decrease as their number of clinical and observation hours increased. This is important to note because EBP does not involve drawing on one's own emotions or gut reactions when making decisions. Smith, Higgs, & Ellis (2010) found that clinicians with more experience were better equipped to self-monitor and manage their own emotional responses. Moreover, Lafrance Robinson & Kosmerly (2015) found that 40% of participants experienced a negative outcome per the clinical decision making as a result of emotion.

Another important implication of this study is the concept of generalization. In the field of SLP, generalization refers to the ability to communicate effectively across multiple contexts; this is a vital part of the treatment of patients with communication disorders (*Transitions/Generalization of Skill*, n.d.). However, generalization can also be applied to students. Students must be able to apply the skills that they have learned in a variety of contexts outside of the school setting (Taylor & Riden, 2021). This is also true for SLP graduate students; consequently, they are required to gain experience in a variety of clinical settings before graduating and practicing in the real world (*2020 Standards and Implementation Procedures for the Certificate of Clinical Competence in Speech-Language Pathology*, 2020). SLP graduate programs and supervisors must train students to be able to implement their decision-making skills a variety of settings while they are in graduate school in so that these skills will generalize to their professional practice. SLP graduate programs should consider implementing specific training on higher-level thinking skills, including critical and lateral thinking, to promote the generalization of these skills to SLP practice.

There are a number of limitations that must be considered when examining the results of this study. Although there were several statistically significant associations revealed, the correlation coefficients of these associations all fell between .00-.30; therefore, the strength of these associations are interpreted as negligible (Mukaka, 2012). As the associations found were weak associations, it is important to remember that a plethora of other factors may have contributed to the correlation other than solely the student's number of observation or clinical clock hours including the student's age, cultural background, type of upbringing, personality, level of professional experience, their emotional state when filling out the survey, etc. Consequently, this study does not reveal a causal relationship between clinical experience and lateral thinking style. Although the survey was based on a categorization instrument that was found to have good validity for assigning a six-hats communication style (Jensen et al., 2000), the survey was completed by self-report, which may have impacted the accuracy of the results of the study. One article published for the Association for Psychological Science by Garcia and Gustavson (1997) describes how there can be issues and inaccuracies associated with every stage of self-report, including "perception of the state of the self, encoding and storage of memory, understanding the question being asked, recalling the facts, and judging how and what to answer" (para. 5). In this study, participants were asked to rate how well different statements describe their tendency to think when making decisions. Participants may have an inflated view of how they approach problems, and their responses may not reflect reality. Future studies might utilize more objective measures to ensure better accuracy of results.

The intent of this study was to begin the conversation of the value of lateral thinking in the field of speech-language pathology, as well as how lateral thinking may be a beneficial topic to introduce to SLP education. Although the statistically significant associations found in this study are considered negligible, the results of this study reveal patterns that may be worthy of additional research. Research has shown that competency in SLP students develops over a time continuum and increases with experience (Sheepway et al., 2014). Further research could explore how lateral thinking skills develop in SLP students over time and with increasing clinical experience. A longitudinal study would be beneficial for this purpose. In addition, it has been well-documented that the six thinking hats method is an effective means of improving students' decision-making skills (Gandhi & Deardorff, 2014; Jensen et al., 2000; Karadag et al., 2009; Kaya, 2013). Further research could implement the six-thinking hats method in a SLP graduate course and examine its effectiveness in improving decision-making skills specifically in SLP students.

In conclusion, the results of this study provide a foundation for further research on lateral thinking in SLP education and practice. This study identified several statistically significant associations between a given SLP student's number of observation or clinical clock hours, and their lateral thinking style (i.e., hat color). However, further research could be performed in order to strengthen these correlations, study the effect of implementing lateral thinking into SLP education, and to provide additional information on how SLP students develop critical/lateral thinking.

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APPENDIX A: ABBREVIATIONS

ASHA	American Speech-Language Hearing Association
CAA	Council on Academic Accreditation
COVID-19	Coronavirus Disease 2019
EBP	Evidence-Based Practice
EBM	Evidence-Based Medicine
IRB	Institutional Review Board
OT	Occupational Therapy
RCT	Randomized Controlled Trial
SLP	Speech-Language Pathology/Pathologist

APPENDIX B: SURVEY INSTRUMENT

6-Thinking Hats Survey

Start of Block: Default Question Block

Q1 Which best describes you?

- Freshman
- Sophomore
- Junior
- Senior
- Post-Baccalaureate Student
- Preparatory or Pre-SLP Student
- 1st Year Graduate Student
- 2nd Year Graduate Student
- Doctoral Student

Q2 What is your ethnicity?

- Black or African American
- Hispanic or Latino
- Native American or American Indian
- Native Hawaiian or Other Pacific Islander
- Asian
- White
- Two or More Races
- Other _____
- I prefer not to say.

Q3 What is your gender?

- ○ Female
- ○ Male
- ○ I prefer not to say.

Q4 What is your age group?

- ○ <18 years
- ○ 18-24 years
- ○ 25-34 years
- ○ 35-44 years
- ○ 45-55 years
- ○ >55 years

Q5 What is your parent's annual household income range?

- ○ <$29,000
- ○ $30,000 - $70,000
- ○ $71,000 - $100,000
- ○ $101,000 - $200,000
- ○ $201,000 - $999,000
- ○ >$1 million

Q6 As of today's date, approximately how many <u>clinical</u> <u>observation</u> <u>hours</u> have you logged related to speech, language, and/or hearing evaluation/treatment?

_____

Q7 As of today's date, approximately, how many <u>clinical</u> <u>clock hours</u> (direct patient and/or simulated contact) have you logged related to speech, language, and/or hearing evaluation/treatment?

_____

Q8 I focus on objective facts.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q9 I enter into a discussion without preconceived ideas on a solution.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q10 I seek to know the facts of a situation.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q11 I seek to know the statistical evidence concerning a decision.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q12 I try to think totally objectively about a situation.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q13 I seek to differentiate between facts and opinions.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q14 I am more interested in facts than opinions.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q15 I usually see the positive side of things.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q16 I can often see the good parts of even a bad idea.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q17 I am usually optimistic that a new idea will work.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q18 I tend to see the valuable contributions in people's ideas.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q19 I believe that most new ideas have significant value.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q20 I usually "look on the bright side" of a problem.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q21 My comments are usually positive and constructive.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q22 I am creative.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q23 I often generate new ways of thinking about a problem.

- Describes me extremely well
- Describes me very well
- Describes me moderately well
- Describes me slightly well
- Does not describe me

Q24 I easily think "outside the box".

- Describes me extremely well
- Describes me very well
- Describes me moderately well
- Describes me slightly well
- Does not describe me

Q25 I am good at finding new approaches to solving a problem.

- Describes me extremely well
- Describes me very well
- Describes me moderately well
- Describes me slightly well
- Does not describe me

Q26 I am constantly thinking of alternatives.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q27 I am not likely to settle for the "status quo".

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q28 I can easily generate new concepts.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q29 My feelings sway my decisions.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q30 I have good intuition.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q31 I often have hunches about the best decision.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q32 My personal opinions play a significant roles in my decision making process.

- Describes me extremely well
- Describes me very well
- Describes me moderately well
- Describes me slightly well
- Does not describe me

Q33 I listen to my emotions when making decisions.

- Describes me extremely well
- Describes me very well
- Describes me moderately well
- Describes me slightly well
- Does not describe me

Q34 I am suspicious of other people's decision making process.

- Describes me extremely well
- Describes me very well
- Describes me moderately well
- Describes me slightly well
- Does not describe me

Q35 I think emotions should play a significant role in decision making.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q36 I can quickly see why an idea will not work.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q37 I often can tell an idea will not work by judging from past experience.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q38 I like to play "devil's advocate".

- Describes me extremely well
- Describes me very well
- Describes me moderately well
- Describes me slightly well
- Does not describe me

Q39 I can usually see the pitfalls in an idea.

- Describes me extremely well
- Describes me very well
- Describes me moderately well
- Describes me slightly well
- Does not describe me

Q40 I can readily detect poor logic in someone's argument.

- Describes me extremely well
- Describes me very well
- Describes me moderately well
- Describes me slightly well
- Does not describe me

Q41 I find it easy to be critical of other's ideas.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q42 I am often pessimistic of others.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q43 I like to lead the problem solving process.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q44 I tend to think as much about the problem solving process as the problem itself.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q45 I focus on the big picture, summarize, and draw conclusions.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q46 I find myself trying to keep the group focused.

- ○ Describes me extremely well
- ○ Describes me very well
- ○ Describes me moderately well
- ○ Describes me slightly well
- ○ Does not describe me

Q47 I tend to try to optimize the group problem solving process.

- Describes me extremely well
- Describes me very well
- Describes me moderately well
- Describes me slightly well
- Does not describe me

Q48 I often help the group clearly define the problem.

- Describes me extremely well
- Describes me very well
- Describes me moderately well
- Describes me slightly well
- Does not describe me

Q49 I often find myself orchestrating the group.

- Describes me extremely well
- Describes me very well
- Describes me moderately well
- Describes me slightly well
- Does not describe me

End of Block: Default Question Block

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