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The Preference of the Use of Intuition Over Other Methods of Problem Solving by Undergraduate Students

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Abstract: Intuition is one of the main factors that drive our everyday decision-making which happens quickly and unconsciously. Individuals often rely on the use of intuition to solve either simple or complex problems. The purpose of this research study is to further break down an individual's thinking processes by understanding how different groups of individuals utilize intuition to make effective decisions. Major, gender, college year of classification, and ethnicity were the main factors analyzed in the study to identify if these factors have a significant impact on the use of each intuition type. The data collected from a survey distributed to undergraduate students at Purdue University (n=1109) was used to build a regression model for each intuition type: inferential ($p = 3.524x10^{-11}$), affective ($p = 2.200x10^{-16}$), holistic big picture ($p = 1.755x10^{-4}$), and holistic abstract ($p = 3.195x10^{-7}$). The results showed that inferential intuition was influenced by gender and ethnicity, while all four studied factors major, gender, ethnicity, and college year of classification have an impact on affective intuition. The holistic big-picture intuition model indicated that only gender and college influenced the use of this intuition type. In addition, gender, major, and ethnicity were the main drivers for holistic abstract intuition usage. The study suggests that intuition usage is driven by all four factors with gender as the main factor that have an impact on all four of the types of intuition. These findings provide a deeper insight into the main factors that influence the use of intuition.

Keywords: *Intuition, Types of Intuition, Major, Gender, College Year of Classification, Ethnicity*

Introduction

When solving a math problem, we often doubt our final answer. Sometimes there are times in which one is sure that the right procedure is used, but the definitive answer does not look right. These are moments where we ask ourselves if we should trust our logical reasoning for the solution of a problem or our "feeling" that it is not right. We usually tend to trust the formulas and equations more than our own "feeling" since mathematics is seen as a pure, well-defined, and logical subject. Intuition can also be seen applied in other fields such as illustrated in the examples below.

> A nurse working during her night shift was taking care of a newborn baby that had a head molding from birth. Even though all the general checks conducted on the newborn showed that everything was normal, she had a feeling that something was not right with the head of the baby given that the baby had a head molding. The nurse decided to trust her intuition and did a couple more checks and assessments on the baby realizing then that the baby had a birth defect (Quinn-Szcesuil, 2019).

> An investor of a company needs to decide whether to hold on or sell a stock. Since prices of the stock change every day, he or she should trust their gut that the prices will rise or go down in the future and make the best decision for the financial success of the company (Harteis & Gruber, 2008).

As the result of these observations, we can observe how each individual according to their surroundings have the ability to shape the intuition they use in their everyday lives. This is because each field of study develops a variety of skills and trains students for a specific way of thinking needed to be successful in that area. Therefore, this research study is focused on identifying whether there is a relationship between specific groups of students that will rely more on the use of intuition when solving problems over the use of analytic methods.

Literature Review

Every day in our lives, we make intuitive judgements. It is part of our daily life and our thinking process. Researchers have been interested to understand how the human brain works and breakdown the thinking process to make effective decisions, specifically, there has been an increase of the interest to understand intuition as a phenomenon (Pretz, 2008; Kaufmann et al., 2017; Liebowitz et al., 2018). Experts have found that intuition is one of the main factors that play an essential role in our decision-making, and it is independent of the rational way of thinking (Wang et al., 2017). As an individual gains more knowledge, depending on his or her experiences, he or she weighs the use of analytical thinking and intuition as needed to best guide his or her decision (Slovic & Västfjäll, 2010).

The following sections cover the definition of intuition, the three main types of intuition, and ways that intuition has been measured to obtain a deep understanding of the current discussion about intuition. Once having a clear understanding of intuition and what it encompasses, researchers of this paper can identify characteristics that might lead to a correlation between different groups and their reliance on the use of intuition.

Intuition

Intuition is commonly referred to as the “gut feeling,” “hunch,” or “instinct” that one has when making a decision (Robert, 2014). Liebowitz et al. (2018) define intuition as “direct knowing,” in other words, it is making a conclusion or decision without going through logical reasoning. This process bypasses the step-by-step analytical reasoning processes and jumps directly into the conclusion. When making a decision, intuition relies on the “big picture” of the setting which is considered as a holistic hunch (Thompson, 2014; Liebowitz et al., 2018). The use of intuition gives the acknowledgment to the truth without going through conscious reasoning. Dane and Pratt (2007) define intuition as an unconscious process based on past experiences one has had in which the reasoning cannot easily be explained explicitly using words. As a result, intuition is considered tacit in the sense that it cannot be explained nor justified in a non-intuitive way. Intuition is characterized as a quick rapid instant process that happens in a very relaxed and pure form. As it occurs spontaneously, it is not something that can be acquired by will.

Some may consider that analytical reasoning and intuition are opposites (Akinci & Sadler-Smith, 2013) indicating a negative correlation, which the use of one implying not the use of the other one. However, a study conducted by Wang et al. (2015) showed that analytical reasoning and intuition are independent of each other indicating that they

are not used at the same time. Nevertheless, there are connected to one another since intuition might be based on previous experiences that used to be analytical (Pretz et al., 2014).

Types of Intuition

According to Pretz, J. E. et al. (2014), there are three different independent types of intuition. These types are inferential intuition, affective intuition, and holistic intuition.

I. Inferential Intuition:

Inferential intuitions are based on the knowledge that used to be analytical, but with experience and time, this knowledge has become intuitive (Pretz et al., 2014). This type of intuition is gained by practice and as time pass it does not need to undergo a rational process anymore as it had become automatic. The short example below illustrates inferential intuition in action.

A farmer during the cut of hay crop starts hearing a weird sound coming from his truck. While he is thinking about the possible causes of this additional sound, he also starts to feel an extra vibration on the truck. Noticing that something was not right, he needed to decide whether he should first finish the cut of the field or to stop the cut immediately and check the truck since the issue might cause great damages to the truck. Relying on his previous experience, he quickly remembers that he encountered a similar issue before caused by the roller bearings of the truck. He concludes that the issue might most likely come from the roller bearings and decides to finish cutting the crop (Dabell et al., 2009).

Dabell et al. (2009) also gave an engineering approach where inferential intuition is implemented on a machine's operating system. The authors describe inferential intuition in five steps. The first step consists of identifying a situation where a decision needs to be made from something that is unfamiliar to oneself. The second step involves defining the known elements from the situation - what is generally accepted or expected to happen, as well as what a potential failure might look like. For the next step, previous knowledge is used to compare and determine possible causes given the situation. Then, taking what is expected and what is previously known, all possible conditions are assessed and compared. The final step entails making the final best decision after evaluating all possible reasons and alternatives.

II. Affective Intuition:

Emotions generally influence the way we look at a person or approach a situation. Intuition is often influenced and "rooted in emotions" (Wolfe et al., 2019). Depending on the positive or negative way we perceive or experience a specific situation, our intuitive decision will be also influenced by those feelings. Affective intuition is the intuition type that most relates to how individuals make intuitive choices (Pretz et al., 2014) as they are related to the emotions from past experiences we had toward a particular situation. These feelings are holistic and quick, which do not require any effort to convey them.

Wolfe et al. (2019) study showed that compared to experienced auditors, less experienced auditors approach audit risk using mainly affective intuition due to their scarce knowledge and experience with audit risk. This prevents less experienced auditors to make decisions based on an analytical way and instead directly jumping to the use of intuition, especially the use of affective intuition since the other intuition types are based on the knowledge that is previously learned. Additionally, researchers had explored the relationship between mood and intuitive judgments. Bolte et al. (2003) discovered that having a positive mood towards a situation stimulates remote and weak connections, which improve the ability to make correct intuitive judgments. Negative emotions, on the other hand, can limit this ability to make weak associations, preventing individuals from making sound intuitive judgments.

III. Holistic Intuition:

Holistic intuition combines many diverse pieces of knowledge in a non-analytical way to make decisions while emphasizing the whole picture. Holistic intuition has a Gestalt perspective (Sinclair, 2011; Pretz et al., 2014), which stresses that the whole of the subject of interest is greater than its individual parts.

An example of a field that uses holistic intuition are nurses. Nurses frequently use holistic intuition for the assessment and care of their patients (Sinclair, 2011). They first equip themselves by obtaining broad knowledge and theory of their discipline and practices. Through experience, they gain valuable knowledge surrounding different health issues and become experts in the practice. In order to provide the best treatment and care, nurses first gather information about the symptoms or condition of the patient. The nurse then looks at the collected data and tries to identify a pattern to determine the cause. With the combination of the nurse's knowledge and experience, the nurse will be able to infer the possible health issue of the patient. The use of quantitative measurements will then validate or reject the observations made by the nurse. This ongoing process and continuous data gathering help to accurately guide the caring and treatment process of a patient (Potter & Frisch, 2007). This example shows how a nurse, by using previous knowledge and collecting data, can look at the whole picture to infer the health issue underlying the patient.

Measuring Intuition

Several validated instruments measure intuition (Sinclair & Ashkanasy, 2005; Pretz et al., 2014; Wang et al., 2017). According to Pretz, et al. (2014) two of the most well-known instruments for measuring intuition are the Myers-Briggs Type Indicator (MBTI) and the Rational Experiential Inventory (REI). Both instruments measure a variety of aspects of intuition and have been widely used by researchers in the field. The Myers-Briggs Type Indicator (MBTI) consists of an Intuitive/Sensate scale and a Thinking/Feeling scale. The Intuitive/Sensate scale indicates the dependence between the use of intuition and the conscious, which refers to the use of inferential intuition and holistic intuition while the Thinking/Feeling scale measures the reliance on rationality and emotions, which describes affective intuition. Similarly, the Rational Experiential Inventory (REI) measures the preference between rationality and intuition, but it does not differentiate between the three different intuition types discussed in the previous sections. Therefore, Pretz et al. (2014) presents a new instrument for intuition measurement, known as The

Types of Intuition Scale (TIntS). This validated instrument combines the MBTI and REI instruments since seen together they measure various intuition elements. In past studies they have also shown that the combination of both is psychometrically strong (Pretz et al., 2014) as both tools assess specific variants of intuition, with MBTI indicating holistic intuition type, and REI reflecting affective and inferential intuition types (Pretz et al., 2014). As a result, the TIntS provides a comprehensive measure of intuition that integrates all three independent types of intuition – inferential intuition, affective intuition, and holistic intuition.

The rapid development of big data and technology growth has changed the role of the markets and increased the amount of knowledge society holds as well as providing a wide variety of alternatives to choose from (Sinclair & Ashkanasy, 2005; Krishnan, 2018). The new challenges and problems that society faces have become more complex and harder to predict. Being in a more uncertain and fast-paced society, individuals have limited time and have become restricted to make decisions simply analytically. This has led experts to try to understand ways individuals use intuition to make effective decisions. The study by Khatri and Ng (2000) indicates that intuition is mainly used when an individual is in an unstable and unfamiliar environment while intuition use is less present when encountering a stable and familiar environment.

Several research studies have explored and validated the reliance on the use of intuition within a specific group. Ruth-Sahd and Tisdell (2007) discusses how novice nurses highly utilize intuition that is built through their life experiences and connections. In the case of Pretz et al. (2014), their study showed that musicians depend on the use of intuition more than non-musicians, specifically with the use of affective intuition. Kaufmann, Wagner, and Carter (2017) highlight that decision-making consists of both analytical and intuitive processes. In this study, it was found that managers depend on intuitive decisions for supplier management. This is due to a lot of uncertainty in these fields, so there is not enough knowledge and time for long time reasoning. Moreover, The Gregorc Style Delineator is a tool that assesses how an individual perceives the world and organize their thoughts. When solving problems, Lucietto et al. (2017) found that engineering technology students have a preference to take risks, which causes them to have a higher dependence on intuition. These results indicated that engineering technology students prefer hands-on experiences, which consist of repetitive and trial and error activities for problem-solving. Lucietto, Moss, & French (2017) as well suggested that educators should structure courses for engineering technology students to be logical, straightforward, and hands-on experiences since students depend on intuition usage. Later, using the Cognitive-Experiential Self Theory (CEST) instrument, Lucietto et al. (2020) also showed that engineering technology students scored higher on the use of intuition thinking than analytical thinking. It was also found that engineering and engineering technology students utilize intuition in similar ways mainly relying on inferential intuition (Cai Shi et al., 2021).

Another perspective, studies by Pretz (2008), Pretz & Folse (2011), and Wolfe et al. (2019) showed that the use of an analytic or intuitive process depends on the level of experience of the individual. A novice individual will make better choices by utilizing an intuitive perspective while a highly experienced individual will make effective

decisions by using a rational pathway. In addition, Taleyarkhan et al. (2023) indicated that engineering technology students have a preference to use logic to solve problems but when encountering an unfamiliar or stressful situation they have a dependence to use intuition. In an earlier study, Taleyarkhan et al. (2021) similarly showed that when solving an unfamiliar problem, engineering technology students indicated the reliance on prior knowledge and their gut feeling to deal with the situation.

Furthermore, a study on magical beliefs differences in gender indicated that intuition plays an important role in explaining these differences (Ward & King, 2020). The analysis concluded that women depend more on intuition than men. Men have been portrayed in society as rational beings who are rarely driven by emotions while women are seen as having high emotional dependence with lower emotion suppression. It is explained that cultural and socialization factors might be the ones that contribute to the women trusting then more the use of intuition (Ward & King, 2020).

Additionally, ethnicity, culture, and values are closely related. A strong preference for the use of intuition among East Asians was found in comparison to Western cultures (Buchtel & Norenzayan, 2008; Ward & King, 2020). East Asian cultures are based on philosophies, such as Confucianism and Taoism that portray intuition in a positive and sophisticated manner. Their ideology follows the spiritual ideal of "wu wei" which is means "effortless action" which is an intuition form. Intuition is highly regarded in these cultures since intuition contributes to the responsiveness and effortless deliberation in their complex societies (Buchtel & Norenzayan, 2008).

However, there had not been an in-depth study or research on the relationship between different groups altogether and their preference for the use of intuition over other problem-solving techniques. This analysis will provide greater insight on how different factors such as field of study, experience in the field, gender, and ethnicity seen together might influence the intuition use. Education systems and the social environment provide knowledge and experiences that can shape the way an individual perceives society and his or her moral values (Slovic & Västfjäll, 2010). As a result, the purpose of this research study is to get a better understanding of intuition, so educators and researchers can better understand the way different groups of students learn and make decisions to provide them with the best teaching methods so the students can be successful in their careers (Lucietto et al., 2017; Lucietto et al., 2017; Cai Shi et al., 2021; Taleyarkhan et al., 2023). analytic methods.

Methods

The research study aims to determine if and which groups of students are inclined to use intuition rather than general analytic methods to solve problems. It is also the intent of this project to gain an understanding of the types of intuition they use. The following questions are intended to guide this research to obtain these answers.

- What specific groups of undergraduate students prefer the use of intuition over other methods of problem-solving?

- What type of intuition do specific groups of undergraduate students who depend on intuition rely upon to solve problems?

From these questions, researchers of the study aim to determine what role the major, gender, ethnicity, and/or college year of classification of an undergraduate student play with the likelihood of relying on the use of intuition. Additionally, it will lead us to find out how do these four factors influence the type of intuition that undergraduate students rely on when solving problems.our lives, we make intuitive judgements. It is part of our daily life and

This cross-sectional study utilized a survey developed from a validated instrument for data collection administered to all undergraduate students from each of the programs offered at Purdue University.

Survey Development

Using the Qualtrics software, the study created a survey based on the Types of Intuition Scale (TIntS) developed by Pretz et al. (2014). Appendix A lists the survey items from the TIntS. While maintaining the participant's anonymity, the study also collected general demographic information which consisted of major, college/school, gender, ethnicity, college year of classification, GPA, age, and address zip code. The survey items focused on the different ways an individual makes a decision and solves problems. Each participant rated each statement on a Likert scale from 1 to 7, with 1 representing strong disagreement and 7 expressing strong agreement.

Survey Administration

The survey was distributed during May and June of 2020 to a cross-section of undergraduate students at Purdue University via an email with an embedded link to the survey. The participants were given unlimited time to complete the survey; however, the survey's estimated time to be completed was approximately 10 to 15 minutes. The survey was left open for 5 weeks for students to complete.

Survey Data Analysis

A general statistical analysis was conducted using R Studio software. The data was first cleaned to remove the incomplete and unanswered responses. A total of 1109 records were used for data analysis. Due to the small sample size, some colleges with similar educational backgrounds were grouped as they have similar characteristics in the way they learn and view the world. This grouping was based on Biglin's (1970) Classification of Academic Disciplines (Souza et al., 2018). The College of Health and Human Sciences, Pharmacy, and Veterinary School were combined since they are considered to work with life systems, and the College of Liberal Arts and Education were merged since they are classified as soft disciplines. Additionally, the gender category "other" was removed because of the small sample size (9 records). Sample size under 20 when applying regression deviates the results providing not representative information to make claim upon that small sample size.

Based on the TIntS items, a regression model was built for each intuition type. Regression analysis provided a way to study the differences between factors (college, gender, ethnicity, and college year of classification) and the interactions between them. The 2-way interaction was used in the regression model to observe how different covariates interactions affect the preference of each intuition type. The selection of the best model with the factors that best explain the use of each intuition type was based on the stepwise selection method. Each model will indicate evidence if there is a significant impact of each specific factor on their preference to use intuition over other problem-solving strategies. This approach will indicate which factors to focus on for each type of intuition.

Results

The baseline chosen for the regression model was College of Health and Human Sciences, Pharmacy, and Veterinary School for the college variable, 1st-year for the college year of classification variable, male for the gender variable, and white for the ethnicity variable. These four groups were chosen as baseline due to the familiarity of the intuition usage of these categories.

The data analyzed had a total of n=1109 records. Figure 1a-d display the distribution of the four factors of interest in the study: college, gender, year of classification, and ethnicity.

Inferential Intuition

Stepwise selection showed that only gender and ethnicity without any interaction between categories explained the use of inferential intuition. College and college year of classification did not provide any additional explanation to the use of inferential intuition. The model gave a p-value of $3.524 \times 10^{-11} < \alpha = 0.05$, which indicated a good fit of the model explaining the relationship of inferential intuition with respect to gender and ethnicity. The intercept of the model was 5.4802 (p-value = $2 \times 10^{-16} < \alpha = 0.05$). Table 1 provides the summary of the coefficient estimates for the inferential intuition regression.

Figure 1

Distribution of explanatory variables

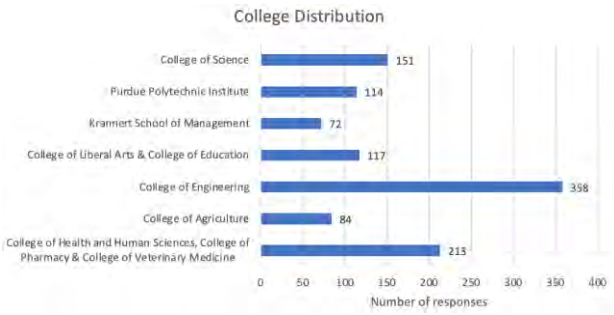

Figure 1a. College Distribution. There was a higher number of responses received by the College of Engineering followed by the College of Health and Human Sciences, College of Pharmacy & College of Veterinary Medicine, and College of Science.

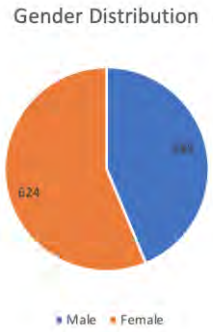

Figure 1b. Gender Distribution. There was a higher response rate from female(n=624) students than male(n=485) students.

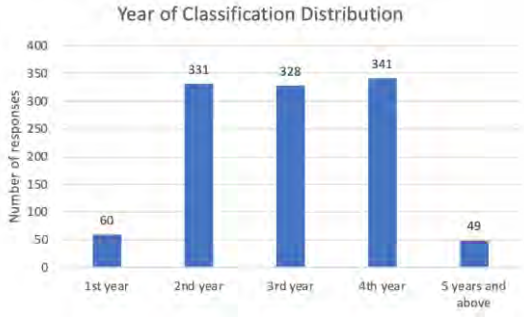

Figure 1c. College Year of Classification Distribution. 2nd-year, 3rd-year, and 4th-year students' number of responses collected were similar. There were fewer 1st-year and 5 years and above students' responses.

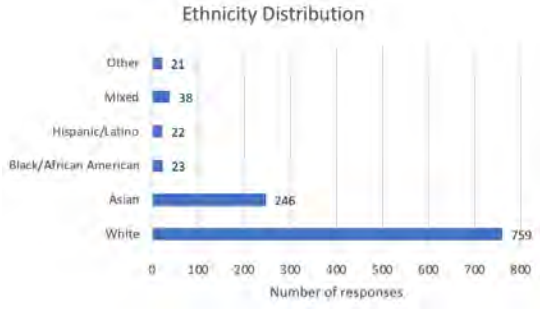

Figure 1d. Ethnicity Distribution. There were a high number of responses from White students followed by Asian students in comparison to the other ethnicities.

There were 4 models constructed, one for each type of intuition. Each model will be described in the following section.

Table 1

Inferential Intuition Regression Coefficient Estimates

	Coefficient Estimate	p-value
Gender		
Female	-0.12937	0.00043*
Ethnicity		
Asian	-0.31225	2.8×10^{-12}*
Black/African American	-0.07497	0.55554
Hispanic/Latino	0.00575	0.96470
Mixed	0.06470	0.51763
Other	0.06691	0.61533

Note: A p-value less than 0.05 indicates that the factor has a significant impact and/or significant difference compared to the baseline in the use of inferential intuition.

Table 1 above revealed that women have a significant difference in the usage of inferential intuition in comparison to men, with women having a lower usage of inferential intuition. Additionally, for the ethnicity category, in comparison to White students, only Asian students showed to have a significant difference in the use of inferential intuition. The use of inferential intuition among Asian students was 0.31225 lower than White students.

Figure 2 depicts the equation for the inferential intuition regression model. Using the equation below and the coefficient estimates from Table 1, the use of the inferential intuition according to each group can be estimated. For example, if it is of interest to know the inferential intuition usage of a female Hispanic individual, the inferential intuition will be 5.35658 (5.4802 + -0.12937 + 0.00575).

Figure 2

Inferential Intuition Regression Line Equation

$$Inferential = b + X_g + X_e$$

b: *Intercept*

X_g: *Gender Coefficient Estimate*

X_e: *Ethnicity Coefficient Estimate*

Affective Intuition

The model (p-value = $2.2 \times 10^{-16} < \alpha = 0.05$) with all four factors – college, gender, college year of classification, and ethnicity – provides the best fit to explain the use of affective intuition. In addition to all four factors analyzed, the college year of classification and gender interaction, and the gender and ethnicity interaction terms have an

impact on the reliance of affective intuition. The intercept of the model was 3.23697 (p-value = $2x10^{-16} < \alpha = 0.05$). The regression coefficient estimates of the affective intuition model are provided in Table 2.

Table 2

Affective Intuition Regression Coefficient Estimates

	Coefficient Estimate	p-value
College		
College of Agriculture	0.02384	0.85204
College of Engineering	-0.54611	$8.87x10^{-09}$ *
College of Liberal Arts & College of Education	0.32638	0.00434 *
Krannert School of Management	0.03485	0.79891
Purdue Polytechnic Institute	-0.34180	0.00513 *
College of Science	-0.36433	0.00109 *
Gender		
Female	0.72885	0.00736 *
Year of Classification		
2nd year	0.36712	0.10453
3rd year	0.49975	0.02789 *
4th year	0.37533	0.09720
5 years and above	0.36447	0.19673
Ethnicity		
Asian	0.33506	0.00135 *
Black/African American	0.42812	0.25671
Hispanic/Latino	0.42405	0.26046
Mixed	0.38983	0.21882
Other	0.54557	0.04257 *
Year of Classification and Gender Interaction		
2nd year – Female	-0.11336	0.69227
3rd year – Female	-0.49552	0.08447
4th year – Female	-0.27798	0.33185
5 years and above – Female	-0.00975	0.98026
Gender and Ethnicity Interaction		
Female – Asian	-0.49120	0.00087 *
Female – Black/African American	-0.69391	0.12637
Female – Hispanic/Latino	-0.51202	0.26222
Female – Mixed	-0.44035	0.23608
Female – Other	-0.98417	0.03325 *

Note: A p-value less than 0.05 indicates that the factor has a significant impact and/or significant difference compared to the baseline in the use of affective intuition.

The Table 2 of the affective intuition regression coefficient estimates showed that the College of Engineering, Purdue Polytechnic Institute, and College of Science are negatively related to the usage of affective intuition with respect to the baseline. The College of Engineering had the greatest significant lower usage of affective intuition. In

the case of the College of Liberal Arts & College of Education, the model suggested that this college had significantly greater usage of affective intuition compared to the baseline. In addition, women have a greater usage in the use of affective intuition as well as Asian students. In comparison to 1st-year students, 3rd-year students demonstrated to rely more on affective intuition. Additionally, the interaction between female and Asian students provided additional information that when these two factors are considered together, there is a significantly lower difference in the use of affective intuition.

Figure 3 provides the regression equation of the model to estimate the affective intuition usage of all the different combinations of groups.

Figure 3

Affective Intuition Regression Line Equation

$$Affective = b + X_c + X_g + X_y + X_e + X_{yg} + X_{ge}$$

b: *Intercept*

X_c: *College Coefficient Estimate*

X_g: *Gender Coefficient Estimate*

X_y: *College Year of Classification Coefficient Estimate*

X_e: *Ethnicity Coefficient Estimate*

X_{yg}: *College Year of Classification and Gender Interaction Coefficient Estimate*

X_{ge}: *Gender and Ethnicity Interaction Coefficient Estimate*

Holistic Big Picture

After utilizing stepwise selection, the model concluded that gender, college, and the college and gender interaction best explains the use of holistic big picture intuition. In other words, gender and college are the factors that drive the use of holistic big picture intuition while college year of classification and ethnicity do not contribute to explaining the use of the holistic big picture intuition. The p-value of the model was $0.0001755 < \alpha = 0.05$, which suggests that the model shows a good fit for explaining the relationship between the use of holistic big picture intuition and the factors studied. The intercept of the model was 4.2912 (p-value = 2x10-16 $< \alpha = 0.05$). Table 3 shows the summary of the results of the model.

Table 3

Holistic Big Picture Intuition Regression Coefficient Estimates

	Coefficient Estimate	p-value
College		
College of Agriculture	-0.37833	0.1955
College of Engineering	0.18657	0.3962
College of Liberal Art & College of Education	-0.15472	0.5537
Krannert School of Management	0.60959	0.0246 *
Purdue Polytechnic Institute	0.11904	0.6122
College of Science	0.17338	0.4582
Gender		
Female	-0.06657	0.7635
College and Gender Interaction		
College of Agriculture – Female	0.34462	0.2784
College of Engineering – Female	-0.01092	0.9639
College of Liberal Arts & College of Education – Female	0.33908	0.2344
Krannert School of Management – Female	-0.60158	0.0504
Purdue Polytechnic Institute – Female	-0.32554	0.2475
College of Science – Female	-0.21502	0.4142

Note: A p-value less than 0.05 indicates that the factor has a significant impact and/or significant difference compared to the baseline in the use of holistic big picture intuition.

Table 3 shows that the Krannert School of Management is the only factor that had a significant difference in the use of holistic big picture intuition compared to the baseline of College of Health and Human Sciences, Pharmacy, and Veterinary School. The students from the Krannert School of Management are more dependent on the use of holistic big picture intuition than the baseline.

Using the regression equation below (Figure 4), we can estimate the use of holistic big picture intuition according to each factor.

Figure 4

Holistic Big Picture Intuition Regression Line Equation

$$Holistic\ Big\ Picture = b + X_c + X_g + X_{cg}$$

b: *Intercept*

X_c: *College Coefficient Estimate*

X_g: *Gender Coefficient Estimate*

X_{cg} : *College and Gender Interaction Coefficient Estimate*

Holistic Abstract

The model selected for holistic abstract intuition is composed of college, gender, and ethnicity. These three variables are the only ones that contribute to the use of holistic abstract. There were no interaction terms between factors that contribute to the use of holistic abstract intuition. The p-value of the model was $3.195 \times 10^{-7} < \alpha = 0.05$ which gives us confidence that our model explains well the data collected and the relationship between variables. The intercept was 3.59814 (p-value = $2 \times 10^{-16} < \alpha = 0.05$). The following table breaks down each of the coefficient estimates for the holistic abstract intuition model.

Table 4

Holistic Abstract Intuition Regression Coefficient Estimates

	Coefficient Estimate	p-value
College		
College of Agriculture	-0.09034	0.52949
College of Engineering	-0.18472	0.08025
College of Liberal Arts & College of Education	0.49859	0.00011 *
Krannert School of Management	0.00492	0.97438
Purdue Polytechnic Institute	-0.19079	0.16134
College of Science	0.10865	0.38287
Gender		
Female	-0.24096	0.00151 *
Ethnicity		
Asian	0.20573	0.01361 *
Black/African American	-0.11347	0.62916
Hispanic/Latino	0.13131	0.58411
Mixed	0.17896	0.33356
Other	0.51664	0.03573 *

Note: A p-value less than 0.05 indicates that the factor has a significant impact and/or significant difference compared to the baseline in the use of holistic abstract intuition.

The College of Liberal Arts & College of Education had a positive impact on the use of holistic abstract intuition with respect to the baseline, while Asian students had a negative impact on the usage of holistic abstract intuition. The model also provided evidence that women have a lower usage of holistic abstract intuition than men.
The following equation (Figure 5) calculates the estimate of the holistic abstract intuition by utilizing the coefficient estimates from Table 4.

Figure 5

Holistic Abstract Intuition Regression Line Equation

$$Holistic\ Abstract = b + X_c + X_g + X_e$$

b: *Intercept*

X_c: *College Coefficient Estimate*

X_g: *Gender Coefficient Estimate*

X_e: *Ethnicity Coefficient Estimate*

Discussions

The study considered college, gender, college year of classification, and ethnicity to analyze whether these four factors influence the intuition preference of undergraduate students. Using the data collected, a model for each intuition was constructed and provided evidence of significant differences between groups for each intuition type usage.

Preferred Use of Intuition

The general results suggest that all four factors to some extent shape the way undergraduate students utilize intuition. Through all four models, gender was shown to be a significant factor that explains the differences in the usage of intuition. Female undergraduate students were revealed to have a higher usage of intuition than male undergraduate students. Ward and King's (2020) research on magical beliefs and intuition also indicated that women have a higher reliance on intuition than men. Socialization and culture are elements that shape how men and women perceive themselves (Ward & King, 2020), which might explain the differences in the dependence of intuition use. Society portrays men as rational beings, and it is disapproved of them when their decision-making is based on emotions. In the case of women, it is seen that they have lower emotional suppression as well as higher emotional intensity than men (Ward & King, 2020). This might contribute to women relying more on the use of intuition.

Additionally, college and ethnicity are other factors that have an impact on the preference of the use of intuition but are less dominant than gender. Ethnicity and culture are very closely related. The reliance on intuition is seen as more important as well as reasonable than analytical thinking on East Asians in comparison to Western people's intuition (Buchtel & Norenzayan, 2008; Ward & King, 2020). Moreover, education provides the knowledge and develops the necessary skills for an individual to succeed in their field. Education can shape the way an individual perceives society and its moral values (Slovic & Västfjäll, 2010). On the other hand, the college year of classification did not show any differences in intuition usage except for affective intuition. College year of classification might have provided skewed results because some students graduate in three years instead of the regular four-year track. Additionally, some students might have entered college with credits, so despite being a 1st-

year student, they could be a 2nd-year or 3rd-year by credit status. Therefore, the results presented are not representative of the intuition levels for each college year of classification. The results of the study indicated that gender, college, and ethnicity affect the way students rely on intuition to solve problems.

Preferred Type of Intuition

Inferential intuition refers to the intuition that is based on past analytical reasoning which is then used in a quick manner overpassing the step-by-step analytical process for decision making. The best model selected for inferential intuition showed that gender and ethnicity are the only factors that drive the use of inferential intuition while college year of classification and college do not have a statistically significant impact. The model indicated that women utilize slightly less inferential intuition than men. This suggests that men rely more on the use of past knowledge to make quick decisions than women. Men depend first on analytical thinking and then store it for later intuitive use (Ward & King, 2020). Additionally, Asian students indicated to rely less on inferential intuition than White students. This reveals that Asian students prefer the use of analytical thought processes to solve problems than relying upon previous similar experiences.

Analyzing the affective intuition model, the model selected considered all four factors, gender, college, ethnicity, and college year of classification. This is the only type of intuition in which all four of the factors contributed to explaining the reliance of the use of the intuition type. Affective intuition is intuition that is based on emotions. The College of Engineering, Purdue Polytechnic Institute, and the College of Science indicated having a lower dependence on affective intuition with respect to the College of Health and Human Sciences, Pharmacy & Veterinary School. The greater exposure to quantitative, analytical, and structured problem solving might attribute to the lower reliance on affective intuition for STEM majors. These results are consistent with previous research in which engineering and engineering technology students ranked lowest in the use of affective intuition (Cai Shi et al., 2021). On the other hand, the College of Liberal Arts & College of Education has a greater dependence on affective intuition. Students from liberal arts majors are known for their creativity in the creation and analysis of literature as well as thinking critically to form arguments to make sense of the theory, facts, and moral reasoning (Seifert et al., 2008). Moreover, women have greater usage of affective intuition than men. As mentioned previously, it has been found that women have lower emotional suppression than men (Ward & King, 2020), which societal cues positively influence women to use affective intuition. It is also interesting to point out that Asian students also have a higher dependence on affective intuition. Asian cultures are based on philosophies that are characterized by being in harmony and cultivating values in which a perfect balance of emotions and morals are important aspects (Buchtel & Norenzayan, 2008; Ward & King, 2020). Additionally, 3rd-year students tend to prefer the use of affective intuition than 1st-year students since more experience attributes to different personal experiences that intuition can be based on (Pretz, 2008; Pretz & Folse, 2011; Wolfe et al., 2019), but as mentioned before, these results might be skewed due to the inconsistencies in the groupings.

Holistic big picture intuition suggests the use of qualitative reasoning to make decisions by combining a variety of pieces of information and looking at it as a whole piece. Based on the best model selected, it was shown that gender and college were the only factors that influence the use of holistic big picture intuition while college year of classification and ethnicity do not have an impact on the use of holistic big picture intuition. Only Krannert School of Management showed to have a significantly greater preference in the use of holistic big picture intuition. Individuals in management positions with experience years are attributed to have the expert intuition which is the ability to make immediate decisions in the financial world (Walsh et al., 2021). The combination of holistic big picture intuition with analytical thinking is needed for managers to create and capture opportunities in their business (Walsh et al., 2021).

The holistic abstract model indicated that college, gender, and ethnicity influence the use of holistic abstract intuition. Holistic abstract intuition is grounded on personal experiences of how the world operates to make decisions. The College of Liberal Arts & College of Education showed to have a greater reliance than the College of Health and Human Sciences, Pharmacy & Veterinary School on the use of holistic abstract intuition. College of Liberal Arts & College of Education are fields that focus on critical thinking and communication skills, which holistic abstract come into play to understand and make sense of the theory, facts, and moral reasoning (Seifert et al., 2008). Women in this case have a lower usage of holistic abstract intuition than their male counterparts. They prefer more logical thought processes. Asian students are also shown to have a higher dependence on holistic abstract intuition in contrast to white students. This might be because Asian cultures have philosophies and morals that highly regard intuition use (Buchtel & Norenzayan, 2008).

One of the limitations from the study is that the college variable consists of a broad category for fields of study. Due to the small sample size, there was not enough data to analyze intuition by major. However, as a broad category, college showed to be a significant factor that influence the usage some intuition types, which the next step of interest is to break it further down to specific majors and observe if which the relationship of intuition usage still holds or there are some differences presented.

Conclusion

The four regression models built with the data collected showed that college, gender, college year of classification, and ethnicity to some extent influence the preference on the usage of intuition among undergraduate students. The results indicated that inferential intuition is driven by gender and ethnicity only, with women and Asian students relying less on the usage of previous analytical reasonings for quick decision making compared to male and white students respectively. In addition, all four factors – college, gender, college year of classification, and ethnicity – contribute to the dependence of the use of affective intuition, with women, Asians, and 3rd-year students having a higher reliance compared respectively to male, white, and 1st-year students. The interaction between women and Asians also provided a significantly lower impact to consider on the use of affective intuition. The College of Engineering, Purdue Polytechnic Institute, and College of Science have a lower dependence on the use of intuition

based on emotions than the College of Health and Human Sciences, Pharmacy & Veterinary School, while the College of Liberal Arts & College of Education has a higher dependence on affective intuition. In the case of holistic big picture intuition, college, gender, and the interaction between college and gender explained the best the usage of this type of intuition. The holistic big picture model indicated that only students in the Krannert School of Management (business school) have a significantly higher preference for using holistic big picture intuition. For holistic abstract intuition, college, gender, and ethnicity were the factors that influenced the use of this intuition type. The College of Liberal Arts & College of Education showed to have a significantly higher usage of holistic abstract intuition compared to the College of Health and Human Sciences, Pharmacy & Veterinary School, as well as Asian students showed to have greater utilization of holistic abstract intuition in comparison to white students. However, women had a lower dependence on holistic abstract intuition in contrast to men. These outcomes suggest that different groups, such as college, gender, year of classification, and ethnicity, can shape the way one utilizes intuition and the dependence on intuition in their daily decision-making process with gender being the main driver of the differences in the usage of each intuition type.

Future work

The results from this study were based on a sample taken from one specific midwestern research university. It will be of interest to replicate this research study as a national study with a larger sample size (e.g., larger than 5000) to observe if the same patterns of students' experiences in the use of intuition arise. These results will give clearer and stronger evidence that the patterns obtained from this study are not specific to a university but can be generalized. When making a decision based on intuition, it involves the risk of making a wrong decision, as well as some religions and cultures, might have a positive view on the use of intuition over others. Therefore, religion, risk aversion, and region of the participant are additional factors to consider in each of the four models since these factors might provide greater insight into the use of each intuition type. Another aspect that can be explored is internship and/or co-op experience, which provides individuals the practical experience in the field, which might influence the usage of intuition. Additionally, if a greater sample per major is obtained, it can also be considered focusing on the major instead of the college to see if there are any additional findings. This study focused on how each individual/group use independently each type of intuition. Another aspect of interest is to further explore is there is a relationship of the different categories simultaneously using different types of intuition.

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Appendix A – Types of Intuition Scale Items

The survey distributed consisted of the following 29 items that were based on the Types of Intuition Scale (TIntS) developed by Pretz et al. (2014):

Inferential Intuition Questions

1. *I trust my intuitions, especially in familiar situations.*
2. *Familiar problems can often be solved intuitively.*
3. *There is a logical justification for most of my intuitive judgements.*
4. *My approach to problem solving relies heavily on my past experience.*
5. *My intuitions come to me very quickly.*
6. *My intuitions are based on my experience.*
7. *When I have experience or knowledge about a problem, I trust my intuition.*
8. *When making a quick decision in my area of expertise, I can justify the decision logically.*
9. *I've had enough experience to know what I need to do most of the time without trying to figure it out from scratch every time.*

10. *If I have to, I can usually give reasons for my intuitions.*
11. *I rarely trust my intuition in my area of expertise. (R)*
12. *When I make intuitive decisions, I can usually explain the logic behind my decision.*

Affective Intuition Questions

1. *I prefer to use my emotional hunches to deal with a problem, rather than thinking about it.*
2. *I rarely allow my emotional reactions to override logic. (R)*
3. *I tend to use my heart as a guide for my actions.*
4. *I often make decisions based on my gut feelings, even when the decision is contrary to objective information.*
5. *When making decisions, I value my feelings and hunches just as much as I value facts.*
6. *I believe in trusting my hunches.*
7. *I generally don't depend on my feelings to help me make decisions logically. (R)*
8. *I prefer to follow my head rather than my heart. (R)*
9. *It is foolish to base important decisions on feelings. (R)*

Holistic-Big Picture Intuition Questions

1. *When tackling a new project, I concentrate on big ideas rather than the details.*
2. *It is better to break a problem into parts than to focus on the big picture. (R)*
3. *When working on a complex problem or decision I tend to focus on the details and lose sight of the big picture. (R)*
4. *I try to keep in mind the big picture when working on a complex problem.*
5. *I am a "big picture" person.*

Holistic-Abstract Intuition Questions

1. *I would rather think in terms of theories than facts.*
2. *I prefer concrete facts over abstract theories. (R)*
3. *I enjoy thinking in abstract terms.*

**R – Reversed*

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