The Grading Process in System 1 and System 2 of Thinking: A Behavioral Economic Approach to Evaluation

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ABSTRACT

The concepts of heuristics and biases underlie the decision-making process both at intuitive and rational levels, which Daniel Kahneman refers to as System 1 and System 2 of thinking. This research seeks to explore the interplay between these cognitive mechanisms and students' grading decisions, examining the extent to which heuristics and biases can influence evaluation in the everyday process of learning and teaching. A survey was conducted, containing four grading situations that combine the experiences of reading, evaluation, and decision-making in four stages of System 1 and System 2 of thinking. The hypotheses and sub-hypotheses were tested using a quantitative approach, through a 15-item self-administered questionnaire (SAQ) in English, which collected data about the heuristics influencing Romanian students' grading decision in four evaluative situations based on a synopsis of *The Book Thief* by Markus Zusak. The self-constructed questionnaire was filled in by 108 Romanian students studying for a bachelor's, master's, or doctoral degree in public and private universities. The data set was analyzed, using descriptive, inferential, and path-analysis methods (frequencies, percentages, measures of central tendency, t-tests, ANOVA, simple and multiple linear regression, mediation, and moderation) and one statistical program (R Studio 4.3.4.). Grade 1 (the most intuitive) can predict Grade 4 for the synopsis of *The Book Thief*. However, the correlation between Grades 2 + 3 and Grade 4 is much stronger than the correlation between Grade 1 and Grade 4. Furthermore, the impact of Grade 1 on Grade 4 is mediated by Grade 3 while Grade 1 has no effect on the impact of Grade 3 on Grade 4. The rational model of heuristics involved in the grading process is much stronger than the intuitive model. The study sheds light on the intricate interplay between intuition and rationality in the grading process, offering novel insights into the cognitive mechanisms that underlie decision-making.

Keywords- System 1 and System 2 of thinking, intuition, reason, heuristics and biases, confirmation bias, *The Book Thief*, grading.

I. INTRODUCTION

The concepts of heuristics and biases play a pivotal role in shaping everyday evaluations and judgments, whether they stem from instinct or rationality. The evolving field of psychology has long sought to unravel the complexities of the human mind through various modalities of psychometric testing. However, the quest to comprehend the brain's structure and function in order to understand human behavior in its entirety necessitated the emergence of interdisciplinary fields such as neuroscience and behavioral economics. A significant milestone of the postmodern era lies in the capability to capture images of cerebral activity, which has opened new horizons in exploring the mechanisms behind human cognition and behavior [1]. Influential figures like Einstein, Tesla, and Targ have emphasized the importance of intuition and the interconnected nature of

consciousness, further motivating the exploration of cognitive processes like heuristics and biases in the current study [2][3][4].

The grading process, at its core, involves evaluating students' academic performance against a set of criteria. This practice can be adapted to individual self-assessment and can aid in recognizing personal strengths, weaknesses, and areas requiring development [5]. The application of cognitive frameworks such as System 1 and System 2 of thinking presents a compelling perspective to understand how evaluators arrive at their final grade assessments. Furthermore, the presence of common judgment errors adds another layer of complexity to the grading process [6].

Within the field of cognition and decision-making, this research paper seeks to explore the influence of heuristics and biases on the grading process in a literature-based context. With the help of one research question and two hypotheses, the present study thus investigates the extent to which common mental shortcuts, along with confirmation bias, can impact everyday evaluation process, with its intuitive and rational mechanisms, represented by System 1 and System 2 of thinking:

1.1 Question

Will students appeal to common heuristics under System 1 or System 2 of thinking, and confirmation bias, when assigning their final grades?

1.2 Hypotheses

1. *Grade 4 is closer or the same as Grade 1 (heuristics under dominant System 1).*

Under the influence of System 1 of thinking, students may rely on intuitive heuristics, resulting in a bias towards assigning a final grade closer to the most intuitive grade (Grade 1). This heuristic-based approach could be driven by rapid, intuitive judgments, potentially leading to imprecise evaluations.

2. *Grade 4 is closer or the same as Grade 2 or Grade 3 (heuristics under dominant System 2).*

When under the sway of System 2, students might engage in more deliberate cognitive processing, which allows them to incorporate a broader spectrum of information. In this scenario, students may assign a final grade closer to the more rational grades (Grade 2 or Grade 3) as a result of systematic analysis and consideration.

1.3 Significance

To investigate these hypotheses, a mixed-methods approach will be employed, based on a survey with four grading situations that amalgamate literature-reading experiences, evaluation, and decision-making in different stages of System 1 and System 2 of thinking. A sample of students from diverse academic backgrounds will be selected, and their grade assessments will be collected. Participants will not be required to provide a rationale for their grading decisions. Quantitative data will then be analyzed using a multitude of statistical tools to determine the distribution of the grades, in four instances of intuitive and rational assessment.

Through this investigation, the research aims to contribute valuable insights into the cognitive mechanisms underlying the grading process and, by extension, to enhance the understanding of the interplay between intuition and reason in educational evaluations and beyond. By examining the heuristic roles of System 1 and System 2, as well as confirmation bias, in the context of grading, educators and policymakers can gain new insights into the accuracy and fairness of evaluation procedures. Always improving educational practices will promote effective learning and teaching methodologies while outside the school system people can become more aware of their subjectivity when assessing and gauging anything.

II.   LITERATURE REVIEW

2.1 Grading

In academic institutions, grading serves several crucial purposes. Primarily, it offers students feedback on their progress, highlighting strengths and areas for improvement. Additionally, grading aids educators in assessing the effectiveness of their teaching methods and curriculum design [7] [8]. The process typically involves the evaluation of assignments, examinations, projects, and class participation, culminating in the assignment of a quantifiable grade that reflects a student's performance relative to predefined standards. Grading methods can vary, ranging from letter grades (A, B, C, etc.) to numerical scales (out of 10 or 100), and even descriptive feedback [9]. Various factors, such as accuracy, depth of understanding, critical thinking, and creativity, contribute to the final grade. However, the traditional approach to grading has been criticized for its potential to foster competition, discourage intrinsic learning motivation, and overlook individualized learning paths [10].

Thus, grading at its best involves a systematic approach to comparing and contrasting different aspects of performance [11]. Applying this skill to everyday life allows for informed goal setting and continuous improvement [12]. Similarly, decision-making in various contexts – whether financial, career-related, or lifestyle-oriented – requires the ability to weigh pros and cons, prioritize factors, and arrive at informed choices [13]. Since grading also often includes feedback for improvement, transferring this principle to daily life encourages reflective thinking and the capacity to learn from mistakes and successes alike, which can lead to personal growth and the refinement of skills over time [14]. In professional settings, grading principles are also integral to project management and quality control, so by systematically evaluating components, setting benchmarks, and measuring outcomes, individuals and organizations can ensure high standards and consistent performance. Moreover, grading's feedback component emphasizes clear communication, which is directly applicable to offering constructive feedback and maintaining effective communication in interpersonal

relationships and workplace dynamics [15]. However, expanding the concept of grading beyond educational settings comes with its challenges. Unlike in schools, where only educators are usually responsible for evaluation, in daily life, individuals often need to take on the role of both evaluators and the evaluated, which requires the development of self-awareness and objectivity. Moreover, the subjectivity inherent in grading can lead to errors, if the adaptive strategies are not approached critically and impartially [16].

2.2 Heuristics and biases

Heuristics and biases are closely related concepts, yet they refer to different aspects of decision-making and thinking processes. Heuristics represent mental shortcuts that humans use to make decisions quickly and efficiently when time and resources are limited, or rules of thumb that help simplify complex tasks by relying on previous experiences, patterns, or generalizations. These simple cognitive strategies thus allow humans to navigate their environments and make decisions without expending excessive mental effort [17]. While heuristics can be effective in many situations, they can also lead to biases when they oversimplify complex problems or do not take into account all relevant information. Biases thus refer to systematic and predictable patterns of deviation from rational judgment and decision-making, based on heuristics that introduce consistent and reproducible errors in thinking. Biases can frequently occur when judgments and decisions are influenced by factors like emotions, social context, or cognitive limitations, making individuals deviate from objective and rational decision-making. Biases can therefore lead to errors in perception, memory, reasoning, and decision-making, and can affect various aspects of life, including problem-solving, interpersonal interactions, and judgments about risks and probabilities [18].

Tversky and Kahneman (1974) pioneered research on human judgment, revealing heuristics called representativeness, availability, and adjustment and anchoring, which in various decision-making contexts may combine with cognitive errors such as confirmation bias, framing and endowment effects. The researchers' seminal work also led to the development of prospect theory, which revolutionized the understanding of how people made decisions under conditions of risk and uncertainty [19]. Gigerenzer (2008), on the other hand, advocates that biases can be mitigated by using heuristics as efficient tools for decision-making in environments dominated by decision fatigue and overchoice. The "fast and frugal" algorithms thus prove that in certain situations simple rules can lead to accurate outcomes with less cognitive effort compared to more complex coping strategies [20]. Another study, co-authored by the German psychologist, explores the concept of "ecological rationality", arguing that decision-making strategies should be adapted to the specific environment in which decisions are made [21]. Although seemingly

contradictory, both schools of thought have led to a deeper understanding of the psychological factors that influence human choices, and inspired advancements in fields ranging from finance to public policy. Since the acknowledgement of heuristics and biases, many other scholars and researchers have explored mental shortcuts and errors of judgment from various perspectives, including their nature as a form of reasoning. Heuristics have thus been conceptualized as intuitive decision-making and attribute substitution processes owing to their significant role not only in academic settings but also in the everyday process of learning and teaching [22] [23][24] [25]. Similarly, another recent study co-authored by Gigerenzer challenges the understanding of heuristics only as a form of reasoning, based on intuition's conclusion-judgments, which do not rely on premise-judgments [26]. These diverse conceptualizations can only emphasize the multifaceted nature of heuristics and their application in various cognitive processes. For instance, representativeness involves the belief that something more representative is more likely to be true, leading to stereotyping and the conjunction fallacy. The availability heuristic influences environmental understanding and decision-making based on what comes to mind immediately, so engaging reasoning to evaluate additional cues proves essential to avoid over- or underestimating event frequencies and probabilities. Anchoring and adjustment, another category, refers to the heavy influence of the first piece of information on the decision-making process, potentially leading to false values and adjacent cognitive biases unless one employs reason to step out of incorrect ways of thinking [19].

A different researcher delved into the connection between the nature of information utilized in forecasting and the cognitive strategies employed in making predictions. Specifically, availability heuristics are applied in forecasts that rely on information stored in memory while representativeness heuristics are employed when forecasting the value of one variable based on explicit information about another variable. On the other hand, anchoring and adjustment strategies are brought into play when forecasting a variable's value using explicit information about its past values. Understanding heuristics is therefore critical in structuring knowledge about judgmental forecasting [27]. An earlier paper also investigated the availability heuristic and other cognitive strategies, this time in lay judgments of research. The study found that what was easy to recall significantly influenced judgments, indicating the power of heuristics in decision-making [28]. Much later, three scholars explore the heuristic of intuition and its relevance to marketing managers making strategic-level decisions. Intuition-led decision-making, historically undervalued, thus proves a powerful tool, especially when data is limited, options are manifold, and the future is uncertain [29]. In a similar vein, yet another approach highlights the susceptibility of decision-makers to cognitive biases, as evidenced in judicial decisions [30]. Heuristics thus play

a major role in decision-making as individuals often construct reasons to resolve conflicts and justify their choices [31].

Regardless of their many interpretations, heuristics simplify and expedite decision-making in complex environments with limited information and bounded rationality [32]. However, among the errors that can derive from their usage are the cognitive biases that frequently permeate the processes of evaluation and grading, influencing academic judgments in subtle ways [33]. The halo effect thus leads to an initial positive impression of a student's work, potentially overshadowing subsequent shortcomings. Similarly, the horns effect taints perceptions negatively, making it challenging to objectively assess potential strengths [34] [35] [36]. The leniency and strictness biases cause graders to lean excessively towards generosity and severity, respectively, regardless of students' true performance [37] [38]. Additionally, anchoring bias links evaluation to an initial piece of otherwise irrelevant information [39] [40] [41]. Yet the most prevalent misjudgment may be confirmation bias, which refers to the tendency of individuals to seek, interpret, and remember only information that aligns with their preexisting beliefs or expectations while overlooking or dismissing contradictory data [42]. In the field of grading, confirmation bias can exert a substantial influence on teachers' perceptions as they may favor evidence that reinforces their initial judgments of students' capabilities, which may lead, in turn, to an inaccurate assessment of students' true potential [43]. Recognizing the presence of confirmation bias in grading is therefore pivotal for creating fair and objective evaluation systems, allowing educators to mitigate its effects and provide all students with equitable opportunities for learning and growth. Beyond academic settings, confirmation bias also indicates how individuals tend to favor information that confirms their pre-existing beliefs or experiences, thereby making all evaluators, including interviewers, more inclined to notice and remember evidence that aligns with their preconceived notions about someone or something [44]. To prevent such biases from influencing behavior, some scholars suggest that all evaluators and assessors should specify decision algorithms in advance and apply them dispassionately, hence the need for structured assessment rubrics and continuous rater training to promote fair and accurate evaluations [45] [46].

In academic settings, research has also explored how heuristics and biases can affect students' learning and assessing. Many scholars reject the notion of distinct learning styles and instead emphasize the influence of individual personalities on the learning process. This distinction emphasizes that everyone learns in essentially the same way, hence the incontestable influence of heuristics on educational settings and beyond [47] [48] [49] [50] [51] [52] [53]. In a similar vein, a 2009-study highlighted the commonalities in the functioning of the human brain, even in the face of significant differences in

people's life experiences and challenges [54]. A year later, two researchers investigated the intuitive and reasoning heuristics used by undergraduate chemistry students who ranked chemical substances based on relative values. Their study found that students' reliance on specific biases could impact curriculum development and teaching strategies, supporting students' analytical thinking and learning. Quantitative data from ranking-task questionnaires and qualitative data from semi-structured interviews thus revealed that many students relied frequently on recognition, representativeness, one-reason decision making, and arbitrary trends to make their academic decisions. While these heuristics enabled students to generate answers in the absence of requisite knowledge, it also led to confusing answers. These findings highlight the complexity of heuristics and biases in academic contexts, where they can both facilitate and hinder learning outcomes. To address such gaps and controversies, researchers recommended creating more opportunities for students to monitor their thinking, develop and apply analytical ways of reasoning, and evaluate the effectiveness of shortcut reasoning procedures in different contexts [55].

As human decision-making often diverges from normative models, implying potential cognitive irrationalities, four alternative explanations could challenge this divergence, in line with the concepts of heuristics and biases: performance errors, computational limitations, misapplied norms, and differing task interpretations [56]. In a different study that centered on computational constraints in tasks requiring cognitive decontextualization, it was observed that the ability to prevent biases exhibited a moderate correlation with conventional assessments of critical thinking. This underscores the significance of logical reasoning, especially when it contradicts pre-existing beliefs [57].

2.3 System 1 and System 2

Despite the extensive research on heuristics and biases, understanding the conditions under which individuals rely on intuitive outputs versus engaging in more effortful thinking remains a topic of debate. Rapid, emotionally-driven heuristics are well-suited for quick decisions in situations where time and information prove limited. Rational heuristics, on the other hand, involve deliberate, analytical thinking and prioritize logic and careful evaluation, being less prone to biased choices and decisions, which otherwise embody the predictable irrationality of human nature [58]. According to Kahneman (2011), System 1 of thinking represents fast, instinctive, and emotional thinking while System 2 involves slower, deliberative, and logical thinking. Notably, System 1 generates skilled intuition after adequate training and creates a coherent pattern of activated ideas in associative memory, often linking a sense of cognitive ease to illusions of truth, pleasant feelings, and reduced vigilance. Also, System 1 cannot experience doubt whereas System 2 can, due to the simultaneous promotion of incompatible options. The

ease with which instances come to mind represents a System 1 heuristic while the focus on content suggests that System 2 is more engaged [6]. Given that individuals guided by System 1 are therefore more susceptible to availability biases than those in a state of higher vigilance, reasoners can rely on intuitive outputs until a metacognitive experience called the Feeling of Rightness (FOR) signals the need for additional analysis by System 2 [59]. This comes in line with dual process theories (DPT) of reasoning, which state that judgments are mediated by both fast, automatic processes (System 1) and more deliberate, analytic ones (System 2) [60].

In essence, the literature on grading, heuristics, and biases highlights the importance of developing analytical reasoning skills and promoting self-monitoring in decision-making. Additionally, the role of heuristics and biases in students' thinking opens opportunities for further research in teaching strategies, curriculum development, and the promotion of analytical thinking in educational settings [61]. The controversies in the literature encompass the understanding of learning styles and personalities, the universality of cognitive processes (System 1 and System 2), and the distinction between intuitive heuristics and reasoning, based on the seemingly unlimited power of the subconscious mind [62]. Addressing these gaps will contribute to a more comprehensive understanding of heuristics within the cognitive processes involved in academic judgments under uncertainty as well as decision-making, learning, and evaluating in diverse contexts.

III. METHODOLOGY

3.1 Sample and design

The survey-based approach in this research generally aimed at investigating the influence of common heuristics and biases in System 1 and System 2 of thinking on the grading decisions of Romanian students in public and private universities from different regions of Romania, including Bucharest. The study thus focused on 108 students from various educational levels, such as bachelor's, master's, and doctoral programs, and with diverse majors, and utilized a 15-item self-administered questionnaire (SAQ) as the online instrument to collect primary data. The survey consisted of four grading situations that combined literature-based experiences with evaluation and decision-making in four stages of System 1 and System 2 of thinking. The types of questions in the survey included single-answer multiple-choice questions with mutually exclusive categories, 7-point and 10-point Likert-scale questions, as well as short-answer and yes-no questions. The questionnaire was thus structured into six parts, covering various aspects relevant to the research question. Part 1 (Questions 1-5) focused on personal data, Part 2 (Question 6) inquired about teaching experience, Part 3 (Questions 7, 8) assessed English language proficiency, Part 4 (Question 9) investigated personality type, Part 5 (Questions 10, 11) gathered information on

prior experience with the novel and the movie *The Book Thief*, and Part 6 (Questions 12-15) asked students to grade the synopsis of the novel in four different circumstances (see Supplement B).

Sample and design

12. Skim over the synopsis of *The Book Thief* and give it a grade from 1 to 10.

13. Read the synopsis of *The Book Thief* carefully and give it another grade from 1 to 10.

14. Read the synopsis of *The Book Thief* yet again while closely following the grading instructions given below. Then grade the synopsis again, according to the grading instructions.

15. Without rereading the synopsis, decide upon a final grade for the synopsis, taking into account whatever cues you consider significant while previously grading the summary in the first three stages.

3.2 Visuals

Set in Nazi Germany during World War II, the compelling historical novel *The Book Thief* weaves themes of love, friendship, loss, and the power of words as it revolves around a young girl who lives with a foster family. Liesel Meminger finds solace in her love for books, and her secret habit of stealing them becomes a true escape from the harsh reality of her surroundings. Australian author Markus Zusak chooses Death as the main narrator, which offers a unique perspective on the characters' lives within the broader context of war. Through Liesel's relationships with her foster parents, her best friend Rudy, and a Jewish man named Max, *The Book Thief* explores the resilience of the human spirit and heart even in the darkest times [63].

The questionnaire was thoughtfully designed to incorporate visual elements, including the movie trailer based on Markus Zusak's novel, along with images depicting the book and key scenes from the film. When querying participants about their prior experience with *The Book Thief*, corresponding images of the book and the movie trailer were provided for context. Additionally, each stage of the grading process was accompanied by captivating visuals from the movie. Notably, the final stage featured an image of Death, the central narrative voice in both the novel and the movie, juxtaposed with the request to assign Grade 4. These visual cues were strategically employed as subtle disruptors, aimed at evoking emotional responses based on personal preferences. The inclusion of the somber image of Death, coupled with the excerpt from the novel "Humans, if nothing else, have the good sense to die" [64], could have thus played a role in prompting participants to engage heuristics and biases when assigning a lower Grade 4 compared to Grades 1, 2, and 3.

3.3 Methods

The data collection process involved a non-probability sampling technique [65], participants being gathered from thirteen university Facebook groups across Romania. The questionnaire was created in English, using Google Forms, distributed through the newsfeeds of the

selected Facebook groups between December 14, 2018 and January 24, 2019, and filled out by 108 students, who voluntarily participated in the survey.

There were seven categorical variables – Gender, Place of residence, Education, Academic studies, Personality type, Book Thief Book, Book Thief Movie – and eight numerical variables: Age, Teaching experience, English level, English book reading, Grade1, Grade2, Grade3, Grade4. Some data required coding due to its nominal, ordinal or ratio nature. Special care was taken in wording the questions and formatting the questionnaire to avoid measurement errors [66].
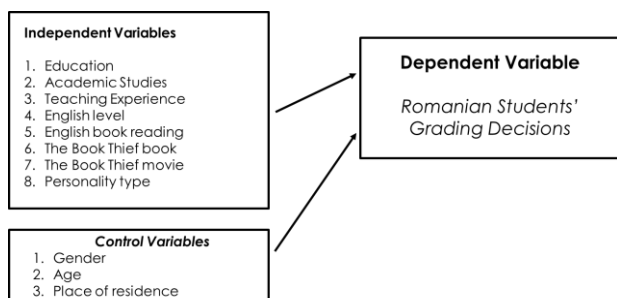

Figure 1: Variables in the study

3.4 Statistical techniques

The data analysis encompassed a comprehensive range of statistical techniques to explore the relationships and correlations between various variables. Firstly, descriptive statistics were utilized to summarize and present the data. The five-number summary provided a clear understanding of the distribution of data. The mean, percentages, and frequencies quantified central tendencies and frequencies of different variables. Histograms and pie charts visually represented the distribution and proportions of the data. Additionally, measures such as standard deviation, coefficient of variation, Pearson's coefficient of skewness, and mode helped assess the variability and symmetry of the data. Boxplots were also used to identify any outliers and to compare distributions across categories (see Supplement A).

Secondly, inferential statistics explored the relationships and correlations between variables. Simple linear regression analysis assessed whether there was a statistically significant correlation between Grade 1 and Grade 4 while multiple regression analysis investigated if there was a statistically significant correlation between Grades 2 and 3 and Grade 4. Four independent samples t-tests were then employed to determine if Grade 1 (given by students who had seen or not seen the movie *The Book Thief*), Grade 2 (given by female and male students), Grade 3 (given by students with majors in Humanities and Social Sciences), and Grade 4 (given by students from Bucharest and other cities in Romania), were significantly different from each other. Two one-way ANOVA analyses were also conducted to assess if Grade 1 (given by bachelor's, master's, and doctoral students), and Grade 4 (given by the four personality types: sanguine, choleric,

melancholic, and phlegmatic), were statistically different from one another.

Lastly, path analysis was utilized to investigate relationships between variables and potential mediation effects. Four mediation analyses were thus conducted to examine if the relationship between Grade 1 and Grade 4 was mediated by Grade 3, if the relationship between Grade 1 and Grade 4 was mediated by Grade 2, if the relationship between Age and Grade 1 was mediated by Education, and if the relationship between English level and Grade 1 was mediated by reading books in English (see Supplements A, C, D).

Additionally, three moderation analyses explored if Grade 1 affected the strength of the relation between Grades 3 and 4, if teaching experience affected the strength of the relation between Grades 2 and 3, and if having read *The Book Thief* before affected the strength of the relation between Grades 1 and 4 (see Supplements A, C, D).

IV. RESULTS

4.1 Findings

Utilizing a blend of descriptive, inferential, mediation, and moderation analyses, this study aimed to provide a comprehensive understanding of the factors influencing the evaluation of literary content (see Supplements A, C). The data variables were analyzed using Google Forms and the statistical program R Studio 4.3.4. to compute the results (R Core Team, 2022). The findings thus provided an overview of the demographic characteristics of 108 respondents, their teaching experience, English proficiency, reading habits, personality types, and grading patterns for *The Book Thief*'s synopsis:

- 73 respondents were females while 50% of students were 26 years old.
- The majority of respondents were from Humanities and Arts, lived in Bucharest and were studying for a Bachelor's degree.
- 41 participants had never taught while 15 were currently teachers.
- 19 participants had native-like English proficiency while 34 were at C2 level and 20 at C1 level.
- 30 participants always read books in English while 17 read rarely in English.
- The majority of respondents were sanguine, followed by the melancholic type.
- 66 respondents had read *The Book Thief*, either in English or in Romanian, while 76 respondents had watched the movie.
- *Grade 1*: 21 participants gave grade 10, 39 gave grade 9, 30 gave grade 8, and 13 gave grade 7.
- *Grade 2*: 19 participants gave grade 10, 42 gave grade 9, 29 gave grade 8, and 14 gave grade 7.
- *Grade 3*: 19 participants gave grade 10, 51 gave grade 9, 29 gave grade 8, and 6 gave grade 7.

- *Grade 4*: 21 participants gave grade 10, 45 gave grade 9, 35 gave grade 8, and 3 gave grade 7.
- The impact of Grade 1 on Grade 4 was statistically significant, indicating that intuitive heuristics played a role in influencing the final grading decision. This finding emphasized the importance of considering intuitive heuristics in the grading process.
- The impact of Grades 2 + 3 on Grade 4 was statistically significant, highlighting the significance of rational heuristics in the evaluation process. Thus, rational decision-making processes also had a considerable influence on the final grades assigned to the synopsis.
- The impact of Grade 1 on Grade 4 was mediated by Grade 3, which suggested that rational heuristics played an important role in the relationship between intuitive heuristics and the final grading decision.
- Additionally, the impact of Grade 1 on Grade 4 was mediated by Grade 2, further supporting the interplay between intuitive and rational heuristics in determining final grades.
- The impact of Age on Grade 1 was mediated by Education, which indicated that students' educational level played a significant role in the influence of age on the initial grading decision.
- Similarly, the impact of English level on Grade 1 was mediated by reading books in English, which highlighted the importance of reading habits in shaping the impact of English proficiency on initial grades.
- Grade 1 had no effect on the impact of Grade 3 on Grade 4, suggesting that the intuitive heuristics at the beginning of the grading process did not influence the relationship between rational heuristics and the final grade.
- Teaching experience had no effect on the impact of Grade 2 on Grade 3, which indicated that the level of teaching experience did not significantly influence the impact of rational heuristics on intermediate grading decisions.
- Having read *The Book Thief* had no effect on the impact of Grade 1 on Grade 4, hence the familiarity with the book did not affect the initial grading decision.
- Students from Bucharest and other cities in Romania did not give significantly different Grades 4. This finding implied that geographical location did not play a major role in determining final grades.
- Male and female students did not give significantly different Grades 2, suggesting that gender did not have a substantial impact on intermediate grading decisions.
- Students from Humanities and Arts did not give significantly different Grades 3 from Social Science students, indicating that the academic discipline did not significantly affect intermediate grading decisions.
- However, students who had seen the movie *The Book Thief* gave significantly different Grades 1 compared to students who had not watched it, implying that

exposure to the movie influenced the initial grading decision.
- There was no significant difference in Grades 4 across personality types yet there was a statistically significant difference in Grades 1 across the three types of educational degrees: bachelor's, master's, and doctoral. The latter finding indicated that the level of education significantly influenced the initial grading decision.

4.2 Data analysis

67.6% of the total respondents were females. The standard deviation was 46% of the mean, indicating some heterogeneity in the dataset. The distribution deviated 23% from a normal distribution. 64.8% of the respondents lived in Bucharest. 31.5% of the respondents were studying for a Bachelor's degree, 58.3% were from Humanities and Arts, and 33.3% from Social Sciences.

The distribution of teaching experience was slightly positively skewed, with a moderate spread of data points around the mean value. The median teaching experience was 3, indicating that half of the participants had 3 or fewer units of teaching experience. The mean teaching experience was approximately 4.57, suggesting relatively low levels of teaching experience on average. Participants showed a diverse range of English skills, with many having good proficiency. Participants reported varying frequencies of reading books in English, with many indicating they did so often, the average frequency being around 4.91. 66 respondents had read the book *The Book Thief*, either in English or in Romanian, while 76 respondents had watched the movie *The Book Thief*. 37% of the respondents had a sanguine personality, followed by 34.3% of the melancholic type.

The motivation for using the four personality types – sanguine, choleric, phlegmatic, and melancholic – lies in its historical significance and enduring popularity. This model can be traced back to ancient Greek and Roman times, where it was proposed by notable figures like Hippocrates and Galen [67]. Over the centuries, this classification system has remained widely recognized and accepted across different cultures and societies. The intuitive nature of the four-type model makes it accessible and relatable to a broad audience, facilitating its use in various contexts, including psychology, education, and self-awareness. Unlike more complex and modern personality models, such as the Five Factor Model (Big Five) [68], the four-type personality classification allows for easier categorization and understanding of individuals, making it a preferred choice in many applications [69]. Additionally, its historical roots lend a sense of legitimacy and time-tested validity to the system, contributing to its continued use and appeal in contemporary settings.

Participants provided the following grades for the synopsis of *The Book Thief*:
- *Grade 1*: Assigned after skimming through the synopsis [70]
- *Grade 2*: Assigned after reading the synopsis carefully
- *Grade 3*: Assigned after re-reading the synopsis with grading instructions [71]

- *Grade 4*: Assigned without re-reading and while considering cues from previous grading

Simple linear regression was used to test the correlation between Grade 1 and Grade 4 [72]. The scatter plot showed a positive relationship between these variables, with a correlation coefficient of about 0.53. The statistical analysis confirmed a significantly positive correlation between Grade 1 and Grade 4. Multiple regression analysis was employed to test the relationship between Grades 2 and 3, and their impact on Grade 4. The model revealed a strong positive connection (~0.60; 0.75) between Grades 2, 3, and 4. The adjusted R^2 indicated that 58.43% of the variation in Grade 4 was explained by the variation in Grades 2 and 3. All terms in the model were found to be significant.

Four independent samples t-tests were also conducted to examine the differences in various groups' means. T-test 1 evaluated whether there was a significant difference in Grades 4 between students from Bucharest and other cities in Romania. The t-value of 1.12 (> 1) indicated that the means were not significantly different. The p-value of 0.26 (> 0.05) led to the failure to reject the null hypothesis, suggesting that there was insufficient evidence to assume a difference in means. The confidence interval supported this result, with 95% certainty that the null hypothesis could not be rejected. Therefore, it was concluded that students from Bucharest and other Romanian cities had not given significantly different Grades 4. T-test 2 investigated whether there was a meaningful distinction in Grades 2 between male and female students. The t-value of -0.90 (< -1) suggested no significant difference in means. The p-value of 0.36 (> 0.05) led to the failure to reject the null hypothesis, indicating insufficient evidence for mean differences. The confidence interval reaffirmed this outcome, showing that, with 95% certainty, the null hypothesis remained unchallenged. Consequently, it was concluded that male and female students had not given notably different Grades 2. T-test 3 examined the potential disparity in Grades 3 between students from Humanities and Arts versus those from Social Sciences. The t-value of 0.47 (< 1) implied no substantial difference in means. The p-value of 0.63 (> 0.05) led to the failure to reject the null hypothesis, underscoring insufficient evidence for mean discrepancies. The confidence interval strengthened this conclusion, indicating with 95% confidence that the null hypothesis would stand. Thus, it was concluded that students from Humanities and Arts, and those from Social Sciences had not provided markedly different Grades 3. Lastly, t-test 4 investigated the distinction in Grades 1 among students who had watched the movie *The Book Thief* and those who had not. The t-value of 2.40 (> 1) indicated a significant difference in means. The p-value of 0.01 (< 0.05) led to the rejection of the null hypothesis, demonstrating adequate evidence for mean differences. The confidence interval corroborated this outcome, asserting with 95% confidence that the null hypothesis was rejected. Therefore, it was concluded that students who had seen the movie *The Book Thief* had provided markedly different Grades 1 than those who had not (see Supplements A, C, D).

Next, two one-way ANOVA analyses were conducted to examine (1) whether there were significant differences in Grades 4 across the four personality types, and (2) whether there were significant differences in Grades 1 across the bachelor's, master's, and doctoral degrees (see Supplements A, C, E). In the first analysis, the ANOVA results revealed that the p-value associated with the F-statistic was 0.523 (> 0.05). This indicated that there was no significant relationship between Grades 4 and personality types. It could therefore be concluded that the mean Grades 4 were not different across the four personality types. To determine which specific groups differed from each other, a Tukey's Honestly Significant Difference (HSD) test was conducted. The results of the test showed the differences between pairs of personality types, along with their associated p-values. None of the p-values were less than 0.05, indicating that no pairwise comparisons were significant. Thus, it could be concluded that there were no significant differences in Grades 4 between any pairs of personality types. The Shapiro-Wilk normality test was performed on the residuals of the ANOVA model. The p-value obtained was 5.913e-06, less than 0.05. This indicated that the residuals did not follow a normal distribution. Therefore, the assumption of normality was violated. Bartlett's test was performed to assess whether the variances of Grades 4 were equal across the different personality types. The p-value obtained was 0.3008 (> 0.05), suggesting that there was no evidence to reject the null hypothesis of equal variances. Levene's test for homogeneity of variance was also conducted. The p-value obtained was 0.6766 (> 0.05), confirming that there was no evidence to reject the null hypothesis of equal variances. In summary, based on the ANOVA results and subsequent tests, it could be concluded that there were no significant differences in Grades 4 across the four personality types, and the data did not meet the assumptions of normality and homogeneity of variances.

In the second analysis, the ANOVA results revealed that the p-value associated with the F-statistic was 0.0181 (< 0.05). This indicated that there was a statistically significant difference in Grades 1 across the three types of educational degrees. The Tukey's Honestly Significant Difference (HSD) showed the differences between pairs of educational degrees, along with their associated p-values. Only one pairwise comparison had a p-value less than 0.05, namely Doctoral-Bachelor's, with a p-value of 0.0152. This indicated a significant difference between these two groups. The Shapiro-Wilk normality test was then performed on the residuals of the ANOVA model. The p-value obtained was 0.002309 (< 0.05), which indicated that the residuals did not follow a normal distribution and the assumption of normality was therefore violated. Bartlett's test was performed to assess whether the variances of Grades 1 were equal across the

different types of educational degrees. The p-value of 0.1446 (> 0.05) suggested that there was no evidence to reject the null hypothesis of equal variances. Levene's test for homogeneity of variance was also conducted, with a p-value of 0.2695 (> 0.05), which confirmed that there was no evidence to reject the null hypothesis of equal variances. In conclusion, based on the second set of ANOVA results and subsequent tests, it could be concluded that there was a statistically significant difference in Grades 1 across the three types of educational degrees: bachelor's, master's, and doctoral. The Tukey's HSD test revealed that the Doctoral group and Bachelor's group had a significant difference in their mean Grades 1, yet the data did not meet the assumptions of normality and homogeneity of variances.

In the pursuit of unraveling the interplay between Grades 1, 3, and 4, the research also employed the following mediated model framework:

- Independent Variable: Grade 1
- Mediator: Grade 3
- Dependent Variable: Grade 4

The research hypotheses were formulated as follows:

- *Null Hypothesis (H0):*

The relationship of Grade 1 on Grade 4 remains uninfluenced by Grade 3.

- *Alternative Hypothesis (H1):*

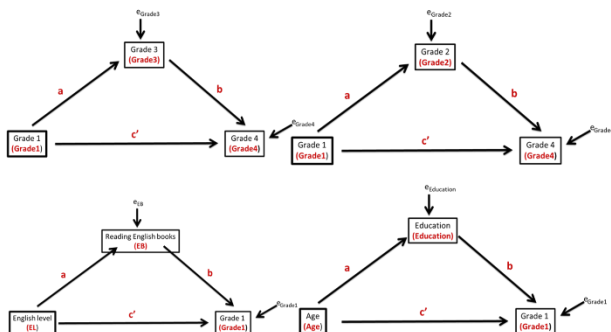The relationship between Grade 1 and Grade 4 is mediated by Grade 3.

Figure 2: Mediation analysis

The empirical outcomes of the mediation analysis revealed that all calculated effects attained statistical significance. Intriguingly, the direct effect diminished in significance upon the integration of the mediator, Grade 3. A substantial portion, accounting for 60.9% of the total effect, was attributed to the mediation effect, signifying its pronounced role in the phenomenon under investigation. The establishment of confidence intervals, derived from a rigorous process of 500 simulations, bolstered the robustness of the analysis. In light of these empirical insights, the null hypothesis was decisively rejected. The mediation analysis unequivocally confirmed the mediating influence of Grade 3 in the relationship between Grade 1 and Grade 4. The analysis extended to the mediation model involving Grade 2 and its interplay with Grade 1 and Grade 4. With the

meticulous articulation of the mediated model and a parallel formulation of hypotheses, the findings substantiated the pivotal role of Grade 2 as a mediator, influencing the relationship between Grade 1 and Grade 4. This mediation effect, accounting for 98.2% of the total effect, reaffirmed its significance in the evaluative context. Moreover, the research probed into the mediation analysis concerning the connection between English level, Reading books in English, and Grade 1. Through the mediation model configuration and a meticulous articulation of hypotheses, the results underscored the mediating role of Reading books in English, substantially contributing to a comprehensive understanding of the impact of English level on Grade 1. The mediation analysis also extended its purview to the Age-Education-Grade 1 nexus. With Age as the independent variable, Education as the mediator, and Grade 1 as the dependent variable, the empirical findings underscored that while not all effects attained statistical significance, the mediation effect remained noteworthy. This effect, accounting for 16.7% of the total influence, corroborated the role of Education in mediating the Age-Grade 1 relationship.

Next, the analysis aimed to determine whether Grade 1 moderated the effect of Grade 3 on Grade 4 in the context of grading *The Book Thief*'s synopsis. The initial model assessed the relationship between Grade 4 (Y) and Grade 3 (X) independently. The coefficient of Grade 3 (X) was highly significant ($p < 2e{-}16$), suggesting that there was a strong positive association between Grade 3 and Grade 4. The R-squared value of 0.5627 indicated that 56.27% of the variability in Grade 4 could be explained by Grade 3. In Model 2, the interaction between Grade 3 (X) and Grade 1 (M) was introduced to examine whether Grade 1 moderated the effect of Grade 3 on Grade 4. Both Grade 3 and Grade 1 coefficients were significant ($p < 2.2e{-}16$ and $p = 0.00495$, respectively). The interaction term's coefficient implied that the moderating effect of Grade 1 was not statistically significant ($p = 0.2713$). The adjusted R-squared value of 0.5868 indicated that the model explained 58.68% of the variance in Grade 4. Model 3 further explored the moderation effect by considering an interaction term between Grade 3 (X) and Grade 1 (M). The coefficients for Grade 3 and Grade 1 remained significant ($p = 0.0137$ and $p = 0.2713$, respectively). However, the interaction term's coefficient was not statistically significant ($p = 0.5459$), suggesting that the interaction did not significantly impact the relationship between Grade 3 and Grade 4. The adjusted R-squared value of 0.5843 indicated that the model explained 58.43% of the variability in Grade 4. The results of the moderation analysis thus suggested that, while both Grade 3 and Grade 1 exerted significant individual effects on Grade 4, the interaction between Grade 3 and Grade 1 did not significantly moderate the relationship between Grade 3 and Grade 4. Therefore, it could be concluded that Grade 1 did not have a substantial moderating impact on the association between Grade 3 and Grade 4 in the context of grading the synopsis of *The Book Thief*.

The second moderation analysis wanted to determine whether Teaching Experience (TE) moderated the relationship between Grade 2 and Grade 3 in the context of grading *The Book Thief*'s synopsis. In the initial model, Grade 3 (Y) was regressed on Grade 2 (X) independently. Both the intercept and Grade 2 coefficients were statistically significant (p < 2.91e-12 and p < 2.91e-12, respectively). The R-squared value of 0.37 indicated that 37% of the variability in Grade 3 could be explained by Grade 2. Model 2 incorporated the moderator, Teaching Experience (TE), which could influence the relationship between Grade 2 and Grade 3. The coefficients for Grade 2 and TE were significant (p < 2.16e-12 and p = 0.268, respectively). However, the interaction term's coefficient for TE was not statistically significant (p = 0.268). The adjusted R-squared value of 0.3655 suggested that the model explained 36.55% of the variance in Grade 3. In Model 3, an interaction term between Grade 2 and TE was introduced to assess whether the relationship between Grade 2 and Grade 3 was moderated by Teaching Experience. The coefficients for Grade 2, TE, and the interaction term were significant (p < 5.77e-05, p = 0.363, and p = 0.434, respectively). However, the interaction term's coefficient for Grade 2 and TE (Grade2:TE) was not statistically significant (p = 0.434). The adjusted R-squared value of 0.3631 indicated that the model explained 36.31% of the variability in Grade 3. The results of the moderation analysis thus suggested that Teaching Experience (TE) did not significantly moderate the relationship between Grade 2 and Grade 3 in the context of grading the novel's summary. While both Grade 2 and TE exerted individual effects on Grade 3, the interaction between Grade 2 and TE was not statistically significant. Therefore, it could be concluded that Teaching Experience did not substantially influence the relationship between Grade 2 and Grade 3.
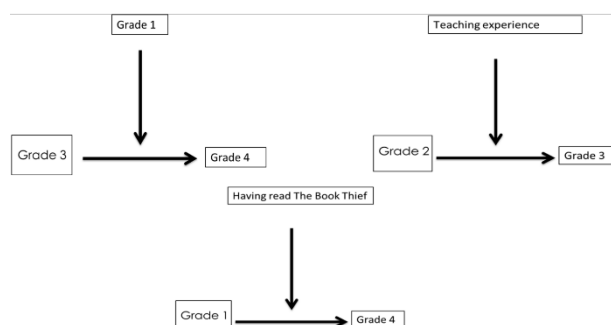

Figure 3: Moderation analysis

The findings of the third moderation analysis used linear regression models to investigate the interaction between Grade 1 (X) and the frequency of English book reading (EB) in predicting Grade 4 (Y) within the context of the study. The coefficients for both Grade 1 and EB were statistically significant (p < 2.80e-08 and p = 0.332, respectively). The adjusted R-squared

value of 0.2679 indicated that the model explained approximately 26.79% of the variance in Grade 4. The coefficients for Grade 1 and EB remained statistically significant (p < 3.17e-05 and p = 0.649, respectively). However, the interaction term's coefficient for Grade 1 and EB was not statistically significant (p = 0.744). The adjusted R-squared value of 0.2616 suggested that the model accounted for around 26.16% of the variance in Grade 4. Thus, the interaction between Grade 1 and the frequency of English book reading (EB) did not significantly influence the prediction of Grade 4. Although both Grade 1 and EB individually contributed to predicting Grade 4, the interaction term did not yield statistical significance, so the relationship between Grade 1 and Grade 4 remained relatively consistent across different levels of English book reading frequency.

Overall, the statistical investigation aimed to explore whether students' final grades were influenced by heuristics and confirmation bias, as manifested through System 1 and System 2 of thinking processes. The analysis of the dataset provided insights into the potential relationship between students' thinking modes and their final grades. The comprehensive analysis indicated that there was a significant correlation between different thinking modes (System 1 and System 2) and students' final grades. The presence of variability in final grades, as reflected in the standard deviations and coefficients of variation, hinted at the application of heuristics. Students might have thus employed common mental shortcuts when making decisions about their grades, possibly leading to the observed dispersion in the grading outcomes. This also suggested that the way students engaged in cognitive processes, whether intuitive or analytical, might have played a role in shaping their grading decisions. The observed skewness in certain variables, such as English book reading, suggested a potential tendency for students to lean towards lower values, possibly influenced by confirmation bias. This implied that students might have been more inclined to perceive and remember information that confirmed their pre-existing beliefs about their performance. However, the final results indicated a predominantly rational approach to Grade 4.

In conclusion, the analysis provided valuable support for the research question and the two hypotheses regarding students' appeal to heuristics under System 1 and System 2 of thinking when assigning their final grades. The data also suggested that confirmation bias could have played a role in shaping students' grading decisions, although Grade 4 resulted from assessment under System 2 rather than System 1. The results highlight the importance of understanding the cognitive mechanisms underlying evaluation decisions and emphasized the need for further research to delve deeper into the specific ways in which cognitive processes influence grading behaviors (see Supplements D, E, F).

V.   DISCUSSION

5.1 Interpretation

The skills developed through grading extend beyond school subjects to real-world challenges. This study focuses on whether student evaluators employ intuitive or reason-based heuristics, and whether confirmation bias plays a role in shaping their final grades. Through the formulation of one research question and two hypotheses, the paper thus aims to shed light on how students' cognitive processes interact with the evaluation procedure. The interpretation of the results aligns with the proposed four-stage grading process, based on the complex relationship between System 1 and System 2 of thinking in the context of evaluation.

In Stage 1, the grading process is primarily intuitive (System 1), influenced by factors such as time constraints, skimming techniques, and participants' prior experience. The comparison between students who have watched the movie *The Book Thief* and those who have not indicates significant differences in Grade 1. This implies that participants' prior exposure to the film adaptation of Markus Zusak's best-selling novel influenced their initial grading decisions, which showcases the role of heuristics and biases. Like the book, the movie portrays life in Nazi Germany during World War II. Following Liesel Meminger, a young girl finding solace in stolen books, the film delves into themes of friendship, love, and the power of words. Narrated by Death, the plot offers a unique perspective on resilience amid the harsh realities of war, capturing the essence of human connection during tumultuous times [73].

In Stage 2, the grading process becomes a blend of intuition (System 1) and rationality (System 2). The extended time frame, full-text reading technique, and participants' prior experience contribute to a more balanced approach to giving Grade 2. This finding reflects the dynamic interplay between cognitive modes, demonstrating that both intuitive and rational factors are at play during grading.

In Stage 3, rational thinking (System 2) takes precedence, influenced by an extended time frame, repeated text encounters, and explicit grading instructions. The statistics of Grade 3 underscore the dominance of rational cognitive processes in shaping grading outcomes, emphasizing the impact of systematic reasoning and analytical thinking.

In Stage 4, the final grade emerges as a culmination of the students' intuitive and rational thinking throughout the grading process. Notably, the correlation between Grade 1 and Grade 4 is weaker compared to the correlation of Grades 2 and 3 with Grade 4. This suggests that Grades 2 and 3 are more predictive of the final rational grade than the initial intuitive Grade 1. Furthermore, the mediation effect of Grade 3 on the relationship between Grade 1 and Grade 4, while Grade 1 has no effect on the impact of Grade 3 on Grade 4, indicates the dynamic role of cognitive progression. Last

but not least, a comparison between the five-number summaries of Grades 1, 2, 3, 4 clearly indicates that Grade 4 is quite the average of Grades 1, 2, 3 in terms of Minimum and Mean while having the same results as Grades 1, 2, 3 in terms of Median and Maximum.

No.	Variable	Minimum	Mean	Median	Maximum	Standard Deviation	Skewness	Variation Coefficient
1	Grade1	4	8.519	9	10	≈ 1.140	-0.833	≈ 0.134
2	Grade2	4	8.519	9	10	1.106	≈ -0.867	≈ 0.130
3	Grade3	6	8.713	9	10	≈ 0.918	-0.705	0.105
4	Grade4	5	8.694	9	10	0.971	-0.883	≈ 0.112

Figure 4: Five-number summary of the four grades

The analysis thus reveals that Grade 4 represents an outcome of experience, reasoning skills, and rational heuristics, making it less susceptible to confirmation bias under System 1. Despite the inclusion of a subconscious disruptor, related to Death's narrative in both the novel and its film adaptation, the results demonstrate that Death's image did not impact the rational grading process significantly. The interpretation ultimately underscores the importance of a harmonious interaction between intuition and reason in decision-making, since heuristics, a hallmark of human nature, serve as gentle reminders of the inherent fallibility of most cognitive processes. Embracing human nature, with all its complexities, allows for a balanced collaboration between intuition and reason, leading to more informed and accurate decision-making processes.

5.2 Comparison

The results of the study align with, expand upon, and offer new insights in relation to existing literature on the grading process, heuristics and biases, decision-making processes, and the interplay between intuitive (System 1) and rational (System 2) thinking. The confirmation bias's impact on Grade 4 echoes studies that highlight how individuals tend to favor information that confirms their pre-existing beliefs or experiences – namely, students' grading choices in the prior stages (Grades 1, 2, 3). Furthermore, the application of representativeness, availability, and anchoring and adjustment heuristics during grading is consistent with the existing understanding of heuristic-based decision-making under System 1 and System 2 of thinking. The analysis of Grades 2 and 3 provides empirical evidence for the shifting balance between intuitive and rational thinking as the grading process evolves, underscoring the impact of experience and expertise on decision-making. This aligns with previous studies that have explored the dual-process theory of thinking and decision-making [74]. The study's emphasis on the mediation effect of Grade 3 between Grade 1 and Grade 4 adds a novel dimension to the literature by highlighting the cognitive progression from initial intuition to final rationality. This aligns with literature that suggests individuals with domain-specific knowledge tend to rely more on System 2 of thinking to make informed judgments [75] [57] [6]. The emphasis on Grade 2's and Grade 3's stronger predictive value for

Grade 4 resonates with research on expertise development, demonstrating that expert judgments are often rooted in comprehensive analysis and systematic reasoning. Furthermore, the study's exploration of the visual disruption caused by the images and movie trailer in the questionnaire, and particularly the image of Death, challenges conventional wisdom about the susceptibility of decision-making to visual cues and cognitive biases. The results provide a nuanced perspective on how individuals may be more or less prone to biases when confronted with visual stimuli [76] [77]. This finding adds depth to the literature on the interplay between visual cues, biases, and decision-making processes, emphasizing the importance of cognitive synergy, where intuition and reason collaborate to produce optimal decisions [6] [60] [78] [79].

In the educational realm, the research sheds light on the cognitive processes involved in grading decisions. The identification of the interplay between intuitive and rational thinking during different grading stages provides educators with insights into the factors that influence grading outcomes. Educators can leverage these insights to design more effective grading practices that consider the role of cognitive biases, expertise development, and visual disruptions. Additionally, the study underscores the value of aligning grading instructions with the intended goals of the evaluation, promoting a more consistent and fair assessment process. The identification of confirmation bias during the initial grading stage underscores the need for individuals to recognize and counteract common biases when making judgments. This has implications beyond education, extending to various professional fields. Promoting bias awareness can enhance the quality of decision-making and mitigate the risks associated with biased judgments.

5.3 Limitations

While this study contributes valuable insights, it is also essential to acknowledge its limitations. Firstly, its reliance on a specific sample of students may limit the generalizability of its findings to broader populations. Cultural, educational, and demographic factors that influence decision-making could vary across different contexts. Replicating the study with a more diverse and representative sample would strengthen the external validity of the findings. Secondly, the study focused on the grading of a specific literary synopsis, which may limit the generalizability of findings to other decision-making contexts. Different types of decisions, tasks, and stimuli could yield varying cognitive processes and biases. Future research could explore how the observed cognitive patterns extend to different domains. Thirdly, the study's use of self-report measures, while common in cognitive research, introduces the potential for response biases. Employing a mix of qualitative and quantitative methods could provide a more comprehensive understanding of decision-making dynamics. Despite these limitations, this study contributes valuable insights into the interplay between intuitive and rational thinking

during decision-making stages. The implications for education, cognitive bias awareness, and the role of visual disruption in decision-making have the potential to inform both research and practice. By recognizing the limitations and building upon these insights, future studies can refine the understanding of decision-making processes and their underlying cognitive mechanisms.

VI. CONCLUSION

6.1 Summary

Grading involves assigning scores, marks, or grades to students' work, performance, or achievements in order to gauge their level of understanding, proficiency, and overall accomplishment. However, the concept of grading extends beyond the confines of schools and universities, as a valuable ability in various facets of everyday life. The ability to assess, evaluate, and assign value is therefore fundamental for making informed decisions and achieving personal and professional growth. The literature demonstrates how people's judgments and decisions can deviate from rationality, so the pervasive influence of heuristics and biases in decision-making processes can highlight their relevance in various cognitive tasks, including evaluation. Understanding the interplay between System 1 and System 2 of thinking can thus provide valuable insights for academics, educators, and decision-makers in diverse fields while the relevance of grading as a form of evaluation and assessment can be extended to everyday life, beyond educational institutions.

In essence, heuristics constitute mental shortcuts that help humans make decisions efficiently while biases represent the systematic errors or deviations from rationality that can occur due to the use of heuristics. Biases thus often arise from the adaptive nature of heuristics although they can lead to flawed judgments, so understanding both heuristics and biases proves crucial for gaining insights into human cognition and rationality while improving the quality of judgments and choices. In schools, when heuristics affect students' decision-making and learning processes, educators can implement teaching strategies that encourage critical thinking and reflective practices, thus enhancing academic performance. Heuristics and biases in students' thinking can thus have implications for curriculum development, so identifying the shortcut reasoning procedures used by students to reduce cognitive load is essential for promoting more analytical ways of thinking. This observation also raises questions about the universality of heuristics and biases and how they might apply successfully to decision-making across diverse individuals and contexts.

This paper represents an exploration of the cognitive processes and heuristics underlying students' grading decisions within the context of a literary evaluation. The research design involved a survey-based approach, using a self-administered questionnaire to investigate the influence of heuristics within System 1 and

System 2 of thinking on Romanian students' grading decisions. The data collection process utilized non-probability sampling, and the questionnaire was distributed through thirteen university Facebook groups across Romania. The participants were 108 Romanian students from various educational levels and academic majors. The questionnaire aimed to gather data about participants' personal characteristics, teaching experience, English proficiency, reading habits, personality traits, and their subjective grading of the provided synopsis. The survey thus covered diverse aspects relevant to the research question, ensuring comprehensive data collection for analyzing what factors might influence participants' evaluation of the synopsis.

The data analysis techniques employed in this study covered descriptive statistics to summarize the data, inferential statistics to explore relationships and correlations between variables, and path analysis to further investigate potential mediation and moderation effects and provide a thorough understanding of the grading process in System 1 and System 2 of thinking among Romanian students. More specifically, the investigation sought to unveil whether students appealed to common heuristics and confirmation bias when assigning their final grades. Through a multi-stage analysis, the study examined the heuristic interplay between intuition and reason, the impact of visual disruption, and the presence of confirmation bias in the grading process.

No.	Variables	Frequency	Percent
1	Male	35	32.4
2	25 years old	18	16.7
	27 years old		
3	Outside Bucharest	38	35.2
4	Doctoral student	30	27.8
5	At least two faculties simultaneously	8	7.4
6	Choleric (short-tempered, fast, talkative)	11	10.2
	Phlegmatic (relaxed, peaceful, tolerant)	20	18.5
7	Teaching experience	*1/No experience*	38
		41	
8	English level	*9/Proficiency*	31.5
		34	
9	Frequency of reading English books	*6/Frequently*	30.6
		33	
10	Prior reading of *The Book Thief*	No	38.9
		34	
11	Prior watching of *The Book Thief*	No	29.6
		32	
12		*Grade 9*	
	Grade1	39	36.1
	Grade2	42	38.9
	Grade3	51	47.2
	Grade4	45	41.7

Figure 5: Background information and grading patterns

An examination of the relationships between thinking modes (System 1 and System 2) and final grades revealed complex interactions. While System 1 of thinking could be associated with a tendency to rely on quick judgments, System 2 could contribute to more deliberative and analytical grading decisions. The significant correlations and differences observed among those variables underscored the interplay between cognitive processes and grading outcomes.

Thus, in the initial stage of grading, characterized by intuitive decision-making, the findings indicated that students who had watched the movie *The Book Thief* assigned significantly different Grades 1 compared to those who had not seen the movie. This divergence might suggest the presence of cognitive biases deriving from exposure to the visual stimulus of the movie. However, contrary to expectations, the image of Death and the grim quote did not affect Grade 4, which highlights a complex interplay between cognitive biases and decision outcomes. Moving to the second grading stage, where intuitive and rational thinking coexist, the results revealed a more balanced approach to grading. The alignment of System 1 and System 2 of thinking suggests that students rely on a combination of skimming techniques, full-text reading, prior experience, and engagement with the material to formulate their grades. This stage represents a fusion of intuition and reason, demonstrating the adaptability of decision-making processes. As it progresses to the third grading stage, the study unveils a transition towards greater reliance on rationality. With extended time frames, repeated encounters with the text, and explicit grading instructions, students exhibited a shift towards rational thinking, leaving behind the biases and heuristics of earlier stages. Finally, Grade 4 reflects a comprehensive integration of intuitive and rational components. While Grade 1 (most intuitive) predicts Grade 4 (most rational), it is Grades 2 and 3 that exhibit stronger correlations with Grade 4. This suggests that the impact of experience, reasoning skills, and System 2 heuristics in determining the final grade is more substantial than that of instinct, intuition, and System 1 heuristics. The rational model of heuristics thus prevails over the intuitive model, reflecting a synergy between intuition and reason.

6.2 Contributions

The grading process, deeply embedded in educational systems, also possesses a broader relevance as a life skill. Its principles – evaluation, critical thinking, and constructive feedback – are therefore crucial for informed decision-making, personal growth, and effective communication. By embracing these skills, individuals can navigate the complexities of everyday life, fostering continuous improvement and achieving their goals. As such, the ability to grade transcends traditional classroom boundaries, becoming an indispensable tool for success in diverse contexts. The study's findings elucidate the roles of intuition and reason at different stages of grading, revealing a complex interplay that challenges the traditional dichotomy between automatic and deliberative thinking. This nuanced perspective provides a blueprint for comprehending how heuristics and biases operate in real-world decision contexts and encourages the acknowledgment of human nature's complexities while striving for balanced and informed choices. The study thus contributes valuable insights into the interplay between intuitive and rational heuristics in the grading process, carrying implications for educational practices, bias awareness, and decision-making strategies. The significance of demographic factors and interaction

effects also adds to the understanding of the complexities involved in the evaluation of students' performance. Educators and policymakers can leverage insights from this study in order to design more effective grading procedures that consider the interplay between intuition and rationality and thus ensure fair and effective evaluation practices. Additionally, the role of visual disruptions in enhancing rational decision-making opens avenues for interventions in various real-world contexts.

The research thus bridges theoretical insights with real-world applications, offering practical implications for decision-making beyond the academic sphere. The grading stages presented therein resonate with decision contexts beyond grading, including problem-solving, policy-making, and consumer choices. The study's emphasis on collaboration between intuition and reason serves as a guide for individuals navigating complex decisions across various domains. As the study employs a comprehensive methodology that blends quantitative analysis, cognitive psychology, and real-world stimuli to explore decision-making, this interdisciplinary approach can broaden the methodological toolkit for investigating cognitive processes in context-specific decision scenarios. This research thus lays the foundation for future investigations into the interplay between cognitive processes, heuristics, and biases across diverse decision-making domains. Scholars can build upon these findings to explore the impact of cultural, demographic, and contextual factors on decision-making dynamics. Ultimately, the research prompts inquiries into how the observed cognitive processes interact with emotion, memory, and metacognition.

6.3 Recommendations

In future research, qualitative data can be used to capture rich contextual information and provide a deeper understanding of the thought processes, emotions, and other factors that influence individuals' behavior and decisions. Thus, combining qualitative and quantitative methodologies can illuminate nuanced aspects of decision-making that quantitative analyses alone may overlook. In this way, comparative studies across diverse cultural contexts could further elucidate the extent to which heuristics and biases operate universally or vary across cultures. While this study offers valuable insights into the interplay between intuition, rationality, and decision-making processes in the context of grading, there remain numerous avenues for further exploration and refinement. The following recommendations outline other scientific approaches, as well as potential directions for future research, that can build upon the current findings while they expand the understanding of cognitive processes:

- conducting longitudinal studies to examine how individuals' decision-making processes evolve over time
- investigating whether the observed transitions between System 1 and System 2 remain consistent or vary with experience, expertise, and changing contexts

- exploring how cultural backgrounds and societal influences shape the cognitive processes underlying decision-making
- investigating the role of individual differences in cognitive styles, such as cognitive reflection, flexibility, and control, in shaping the balance between intuition and rationality during decision-making
- examining whether these cognitive traits moderate the observed transitions between stages
- examining how variations in decision-framing and contextual cues impact the interplay between intuition and rationality
- investigating how different decision prompts, feedback mechanisms, and contextual information influence the weighting of cognitive processes at each stage
- developing and assessing interventions aimed at enhancing decision-makers' bias awareness, and promoting the integration of rational thinking in intuitive decision contexts
- investigating the efficacy of interventions in improving the quality and consistency of decision outcomes
- exploring the interaction between emotional states, affective processes, and cognitive biases in decision-making
- investigating how emotions, such as anxiety, confidence, and emotional salience, affect the balance between intuition and rationality
- employing neuroimaging techniques to uncover the neural underpinnings of the observed transitions between System 1 and System 2 of thinking
- investigating how different brain regions and networks are activated during intuitive and rational decision stages
- extending the study's framework to other decision-making domains, such as medical diagnosis, financial investments, and policy-making
- analyzing how the interplay between intuition and rationality varies across diverse decision contexts
- developing advanced heuristic models that capture the nuanced interactions between heuristics and biases
- exploring computational models that simulate decision trajectories under varying conditions and assessing their predictive accuracy against empirical data
- investigating the integration of technology, such as automated grading algorithms and cognitive tutoring systems, in optimizing the decision-making process in educational assessments
- exploring how technology can support educators in minimizing bias and enhancing grading consistency

More specifically, future participants in similar studies could be prompted to justify their grading decisions in order for a qualitative analysis to uncover discernible trends. In this study, participants could have been inquired about whether their assessment at any or all of the four stages was impacted by the images and the movie trailer. Some students might have thus indicated that their engagement with the book or film had arisen solely from encountering the novel's image and/or the movie trailer. This disclosure would not have necessarily pointed to a conscious manipulation of the truth, but would have rather suggested inadvertent predispositions

regarding information quantity. Other examples of qualitative data to collect in future researches on the grading process could be as follows:

During interviews or focus group discussions, evaluators could elaborate on their thought processes as these examples suggest: "I tend to give higher grades to assignments that have a lot of detail, even if the main points are weak." "I consider how much effort the student has put into the assignment, and that influences my grading decision." "If a student's work aligns with my personal views, I might subconsciously give them a higher grade." Evaluators could also share insights about their awareness of cognitive biases affecting their grading decisions: "I have realized I tend to give more lenient grades to students who are very active in class discussions, even if their written work isn't exceptional." "I have noticed that I'm more critical of assignments submitted closer to the deadline, which might not be fair." Furthermore, evaluators could discuss how they weighed subjective assessments against objective criteria: "I tried to balance my impressions with the rubric's guidelines, aiming for consistency." "Although I initially thought the student deserved a higher grade, I realized their work hadn't met the objective criteria for that grade level." Also, evaluators could mention external factors that influenced their grading decisions: "The fact that the student has been struggling lately made me want to give them a slightly higher grade to boost their morale." "I know the student's personal circumstances, and that affected my decision to be more lenient." Last but not least, evaluators could share how their grading approach evolved or changed after reflecting on their biases: "After learning about confirmation bias, I've become more conscious of how it can affect my grading, and I'm working on mitigating its impact." "I used to rush through grading, but now I take more time to consider each student's work and avoid hasty judgments."

By addressing these research recommendations, scholars can advance the understanding of heuristics and biases, contributing to the refinement of cognitive models and the development of evidence-based strategies for effective decision-making in diverse contexts. These investigations will deepen the comprehension of the intricate interplay between intuition and rationality, offering practical implications for enhancing decision quality and accuracy.

In conclusion, this research paper delves into the complex realm of decision-making within the grading process, investigating the interplay between System 1 and System 2 thinking paradigms. Through a comprehensive analysis of participants' grading behaviors, heuristics, and biases, the study unravels the intricate dynamics underlying the process of evaluation. The findings thus highlight the multifaceted nature of decision-making, wherein intuition and rationality coexist, adapt, and interact across different stages of the grading process. By bridging the fields of behavioral economics, education, and literature, this study may contribute a novel perspective that enriches the understanding of human cognition in real-world decision contexts. As humans continue to navigate the intricate landscapes of intuitive and rational thinking, these insights can prompt them to reevaluate their assumptions, refine their methodologies, and strive for a harmonious synergy between these cognitive systems, ultimately advancing the pursuit of accurate and equitable evaluations in education and beyond.

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DATA AVAILABILITY STATEMENT

The data supporting the findings of this study are openly available in "figshare".

https://figshare.com/authors/Amalia_Calinescu/16849569.

SUPPLEMENTS

Supplement A
R Code (including partial output), https://doi.org/10.6084/m9.figshare.23987850

Supplement B
Questionnaire (including the names of the thirteen university Facebook groups and links to Google Forms, CliffsNotes, and WritersDigest)
https://doi.org/10.6084/m9.figshare.23987859.v1

Supplement C
Detailed presentation of results: findings; R code + output; tables, figures, graphs, pie charts, boxplots, histograms
https://doi.org/10.6084/m9.figshare.23987856.v1

Supplement D
Complete data for R analysis, including coded data
https://doi.org/10.6084/m9.figshare.23987925.v1

Supplement E
ANOVA 1, 2 dataset for R analysis
https://doi.org/10.6084/m9.figshare.23987937.v1

Supplement F
T-tests 1, 2, 3, 4 dataset for R analysis
https://doi.org/10.6084/m9.figshare.23987904.v1