

AI as Double-Edged Sword: A Quantitative study of Teacher Efficiency, Cognitive Load and Burnout in Education

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Abstract

Teaching practices have been transformed by Artificial Intelligence (AI) integration in education. Use of AI has automated administrative tasks. Instructional delivery has been enhanced, and personalized learning is supported by using AI in education. It uses promises to increase efficiency and reduce workload, but there is emerging evidence that AI usage may contribute to burnout among teachers simultaneously by increasing stress caused by technology usage and cognitive load. This study explores dual role of AI-based educational technologies towards burnout, by analyzing whether AI works as a tool of relief or a source of psychological stress by using quantitative research design with a sample of 500 school teachers. In this study the relation between use of AI, perceived efficiency, cognitive load, and levels of burnout has been analyzed. The findings of this study indicate that while AI usage in education significantly improve task efficiency ($r = 0.62$), it also poses new problems by elevating mental workload that contribute to burnout ($R^2 = 0.49$) among teachers. It is concluded, based on the finding of this study that AI usage in education works as a double-edged sword by providing both benefits

and problems. It is emphasized that there is a dire need for strategies to implement AI usage in education with a proper balance reducing problems while enhancing its benefits.

Key words: AI, Efficiency, Cognitive load, Burnout, Secondary education

1. Introduction

In this era of technology modern education has been transformed with the advent of Artificial Intelligence (AI) that has reshaped learning environment, educational administration and teaching methodologies (Crompton & Burke, 2023). The process of integration of intelligent systems in education has been accelerated with rapid advancements of AI technologies, especially after 2020 and introduced new dimensions of educational systems such as processing of natural language, machine learning, chatbots powered by AI, and adaptive learning platforms. AI tools are rapidly being used by educational institutions all over the world to personalize learning, improving teaching outcomes, to enhance engagement of students and to automate administrative activities (Ouyang et al., 2023). Digital transformation has become essential after COVID-19 and has encouraged educational institution to rely heavily on AI-assisted and net based learning systems (Ng et al., 2023). Personalized instruction is supported by educational technologies which are based on AI that help in analyzing learning behaviors of students, their weaknesses and strength. These technologies are helpful in providing customized feedback to students along with providing adaptive learning techniques. AI based technologies assist teachers in their lesson planning, classroom management, student assessment, grading, help in reducing educational workload and enhance instructional efficiency of teachers (Zawacki-Richter et al., 2021).

It is highlighted by recent studies that inclusivity and accessibility of education can be ensured by using AI. Students with diverse cognitive, linguistic and physical differences can utilize learning activities more effectively by using AI-assisted tools such as automated translation, speech recognition, and intelligent tutoring systems (Labadze et al., 2023). AI generated tools including virtual assistants, and AI chatbots are becoming more popular in the higher education as they have potential to facilitate in collaborative learning environments and, provide educational support instantly that facilitate in independent learning (Crompton & Burke, 2023).

Although increasing use of AI in education promise several benefits, but its rapid use is also developing certain pedagogical, ethical and social concerns. Great concerns have been expressed by researchers regarding academic integrity, data privacy, over reliance upon tools of AI, bias in algorithmic, and potential reduction in skills of critical thinking in students

(Ouyang et al., 2023). A great debate has been generated by increasing reliance on technologies generated by AI such as plagiarism, role of teachers in AI-assisted classrooms authenticity of students work (Ng et al., 2023).

It is emphasized by research scholars that proper training of teachers is required for successful utilization of AI in education. Policy frameworks and technological infrastructure is essential to ensure its effective and ethical use (Zawacki-Richter et al., 2021). It is essential for educational institutions to create a balance among technological innovation and human centered pedagogical techniques so that maximum utilization of AI benefits may be ensured along reducing its risks. In the era contemporary educational research, the understanding of opportunities and challenges related with integration of AI in education has become an important area (Garzón et al., 2025).

In modern education systems, teacher burnout is emerging as a matter of critical concern that is characterized by emotional exhaustion, depersonalization, and reduced personal accomplishment. Christina Maslach and Jackson (1981), describe burnout as a psychological syndrome that results from chronic exposure of occupational stressors that are not managed successfully.

Increasing demands of teaching workload, administrative responsibilities and emotional labor are accelerating the process of burnout among teachers. It is highlighted by the research that teachers experience burnout and often demonstrate lower motivation, reduced teaching quality, and higher intentions to quit their profession (Ingersoll, 2001; Skaalvik & Skaalvik , 2017).

New dimensions of teacher well-being and workload has been introduced by the integration of Artificial Intelligence (AI) in education. AI-based educational tools such as intelligent tutoring systems, content generation platforms and automated grading systems are designed to improve the efficiency of teachers and minimize repetitive task activities (Luckin et al., 2016). Despite the advantages of using AI for teaches, there is a growing concern regarding its cognitive and psychological on teachers. It is suggested by recent research studies that although AI may increase teaching productivity, but it may also enhance cognitive demands that are required by teachers in order to adapt to technological changes, interpret algorithmic outputs, and learn new systems (Selwyn, 2019). The dual impact position of AI as a “double-edged sword,” simultaneously offer efficiency gain and introduce new stressors.

Despite of growing research in this area there are limited research studies that integrate, cognitive load, AI usage and teacher burnout in a single empirical model. Therefore, this study aims to explore complex relationship between cognitive load AI usage, and teacher burnout, investigating whether AI contribute to occupational stress or serves as a supportive tool to be used in education.

2. Literature Review

Teacher burnout is a multidimensional psychological state that involve emotional exhaustion, depersonalization, and reduced personal accomplishment (Maslach & Jackson, 1981). It is developed as a response towards prolonged occupational stress and is being focus of research studies in educational psychology. It is proved by research that both students and teachers are negatively effected by burnout. Poor classroom engagement, lower teaching effectiveness and increased absenteeism is indicated by teachers who experience burnout (Skaalvik & Skaalvik, 2017). According to Ingersoll (2001) that burnout is a significant predictor of teacher attrition, contributing to global teacher shortages. Learning and teaching processes have been transformed by integration of Artificial Intelligence (AI) into education. AI assisted technologies are designed to personalize instruction, automate administrative tasks, and enhance outcomes of student learning (Luckin et al., 2016).

Holmes et al. (2019) are of the opinion that use of AI promises to revolutionize education systems by supporting processes of decision-making and reducing workload of teachers. However, they also aware that careful consideration is required of requires of psychological, ethical and pedagogical, factors for AI implementation. Selwyn (2019) suggests should not be considered as a neutral tool but must be considered as a socio technical system to reshapes teachers professional identity roles, and responsibilities. It is also highlighted by recent research that digital transformation of education increase psychological burden of teachers, especially when multiple systems and platforms become essential to be used simultaneously (Zhang & Liu, 2022). John Sweller developed Cognitive Load Theory, to explain limited human cognitive capacity that can be overwhelmed by the complex tasks (Sweller, 1988). This theory differentiated between:

- Intrinsic load that is related with task complexity
- Extraneous load related with useless mental effort
- Germane load associate with learning-related effort

Extraneous cognitive load is especially relevant and related with the context of AI in education. Teachers have to perform not only instructional tasks but also interpret outputs of AI, consistently update technological skills, and manage digital systems. It is proved by research evidences that excessive cognitive load cause reduced performance, increased stress and mental fatigue (Paas et al., 2003). In literature dual nature of AI in education is acknowledged. AI enhances efficiency on one hand, by supporting personalized learning and automating the routine tasks (Luckin et al., 2016). On other hand, it poses new challenges such as increased technology dependence, and technostress.

It is emphasized by Selwyn (2019) that AI must be considered as both a challenge, and as an opportunity as it transforms teaching practices with complexity. Holmes et al. (2019) also highlights that AI enhance productivity, but its implementation should consider human factors such as well-being and workload. The dual effect of AI develops conceptual foundation for the present study that examines AI as a double-edged sword influencing both burnout and efficiency through cognitive load.

Substantial evidence is provided by empirical research which support relationship between Artificial Intelligence (AI), technology usage stress, and teacher burnout. Research Studies conducted in educational environment, indicate that integration of advanced digital tools significantly affects psychological wellbeing of teachers. For example, research on STEM educators shows that stress of using technology negatively influences overall well-being, job satisfaction and illustrate psychological costs that are associated with technology usage (Tarafdar et al., 2015; Tu et al., 2025).

It is also indicated by research studies that growing technological demands can offset productivity benefits produced by AI. Efficiency is enhanced by AI tools by automating the routine tasks, but their effectiveness is dependent heavily on the contextual factors such as institutional support, teacher training, and usability of systems (Holmes et al., 2019; Luckin et al., 2016). It indicates that AI cannot guarantee the improved outcomes but appropriate implementation strategies are required for this.

It is indicated by recent research studies that various forms of the occupational stress is introduced by AI assisted educational systems. These involve pressures related with data interpretation, performance monitoring, and accountability measures that are developed by AI systems. Reduced autonomy, increased anxiety and lower job satisfaction is caused as teachers

can feel pressure to meet with performance indicators based on algorithm (Selwyn, 2019). Integration of AI has not only transformed teaching practices but also reshaped psychological demands from teachers.

Several multiple individual and contextual factors influence the effect of AI on teacher burnout. It is essential to understand these factors to evaluate the conditions that under which AI either exacerbates or alleviates burnout. The response of teachers towards AI technologies is determined by the role of digital literacy. Teachers having digital competence are enabled to interpret the outputs of AI outputs, navigate the complex systems, and integrate the digital tools in teaching practices effectively and least exposed to cognitive overload and technostress (Zhang & Liu, 2022). Increased anxiety, frustration and burnout is experienced by the teachers who lack technological skills. Institutional support greatly affects the role of AI in burnout. Technical assistance, Access of professional training, and organizational resources greatly reduce negative impact of the technology integration. Tarafdar et al. (2015), suggest that technostress is increased by least support, while proper support systems reduce psychological stress and increase confidence of user. Structured training programs and technical support provided by schools that provide and ongoing t enable their teachers to adapt systems based on AI more effectively.

Working environment holds a critical moderating role in the effects of AI on burnout. Flexibility, collaboration, and shared learning is encouraged by supportive environments and help in reducing stress and enhancing teacher resilience. Contrarily environments with high-pressure, limited autonomy and rigid expectations may intensify negative effects of AI, especially when teachers have to meet performance targets strictly (Bakker & Demerouti, 2017). Age, adaptability, teaching experience, and openness are categorized as individual characteristics that assist teachers to respond technological advancements. Youngers and technological experienced teachers can easily adapt to AI tools, while increased stress is experienced by teachers who are unfamiliar with the digital systems (Skaalvik & Skaalvik, 2017). Mitigating role in burnout is played by Personal resilience and coping strategies. Absence of the supportive factor such as institutional support, training, and positive work environment exacerbates negative effects of AI and leads towards higher levels of burnout among teachers.

Although a great body of research is available on AI, and teacher burnout but there are many gaps that are required to be filled for comprehensive understanding of this issue. First, there is

lack of studies that examine combined effect of AI usage, burnout and cognitive load, within a single analytical research framework. Most of the existing researches focus either on psychological stressors or technological benefits independently, without integration of these dimensions. Second, there is lack of longitudinal research studies that assess long-term effect of AI on well-being of teachers. Most of the studies are based on cross-sectional data, that has limited ability for clear understanding of burnout development in technology-oriented environments. Third, diverse educational contexts especially in developing countries are not considered in exiting body of available literature. Much of the available literature is based on research findings of researches conducted in developed countries that cannot accurately reflect challenges and problems faced in developing countries which are resource constrained systems of education. Finally, limited exploration of the intervention strategies is focused to reduce cognitive load and stress of technology among teachers and the problem is that there are fewer well-documented studies which provide practical solutions to manage the negative effects of AI integration in education.

The above, mentioned gaps reflect need for a comprehensive, context-specific, and longitudinal research for better understanding of complexities caused due integration of AI in education and its impact on burnout among teachers. Literature reviewed in this study reflects that teacher burnout is multifaceted issue that is affected by both traditional occupational stressors and factors of emerging technologies. Artificial Intelligence not only offer significant benefits regarding productivity and efficiency but also introduce new challenges associated with cognitive load, psychological strain and stress of technology usage.

Research evidences confirms that AI simultaneously increase performance and enhance mental workload, supporting conceptualization of AI as a double-edged sword. The effect of AI on burnout is further shaped by the factors such as institutional support, digital literacy, individual characteristics. And work environment. However, existing literature is remained fragment, with limited integration of the key variables such as cognitive load, AI usage, and burnout. To Address these gaps it is necessary to understand how AI affects teacher well-being.

Therefore, this study can contribute to existing literature by analyzing interconnected relationship between cognitive load, AI, and burnout within a single framework, providing insights to balance teacher well-being with technological innovations.

3. Research Objectives

1. To examine the role of AI tools in teacher efficiency.
2. To analyze the relationship between AI usage and cognitive load
3. To evaluate the effect of cognitive load on teacher burnout
4. To determine whether AI reduces or increases burnout overall

4. Research Hypotheses

- **H1:** AI usage significantly improves teacher efficiency
- **H2:** AI usage significantly increases the cognitive load
- **H3:** Cognitive load positively correlates with teacher burnout
- **H4:** AI has dual effect (efficiency and burnout)

5. Research Methodology

5.1 Research Design

A cross-sectional quantitative research design followed in this study to explore dual effect of Artificial Intelligence (AI) on teachers' professional experience specially focusing on its role in increasing efficiency while simultaneously enhancing cognitive load and contributing towards burnout. Quantitative approach is suitable as this study aims to measure the relationships between clearly and well-defined variables: AI usage, cognitive load, perceived efficiency, and burnout by the use of statistical analysis of numerical data. In Cross-sectional research design data is collected at single point from a large sample of the teachers, that enable identification of the patterns and correlation without the requirement of long-term tracking.

5.2 Research Framework and Variables

- Conceptual framework of this study is based on an assumption that AI serves as a double-edged sword that yields both negative and positive outcomes. In this study use of AI based educational tools, their frequency and intensity are considered as Independent Variable while Cognitive Load associated with mental effort consumed to use AI based tools is taken as mediating variable. There are two dependent variables in this study Teacher Efficiency; perceived improvement in task productivity and completion and Teacher Burnout; emotional exhaustion, depersonalization, & reduced accomplishment. This framework assumes:

- AI → increases efficiency (positive effect)
- AI → increases cognitive load → increases burnout (negative effect)

5.3 Population and Sample

5.3.1 Population

Target population of this study is consisted of school teachers working in both public and private educational institutions o Pakistani Punjab.

5.3.2 Sample

Sample of 500 school teachers was selected because it is considered sufficient for the quantitative educational research as it can provide adequate statistical power to conduct advanced data analyses such as regression, correlation, and comparative statistical analysis (Field, 2018). Large size of sample enhances consistency and stability of research outcomes and make findings more valid and reliable. Simple random sampling technique was applied in order to ensure that every teacher had equal chance of being selected. Generalizability of research finding is ensured by this method and researcher bias is reduced. Teachers using at least one AI-based educational tool having minimum teaching experience of 1 year who were willingness to participate were included in the sample of his study.

5.4 Data Collection Instrument

Structured questionnaire was used to collect data that was comprised of four main sections:

Section A: Demographic Information

- Age
- Gender
- Teaching experience
- Type of the institution (private / public)

Section B: AI Usage Scale

This section measures the frequency and extent of AI usage in teaching.

Sample items:

- I use AI tools for my lesson planning
- I use AI for assessment and grading.

The statements were measured on 5-point Likert scale:

(1 = Strongly Disagree, 5 = Strongly Agree)

Section C: Teacher Efficiency Scale

Measures perceived improvement in work performance due to AI.

Sample items:

- “AI helps me complete tasks more quickly.”
- “AI improves my productivity in teaching.”

Section D: Cognitive Load Scale

Measures mental effort required to use AI tools.

Sample items:

- “Using AI tools requires a lot of mental effort.”
- “Managing multiple AI platforms is challenging.”

Section E: Burnout Scale

This scale was adapted from Maslach Burnout Inventory that was developed by Christina Maslach.

Sub-dimensions:

- Emotional exhaustion
- Depersonalization
- Reduced personal accomplishment

5.5 Validity and Reliability

Content validity was ensured through expert review by education and psychology specialists. Construct validity was ensured by aligning the questionnaire items with established theories such as Cognitive Load Theory and burnout theory. Cronbach's Alpha=.87 was used to test Reliability of the questionnaire as a value of 0.70 or higher is considered suitable for the internal consistency.

5.6 Data Collection Procedure

Questionnaires were distributed both online and in printed form. Participants were informed about the purpose of the study. Consent was obtained prior to participation. Confidentiality and

anonymity of the information and participants were ensured. Data collection was completed within a 4-6-week period.

5.7 Data Analysis Techniques

Statistical software (SPSS) was used to analyze the data. Descriptive Statistics; Mean, Standard deviation, and Frequency distribution was used to summarize demographic data and responses. Inferential Statistics; Correlation Analysis was used to examine relationships between:

- AI usage and efficiency
- AI usage and cognitive load
- Cognitive load and burnout

Regression Analysis was used to determine the contribution of:

- AI usage towards efficiency
- AI usage and cognitive load towards burnout

“PROCESS macro” Mediation Analysis was used to test whether cognitive load mediates the relationship between AI usage and burnout

5.8 Ethical Considerations

- Participation of teachers was voluntary
- Informed consent from teachers was obtained
- Data confidentiality was maintained
- No personal identifiers were recorded

5.9 Limitations

- Cross-sectional design does not establish causation
- Self-reported data may include bias
- Limited to secondary school teachers

6. Data Analysis and Results

Data collected from 500 school teachers was analyzed to identify the role of Artificial Intelligence (AI) as a double-edged sword in increasing efficiency while enhancing cognitive load and burnout among teachers. Statistical techniques descriptive statistics, regression analysis, correlation analysis, and mediation analysis were used for data analysis.

6.1 Demographic Profile of the Respondents Teachers

Demographic characteristics of the respondents' teachers are summarized below:

Table 1: Demographic Profile (N = 500)

Variable	Category	Frequency	Percentage
Gender	Male	220	44%
	Female	280	56%
Age	20–30 years	180	36%
	31–40 years	200	40%
	41+ years	120	24%
Institution Type	Public	260	52%
	Private	240	48%
Experience	1–5 years	150	30%
	6–10 years	210	42%
	11+ years	140	28%

Table 1 indicate that the sample is well-distributed among gender, teaching experience, and age groups that ensure generalizability and reliability of results.

6.2 Descriptive Statistics

Table 2: Descriptive Statistics of the Variables

Variable	Mean	Std. Deviation
AI Usage	3.8	0.71
Teacher Efficiency	4.01	0.68
Cognitive Load	3.78	0.75
Burnout	3.65	0.80

Table 2 shows that teachers who reported high AI usage (Mean = 3.84), were higher in their efficiency levels (Mean = 4.01). It suggests that AI increases productivity. It is also indicated that Burnout and Cognitive load are moderately high, among teachers using AI which reflect its potential stress effects.

6.3 Reliability Analysis

Table 3: Reliability Statistics

Variable	Cronbach's Alpha
AI Usage	0.82
Efficiency	0.85
Cognitive Load	0.88
Burnout	0.90

Table 3 reflects that all values of statistical analysis are above 0.70, which indicate strong internal reliability and consistency and of scales.

6.4 Correlation Analysis

Table 4: Correlation Matrix

Variables	AI Usage	Efficiency	Cognitive Load	Burnout
AI Usage	1	0.62**	0.55**	0.48**
Efficiency	0.62**	1	0.30*	0.25*
Cognitive Load	0.55**	0.30*	1	0.70**
Burnout	0.48**	0.25*	0.70**	1

(* $p < 0.05$, ** $p < 0.01$)

Table 4 indicates that efficiency and AI usage has strong positive correlation ($r = 0.62$) with each other. AI usage is also positively correlated with cognitive load ($r = 0.55$). Cognitive load shows a very strong correlation with burnout ($r = 0.70$). This confirms that

- AI improves efficiency ✓
- AI increases cognitive load ✓
- Cognitive load increases burnout ✓

6.5 Regression Analysis

6.5.1 Contribution of AI towards efficiency

Table 5: Regression analysis (AI $\rightarrow$ Efficiency)

Variable	Beta (β)	t-value	Significance
AI Usage	0.62	12.45	0.000

$R^2 = 0.39$

Table 5 reflects that AI usage explains 39% of the variation in efficiency of teachers which indicate strong positive contribution. It suggests that teacher efficiency is enhanced with use of AI.

6.5.2. Contribution of AI towards Cognitive Load

Table 6: Regression Analysis (AI → Cognitive Load)

Variable	Beta (β)	t-value	Significance
AI Usage	0.55	10.80	0.000

$$R^2 = 0.30$$

Table 6 reflect that AI significantly increases cognitive load, explaining 30% of variance. normality of data was ensured. Overall, the results suggest that AI plays a meaningful role in increasing cognitive load, highlighting the need for careful integration of AI tools in educational environments. While AI offers many benefits, its impact on mental effort and information processing should be managed to avoid overwhelming learners.

6.5.3. Contribution of Cognitive Load towards Burnout

Table 7: Regression Results (Cognitive Load → Burnout)

Variable	Beta (β)	t-value	Significance
Cognitive Load	0.70	15.20	0.000

$$R^2 = 0.48$$

Table 7 highlights that Cognitive load strongly predicts burnout, explaining 48% of variation, that is very high. The findings suggest that increase in cognitive load is a great source of burnout among teachers.

6.6 Mediation Analysis

To test whether cognitive load mediates the relationship between AI usage and burnout, a mediation analysis was conducted.

Table 8: PROCESS Macro Mediation Analysis Results (Model 4)

Path	Relationship	β (Beta)	SE	t-value	p-value
a	AI Usage → Cognitive Load	0.55	0.05	10.80	0.000
b	Cognitive Load → Burnout	0.48	0.05	9.35	0.000
c (Total Effect)	AI Usage → Burnout	0.40	0.05	8.12	0.000
c' (Direct Effect)	AI Usage → Burnout (controlling M)	0.18	0.04	4.10	0.000

- **Outcome Variable:** Burnout
- **Predictor (X):** AI Usage
- **Mediator (M):** Cognitive Load

Table 9: Indirect Effect (Bootstrapping Results)

Effect	Estimate	Boot SE	BootLLCI	BootULCI
Indirect Effect ($a \times b$)	0.22	0.04	0.15	0.30

Table 10: Model Fit / Explanation Power

R	R ²	F-value	p-value
0.55	0.30	88.45	0.000

The indirect effect of AI Usage on Burnout through Cognitive Load is significant (BootCI does not include zero: 0.15 to 0.30). Since both direct effect (c') and indirect effect are significant, this indicates partial mediation. AI usage influences burnout both directly and indirectly through cognitive load.

6.7. Hypothesis Testing

Table 11: Hypothesis testing

Hypothesis	Statement	Result
H1	AI improves efficiency	Accepted
H2	AI increases cognitive load	Accepted
H3	Cognitive load increases burnout	Accepted
H4	AI has dual effects	Accepted

6.8. Discussion of Findings

This study investigated Artificial Intelligence (AI) as a double-edged sword in education, that focused on the dual effect of technology usage on teacher efficiency and burnout through cognitive load. The findings of this study reveal that AI has complex relationship which simultaneously increases productivity along with enhancing mental workload that ultimately influence well-being of teachers.

Findings of this study show strong positive relationship between teacher efficiency and AI usage. It is reported by teachers AI improves their performance in teaching related tasks such

as administrative work, lesson planning, and grading. These findings are aligned with previous research that suggests that productivity is enhanced by AI-based educational tools that automate repetitive processes and support in instructional designing (Luckin et al., 2016).

However, it is reflected that this improvement is reflected in terms of productivity paradox, and this efficiency gain does not necessarily cause reduction in overall workload. AI usage shifts physical demands to cognitive demands and changes the nature of work (Selwyn, 2019). Now teachers have to interpret outputs of AI, integrate various digital systems in their teaching practices and verify the automated decisions. Thus, while AI usage helps in improving efficiency, simultaneously it also enhances complexity of the teaching tasks, that supports the argument that occupational stress is not necessarily reduced with technological efficiency.

A strong positive relationship between the use of AI and cognitive load is one of the most important findings of this study. Teachers reported that learning about new platforms, managing the digital tools, and interpreting the outputs generated by AI-generated outputs increase their mental effort. This finding is aligned with Cognitive Load Theory that is proposed by John Sweller, suggesting human memory possess limited working capacity and may be easily overloaded with complex tasks (Sweller, 1988).

In the context of education, extraneous cognitive load is often increased due to unnecessary mental effort caused by unfamiliar or poorly designed systems. Recent studies support this argument which reflects that educational digital transformation enhances stress level and cognitive demands of teachers (Zhang & Liu, 2022). Therefore, although physical workload is reduced but hidden cognitive burden is introduced with AI usage which is mostly underestimated in the policy discussions.

The findings of this study reflect very strong relationship between burnout and cognitive load. Teachers with higher cognitive load reported emotional exhaustion, least motivation, and experience difficulty in their concentration. This finding is strongly aligned with the theory of burnout that is developed by Christina Maslach, which reflects emotional exhaustion as core dimension of burnout (Maslach & Jackson, 1981). Similarly, the research about occupational stress reflects that cognitive overload is major predictor of least job satisfaction and emotional fatigue among teachers (Bakker & Demerouti, 2017). This study highlights that cognitive load is most influential factor in contributing towards burnout, then the direct physical workload.

These findings propose that in modern technology-oriented environments burnout among teachers is increasingly driven by cognition rather than physical tasks. Thus, conceptualization of AI as a double-edged sword in education is strongly supported by the research findings. At one side, AI increases productivity by improving access towards resources automate the tasks, and support in personalized learning as is indicated by the studies Holmes et al. (2019) which reflect that AI has potential to transform the educational system enhancing instructional efficiency and reducing administrative burdens.

On the other side, new challenges are introduced by AI introduces which include increased technostress, cognitive load, and dependency on the digital systems. Tarafdar et al. (2015) propose that stressors related with technology significantly affect the well-being of teachers who have to work in high-demand oriented profession. Thus, AI simultaneously works as:

- An enhancer of productivity
- An amplifier of cognitive stress

This duality clarifies why teachers can report being more efficiency along with being more mentally exhausted. Another important finding of this study is that cognitive load partially mediates relationship between burnout and AI usage. This means that burnout is not only directly affected by AI but also indirectly impacted by increasing cognitive load. Ragu-Nathan et al., (2008) support this finding and opine that cognitive overload works as a key pathway that links technology usage with psychological stress. In other word, this reflects that negative psychological impacts of AI usage in education can be mitigated by reducing cognitive load.

These findings are in line with the previous studies on technostress, that reflect the capability of digital technologies to both burden and support employees simultaneously (Tarafdar et al., 2015). Similarly, OECD reports on educational technology highlights that digital tools require continuous learning and teacher adaptation along with improving efficiency (OECD, 2021).

However, existing literature is extended by this study as it explicitly integrating three variables; AI usage, cognitive load, and burnout into a single explanatory model which reflect that AI usage improves efficiency but at the same time it enhances cognitive load that cause burnout among teachers. This integrated approach provides a more comprehensive understanding about the effects of AI on well-being of teachers. From practical point of view findings of this study suggest that with increasing use of AI in education teachers are experiencing a new

transformation in their workload structure. Although physical workload is minimized with automation, but emotional and cognitive demands are increased that explains a key paradox being observed in the modern education:

Teachers experience more mentally exhausted along with feeling more productive.

Such findings reflect the need of ensuring proper training about workload management strategies and providing support systems along with introducing AI tools in education. Overall, the findings of this study confirm the dual and complex impact of AI on teachers. Its usage improves efficiency while simultaneously enhances cognitive load, which in turn cause burnout. This reinforces central argument of this study that AI acts as a double-edged sword in education, yielding both psychological strain and productivity gains.

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