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Distinguishing Between Efficiency and Value in Artificial Intelligence Applications —Reflections on Education from the Perspective of the Labor Theory of Value

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Abstract: The application of generative artificial intelligence in writing, translation, and teaching assistance has made the relationship between efficiency gains and value creation a theoretical issue requiring clarification.Based on Marx's labor theory of value and drawing on relevant research on the "Fragment on Machines," this paper distinguishes between the increase in use value, the formation of commodity value, and the distribution of profits. While technology enhances productive capacity, this does not mean that technology itself becomes an independent source of new value; when analyzing the AI production process, one must simultaneously examine the labor involved in R&D, maintenance, and review, as well as the transfer of the existing value of the means of production, to avoid interpreting the reduction in end-user operations as the disappearance of social labor.The efficiency advantages of individual enterprises, changes in socially necessary labor time following the widespread adoption of technology, and corporate revenue growth also belong to different levels of analysis. Consequently, the evaluation of artificial intelligence in education should balance task efficiency with the development of competencies, assessing learning quality through process documentation, outcome verification, and independent transfer, thereby ensuring that the time saved by technology serves human development.

Keywords: generative artificial intelligence, labor theory of value, labor productivity, working class as a whole, educational evaluation

1. Introduction

Generative AI provides new tools for lesson plan preparation, foreign language translation, and learning feedback, but it also raises an easily overlooked question: Does faster text generation necessarily mean the creation of more value? In education, this question manifests as whether the speed of assignment completion can be equated with learning quality; in production, it manifests as whether an increase in output can directly imply that machines have become the primary agents of value creation.The "Opinions on Accelerating the Digital Transformation of Education" emphasize a people-centered approach and place importance on cultivating higher-order thinking, judgment, and practical skills [1]. Therefore, when discussing the efficiency of AI, it is necessary to clarify both what efficiency metrics answer and what they do not yet address.

Existing research provides concrete evidence for understanding the utility of technology. Noy and Zhang conducted an experiment on professional writing tasks and found that participants using generative AI reduced their average task completion time by 40% and improved their output quality scores by 18% [2] .Research by Brynjolfsson et al. on customer service work found that the introduction of AI assistance increased the average number of issues resolved per hour by 15% [3]. These results demonstrate that task efficiency can be improved under specific conditions; however, they do not directly measure commodity value in the Marxist sense, nor can they be used to conclude that learning abilities in the classroom have improved to the same extent. A supplementary argumentative step is needed to bridge the gap between task metrics and theoretical categories.

Xiong Xiaolin and Sun Xifang, in analyzing

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controversies surrounding the "machine theory fragment," point out that discussions on the role of science and technology should be situated within the broader context of Marx's labor theory of value, paying attention to the distinctions between productive labor, the "working class as a whole," and the creation and distribution of value [4]. This line of thinking suggests that any analysis of artificial intelligence must acknowledge the role of technology in transforming the labor process while avoiding the direct interpretation of the magnitude of this role as a source of value.Based on this, this paper conducts a conceptual analysis, using a hypothetical translation task to illustrate the relationship between efficiency and the quantity of value, then discusses the identification of labor and the distribution of benefits in human-machine collaboration, and finally addresses issues of evaluation in educational practice. The term "value" as used in this paper primarily refers to commodity value in Marx's political economy; the social and educational significance of technology will be explicitly addressed separately.

2. Different Scales of Efficiency Improvement and Value Formation

Use-value refers to the usefulness in satisfying needs, whereas commodity value refers to the abstract human labor embodied in a commodity. Concrete labor and abstract labor are two aspects of the same labor: the former concerns how labor produces useful outcomes, while the latter concerns the social labor relations among commodity producers. The measure of the quantity of value is socially necessary labor time, not the simple summation of the time actually expended by individual workers ([5]).Accordingly, a translation that is more accurate and facilitates communication better represents an improvement in its utility; a reduction in the time required to produce an equivalent translation represents a change in efficiency. Neither of these changes can directly substitute for a judgment regarding the quantity of value.

Nor does this distinction imply that only activities capable of generating commodity value are meaningful. In *Critique of the Gotha Program*, Marx opposed the notion that labor is the sole source of all wealth, pointing out that nature is also a source of use-value [6] .Wealth, utility, and commodity value have distinct meanings. Artificial intelligence enhances information processing capabilities, thereby expanding the supply of useful outputs; public education improves access to education and also holds significant social importance. Whether these are beneficial and whether they manifest as value within specific commodity production relations are two separate issues. The significance of education, care, or public services cannot be negated by specialized concepts from value theory.

To illustrate the distinction between efficiency and the quantity of value, we can consider a simplified example involving commercial translation. Assume that the translated texts are of equal length, difficulty, and quality, and that there is corresponding social demand for all new outputs; assume that the duration, intensity, and complexity of labor remain constant; and assume that new technologies have become widespread, establishing new socially average conditions of production. Previously, a given translation task could produce four translated texts within eight hours; with AI assistance, it now produces eight.For now, we will not account for the value transferred via means of production but will focus solely on the new value added by living labor in this specific stage. Under these assumptions, the same eight hours of socially average labor are distributed across a greater number of outputs, reducing the amount of new labor contained in each translation from two hours to one hour. A doubling of output and a decrease in the amount of new labor per unit of output can occur simultaneously; the former should not be interpreted as implying that the total new value necessarily doubles.

The above calculation is a conceptual illustration, not a conclusion drawn from a survey of the real-world translation industry. It does not account for inputs such as computing power or software, nor does it convert labor hours into monetary value. If AI makes the review process more complex or requires workers to handle more concurrent tasks simultaneously, then the complexity or intensity of labor has changed, and the original assumptions can no longer be applied. Furthermore, if a large volume of generated content lacks actual demand, socially recognized labor output cannot be calculated based solely on the quantity of output.Real-world research should first verify quality, demand, and working conditions before discussing the implications of efficiency gains.

It is also necessary to distinguish between the social average state following the widespread adoption of technology and the state in which a few enterprises are early adopters. *Capital* discusses surplus value arising when individual productivity exceeds the social average and points out that this differential disappears as production methods become widespread [5] .Therefore, while pioneering enterprises may achieve higher returns based on lower individual costs, simplified calculations based on social averages cannot be directly applied to them. However, this advantage still requires explanation through social comparison and market realization; one cannot conclude that machines independently create new value merely based on an increase in corporate revenue. Similarly, in educational evaluation, the basis for comparison must be clarified: a speed advantage in a single task does not equate to

the learner having developed stable and transferable competencies.

3. Shifting from End-User Operations to the Holistic Labor Process

The tendency to view artificial intelligence as an independent source of value often stems from an overly narrow scope of observation: after a user enters a request, the system quickly provides an answer, and the reduction in directly observable human operations seems to imply that human labor has been eliminated. However, terminal output is only part of the entire production process. Model development and practical application involve different stages of work; analysis must, at a minimum, distinguish between the development of technological products, their deployment and operation, and the processing and verification of specific outcomes.We cannot simply calculate the time required for the final click, nor can we, conversely, indiscriminately lump all related activities together into a single total value.

A distinction must also be made between the "novelty" of generated content and the "new addition" in value creation. A statement that has never appeared before represents a new combination at the content level; whether it is accurate or helpful in solving problems is a judgment regarding the quality and usefulness of the outcome.The "new creation" of a commodity's value, however, pertains to the social labor newly incorporated into the current production process. These two types of "new" are not the same: novelty in content alone cannot prove that a machine creates value, nor does common content preclude the necessary participation of human labor in commodity production. For example, when a translator repeatedly processes documents with similar formats according to client requirements, their work cannot be excluded from labor analysis merely because it lacks literary originality; similarly, when a machine generates rare expressions, the rarity of those expressions alone cannot serve as a measure of labor time.

When discussing the machine system, Marx had already noted that scientific knowledge enters production through technical devices, altering the relationship between workers and the means of production; the technical form of a machine is not equivalent to its capital form within specific social relations [7] .For generative artificial intelligence, this implies that two distinct questions must be addressed: what tasks the system is capable of performing, and within what framework of labor organization and ownership relations these capabilities are utilized. The former explains technical capabilities, while the latter pertains to the control of labor and the attribution of profits. The fact that a system can perform certain operations autonomously is insufficient to prove that it possesses the same social characterization as human abstract labor.

In terms of value formation, a distinction must also be made between the transfer of the existing value of the means of production and the new value created by living labor. *Capital* explains that while labor creates new value, it simultaneously preserves or transfers the value of the means of production consumed through concrete labor [5] . Accordingly, when an AI system is put into use as a means of production, the value previously formed by the technological product cannot be recalculated as newly created value during each operation.The labor involved in developing a piece of software and the labor involved in using that software to complete a translation belong to different stages; if researchers examine both upstream and downstream processes simultaneously, they must clarify the accounting boundaries to avoid double-counting the same portion of value.

Furthermore, software and online services cannot simply adopt the depreciation algorithm used for a physical machine. When a company purchases continuously updated services, the fees paid may correspond to various factors, such as computational resources, maintenance labor, product development, and market pricing.The fact that a certain expense is classified as a technology cost in accounting does not mean that its value composition has been identified. Therefore, while this paper can clarify the distinctions that must be made in analysis, it cannot estimate value based solely on subscription prices, the number of calls, or the number of model parameters. This limitation stems from the organizational form of the research subject and does not deny the actual role of software as a means of production.

When identifying the sources of new value, productive labor cannot be reduced to manual operations or final execution. Marx's analysis of the "total worker" views collaborative production as a unified whole in which workers can assume different functions; the specific characterization of productive labor must be examined in conjunction with social relations [5] .Based on this, Xiong Xiaolin and Sun Xifang emphasize the role of intellectual labor—such as scientific research—in overall production [4] . Following this line of reasoning, tasks in AI-assisted translation—such as terminology design, contextual judgment, and error review—should all be included in the observation of the labor process and must not be overlooked simply because they do not directly manifest as word-for-word translation. As for how these tasks contribute to value production, this must still be judged in the context of the specific production organization in which they occur.

Similarly, this perspective should not be generalized to the extent of claiming that "any

interaction with artificial intelligence creates commodity value."Students practicing prompt generation, users browsing content, and individuals employed to complete commercial projects do not involve the same social relationships. It is also necessary to distinguish between whether upstream labor is organized as part of commodity production and whether downstream outputs are actually sold. Only by clarifying who organizes the work, how the outputs are provided, and how labor enters the collaborative process can we avoid using the vague notion of "human-machine co-creation of value" to obscure human labor and its specific circumstances.

4. The Conditions Governing the Relationship Between Corporate Profits and Worker Benefits

Value creation, value realization, and profit distribution are interrelated but not interchangeable elements. Taking AI-assisted translation services as an example, the production of translations, client purchases, and the distribution of revenue between workers and operators each correspond to distinct issues. If a study focuses solely on operating revenue, it cannot distinguish whether revenue growth stems from an increase in orders, improvements in quality, changes in costs, or pricing power. Even if technology has indeed improved production efficiency, increased revenue cannot serve as direct evidence that machines independently create value.

This is particularly relevant when interpreting fees for technical services. High fees may reflect the labor involved in providing ongoing services, or they may be influenced by intellectual property arrangements, scarce resources, and the degree of market competition.Without research into specific business structures, one cannot attribute all fees to new value created by technology itself, nor can one attribute all fees to monopoly profits unrelated to production. A more prudent analytical approach is to first delineate the production and service stages, then distinguish between labor input, consumption of means of production, and the attribution of revenue—rather than inferring the source of value from prices.

The relationship between efficiency gains and the production of surplus value is also subject to clear theoretical conditions. The "relative surplus value" referred to by Marx involves a reduction in necessary labor time and a corresponding extension of surplus labor time; here, necessary labor time refers to the labor time required to reproduce the value of labor power and cannot be directly equated with the time required to complete a translation or a lesson plan [5] .Therefore, "halving the time required for a task" is insufficient to prove an increase in relative surplus value at the societal level; one must also examine how changes in productivity affect the conditions for the reproduction of labor power. Distinguishing between these two time scales helps avoid mechanically applying the same conclusion to every instance of technological savings.

For workers, the more immediate question is how the time saved will be allocated. Suppose a task is reduced from two hours to one hour; the organization could maintain the original workload and allow workers to use the remaining time for learning and rest, or it could raise production quotas, requiring workers to continuously handle more tasks. These two arrangements utilize the same technology but correspond to different work experiences.Artificial intelligence thus offers the potential to transform working conditions, but whether workers benefit depends on arrangements such as work quotas, learning support, and the distribution of gains. Technological capabilities alone do not predetermine these outcomes.

Research by the International Labour Organization on generative AI also suggests that a distinction should be made between the displacement of specific tasks within an occupation and the disappearance of an entire occupation, and that attention should be paid to the quality of work and policy arrangements during the transition [8] .This study discusses potential impacts and cannot be used as a statistical measure of the actual scale of unemployment. For educational institutions and training organizations, this raises a specific requirement: beyond examining how much operational time the tools save, they should also observe who bears the burden of the newly added verification tasks and whether there is corresponding support for skills updating. Otherwise, the introduction of technology may merely transform existing work into verification and maintenance tasks that are difficult to quantify, without actually reducing the workload.

5. Evaluation Boundaries and Practical Implications in Educational Applications

Applying the above analysis to the field of education first requires maintaining conceptual boundaries. Public education's fundamental mission is to nurture students; therefore, the significance of teachers' work cannot be directly evaluated using the standard of surplus value from capitalist commodity production. The discussion of productive labor in *Capital* is premised on specific social relations and does not imply that labor which does not directly produce surplus value is unworthy of attention [5] .This paper discusses commodity value to clarify the theoretical implications of AI-driven efficiency gains, not to measure the importance of teaching by market returns. For Chinese educational practice, the more meaningful questions are whether the application of technology can foster comprehension, judgment, and practical skills, and whether it can

improve the conditions under which teachers organize learning.

Second, the completion of tasks and the development of competencies should be evaluated separately. UNESCO's guidelines on generative artificial intelligence emphasize human-centered educational applications [9] .Applied to foreign language teaching, the fact that a student uses a tool to produce a fluent translation merely indicates that a certain outcome has been achieved under current conditions; whether the student can identify contextual differences, explain translation choices, and independently handle problems in new contexts requires separate assessment. If grading is based solely on the fluency of the final text, the focus of evaluation easily shifts from the student's learning to the output provided by the tool, making it difficult for teachers to determine what additional guidance is needed.

Taking Japanese-to-Chinese translation exercises as an example, three interconnected stages can be designed around a passage containing omitted subjects, honorifics, or cultural context. Students first independently analyze the context and translation challenges; then, they compare human-translated and AI-translated versions, listing expressions requiring revision and the reasons for them; finally, they complete a new passage of similar difficulty to test whether they can apply their previous judgments.Grading would assess the accuracy of the translation, the rationale for revisions, and the demonstration of transfer of learning, with the tool-generated draft serving as the material for analysis. This approach allows for the use of technology while preserving the basis for observing students' thought processes. This instructional design is proposed based on the analysis presented in this paper; its actual effectiveness still requires verification through classroom research.

This arrangement also requires that evaluation criteria align with learning objectives. If the course objective is basic language training, components involving independent comprehension and expression should be retained; if the objective is to cultivate technology-assisted translation skills, then tool selection, result review, and quality control should be evaluated.The two types of tasks can be combined, but grading should clearly indicate to students where they have made progress or where they still have room for improvement. For students with varying access to tools, instructors should provide universally accessible materials and operating conditions to avoid misinterpreting differences in equipment or account access as differences in ability. Process records should also be limited to content necessary to support instructional judgment, preventing the addition of repetitive tasks that do not aid understanding merely to demonstrate learning engagement.

Teachers should also adopt corresponding work evaluations. While artificial intelligence can assist in generating draft exercises, pedagogical judgment is still required to determine whether the materials are appropriate for students' proficiency levels, whether example sentences are accurate, and whether the feedback addresses genuine difficulties.If schools focus solely on the number of course materials or the speed of their generation, they risk overlooking these critical tasks. A more appropriate approach is to document the revision process from the initial draft to the final, usable material, and to redirect the time saved on routine tasks toward individual guidance, collaborative lesson planning, and necessary professional development. The educational value of efficiency is thus reflected in improved learning support, rather than merely in the production of more materials.

6. Conclusion

Generative AI enhances output capacity, but whether it independently creates commodity value is a matter of a different order. According to Marx's labor theory of value, analysis must integrate the utility of technology, socially necessary labor time, the overall labor process, and the distribution of profits. Only by acknowledging the role of labor in R&D, maintenance, and review—while distinguishing between the formation of new value and the transfer of existing value—can we avoid the conclusion that human labor has disappeared due to end-user automation, and prevent interpretations that substitute corporate profits for the source of value.

This paper illustrates the aforementioned distinctions through theoretical analysis and hypothetical tasks; it does not quantify the actual value of AI products nor test the effectiveness of any specific teaching program. For educational practice, this analysis offers a concrete direction: to examine task speed and skill development separately, making human judgment, learning, and development key criteria for evaluating technology applications. Whether the time saved by technology can be transformed into more substantive educational activities still requires the combined support of curriculum design, work arrangements, and evaluation systems.

Conflict of Interest

The author(s) declare that there are no conflicts of interest to this work.

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