



Opting Out as an Untapped Resource in Instructional Design: Review and Implications

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Abstract

When faced with challenging thinking tasks accompanied by a feeling of uncertainty, people often prefer to opt out (e.g., replying “I don’t know”, seeking advice) over giving low-confidence responses. In professions with high-stakes decisions (e.g., judges, medical practitioners), opting out is generally seen as preferable to making unreliable decisions. Contrarily, in educational settings, despite being designed to prepare students for real-life challenges, opting out is often viewed as an indication of low motivation or an avoidance of challenges. Presenting a complementary perspective, metacognitive research dealing with knowledge management and problem-solving shows substantial empirical evidence that both adults and children can use opt-out options to enhance the quality of their responses. Moreover, there are initial signs that strategic opting out can increase the efficiency of self-regulated effort. These opportunities to improve self-regulated learning have yet to be exploited in instructional design. Research guided by Cognitive Load Theory (CLT), which focuses on effort allocation in the face of cognitive challenges, has largely ignored the benefits of opting out as a strategy for improving effort allocation. The present review summarizes advantages and pitfalls within the current state of knowledge. Furthermore, we propose new avenues of inquiry for examining the impact of incorporating explicit opt-out options in instructional design to support knowledge and skill acquisition. As a novel avenue, we urge educators to develop effective opting-out skills in students to prepare them for real-life challenges.

Keywords Self-regulated learning · Metacognition · Meta-reasoning · Cognitive Load Theory · Effort regulation

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Introduction

We are acutely aware that our cognitive resources are limited. In everyday situations, be it educational or professional settings, we consistently decide when and where to invest our time and thinking effort. Generally, determination to succeed is positively associated with achievements (Paas et al., 2005; van Merriënboer and Sweller, 2005; Vroom, 1964). However, substantial empirical evidence indicates that when allowed to opt out, both adults and children may improve the quality of their provided responses relative to situations in which they are required to respond to each and every problem or question (e.g., Ackerman & Goldsmith, 2008; Ferguson et al., 2015; Koriat & Ackerman, 2010; Koriat & Goldsmith, 1996; Krebs & Roebbers, 2012; Lyons & Ghetti, 2013; Undorf et al., 2021; see Goldsmith, 2016, for a review). At the surface level, the two strategies, determination and opting-out, stand in opposition. In this review, we call educational designers to consider how to combine them for the benefit of both learning and assessment.

A central consideration in combining determination to succeed with effective utilization of opting out is the aim to work efficiently, with or without explicit time restrictions (Deci, et al., 1991; Sitzmann & Ely, 2011). In educational contexts, such as a classroom or a testing scenario, students frequently encounter several challenging tasks (e.g., scientific problems) that they are expected to solve within a limited time. This situation requires making a set of regulatory decisions regarding effort investment (see Ackerman & Thompson, 2017; Boekaerts & Corno, 2005, for reviews). In particular, deciding effectively on which questions to invest most of the time on, as well as how to avoid wasting time on a failing course of action, is critical for effective effort regulation (see Ackerman & Levontin, 2024; Son & Metcalfe, 2000; van Gog, et al., 2020). One alternative is to postpone attempting to solve a particular problem if the student is uncertain about which approach to use. This strategy allows the student to redirect their efforts towards either enhancing their overall skills or focusing on problems where they anticipate greater success. Therefore, students in both learning and assessment scenarios face a composite challenge of addressing each problem individually, while also strategically allocating their mental resources across the task components.

Notably, using the strategy of selectively opting out effectively is relevant even in more global situations than studying a particular topic or taking an exam. For example, a graduate student in an advanced elective course might realize early that she lacks essential foundational knowledge. Acknowledging this, she decides to withdraw from the course and enroll in another that provides the missing foundational understanding, intending to return to the advanced course in a subsequent semester. Teaching students to effectively utilize the opting-out strategy can aid them in a variety of real-life situations, encompassing both their academic and future professional endeavors.

So far, research on self-regulation of effort investment while performing thinking tasks has mostly used forced-response paradigms, in which participants are

not explicitly encouraged to opt out. Moreover, opting out while performing these tasks (e.g., by responding “I don’t know” or choosing to quit) is often considered a sign of low motivation or avoidance, rather than a strategic behavior that promotes achieving overarching goals. In this review, we aim to inspire the development of a comprehensive guidance regarding effective utilization of opting-out options, aiming to bolster students’ performance in terms of both achievement and efficient effort distribution.

Our review commences by describing well-established theories not originally addressing the concept of opting out in educational contexts, yet capable of informing theoretical development in this almost neglected area. Specifically, we evaluate advantages and disadvantages of explicitly offering opting-out options and review factors identified as influencing their use, laying a foundation for numerous research directions. Next, we turn our discussion to Cognitive Load Theory (CLT, Sweller, et al., 1998). Research informed by CLT underpins much of the educational research on effort allocation and optimization. Despite its prominence, the integration of opting out in instructional design and its potential role in enhancing self-regulatory processes and learning outcomes have been largely neglected in CLT-based research. This review, therefore, specifically elaborates on CLT, viewing it as a solid infrastructure for educational practices. These practices can go beyond delivering knowledge and engaging learners; they should aim to optimize effort by employing diverse opting-out methods, as discussed throughout this review.

We focus our review on how individuals utilize the option to opt out as a self-regulation strategy in learning and assessment contexts. Given the limited existing research on this topic, our review was not a systematic one. Instead, we conducted an explorative analysis, identifying gaps in the literature and suggesting potential avenues for future research. The review method is described in Appendix.

Opting Out as a Regulatory Decision

Theoretical Concepts

Many educational theories describe thinking steps and activation of relevant knowledge and strategies (e.g., Boekaerts, 1997; Butler & Winne, 1995; Pintrich, 2000; Zimmerman & Schunk, 2001). When discussing self-regulated efforts, many of these theories deal with motivation, self-efficacy, and encouraging persistence (e.g., Efklides, 2011; Panadero, 2017; Skinner & Saxton, 2019; Vollmeyer & Rheinberg, 2006; Winne, 2017). While none of them consider the opportunities encompassed in opting-out, some theories allow deriving concepts that can shed light on this aspect of self-regulated learning.

One conceptualization for deriving a theoretical understanding of opting out is the *Region of Proximal Learning*, which explains self-regulated learning choices (Kornell & Metcalfe, 2006; Metcalfe & Kornell, 2005). Vygotsky’s famous Zone of Proximal Development theory (Vygotsky, 1978; see Margolis, 2020 for a review) is meant to guide teacher activity to choose instructional activities that reside within an optimal challenge spectrum of their students, not too hard and not too easy for their

current state of knowledge. The Region of Proximal Learning, in contrast, focuses on *self-regulated learning*—students' own choice in which task components to engage more than others. According to this framework, learners continue to work on each task item as long as they metacognitively sense progress while thinking. This state characterizes tasks that align with learner's current capabilities and potential for knowledge acquisition. When confronted with tasks that either fall short of or exceed one's state of knowledge, the learner is expected to disengage from those that exceed their self-perceived current developmental trajectory (see Ackerman & Levontin, 2024, for a review). Thus, tasks that learners perceive as overly simplistic fail to stimulate meaningful cognitive advancement, whereas those excessively challenging may surpass the learners' current cognitive capacity, rendering them to infer that they require effort disproportionately high relative to the expected progress.

Following this theory, we propose that effective strategic utilization of opting out is expected to be based on a fine-tuned balance between the perceived challenge level of each task item and the motivation to overcome it. By this view, a student who is highly motivated can address more challenges by applying determination to succeed. A less motivated student is more likely to give up on challenges that may fall within her zone of proximal learning, unless she manages to boost her motivation. We suggest that opting out and motivation are not at odds with each other. Rather, a highly motivated student should be taught how to make informed decisions about when and what to quit to improve knowledge and acquired skill in the task, given current requirements (e.g., time limit, number of questions one should choose to answer).

Another theoretical concept that relates to opting out is *desirable difficulties* (Bjork, 1994a, b). Desirable difficulties refer to the benefits of introducing challenges as part of task design. These challenges are considered desirable because "they trigger encoding and retrieval processes that support learning, comprehension, and remembering" (Bjork & Bjork, 2020, p. 3). This concept intersects intriguingly with the practice of opting out in educational settings. By the classic view, opting out can be seen as a means to avoid difficulties, as learners might choose to withdraw from tasks perceived as overly challenging or outside their comfort zone. However, we propose that the judicious use of opting out can also be an integral part of managing these desirable difficulties. Learners, especially those adept at self-regulated learning, might strategically choose to engage with challenges that are more aligned with their current learning objectives and abilities. This strategic choice ensures that the difficulties they face are desirable in the sense of being conducive to their learning, rather than overwhelming or demotivating.

Finally, the conceptual framework of self-regulated learning (SRL) suggests that learning involves planning, monitoring, and evaluating one's behaviors towards achieving one's goals (Schraw, 1998). Most existing educational research dealing with SRL has used forced-response paradigms, under the assumption that students in learning contexts are expected to provide concrete responses rather than avoid answering (e.g., Hui, et al, 2021; Onan et al., 2022; van Harsel et al., 2022). At the heart of SRL lie metacognitive processes that facilitate effective information processing. Within the metacognitive framework (Nelson & Narens, 1990), *metacognitive monitoring* refers to ongoing self-assessments of the quality of one's thinking.

For example, when solving a problem, people are hypothesized to constantly assess whether the problem is solvable, the chance that the first answer that comes to mind is correct, the ongoing progress towards their goal, and their confidence in the chosen solution (Ackerman & Thompson, 2017). *Metacognitive control* refers to the decisions for action one makes based on the output of the monitoring process. For example, providing an initial response, switching to another strategy, or withholding an answer. When considering opting-out choices, it is subjective monitoring, rather than actual knowledge, which guides the decision to provide a response or to opt out (see Fiedler et al., 2019). Indeed, research under the metacognitive framework has provided the most empirical evidence we have so far regarding the utilization of opting out, as detailed below (see Goldsmith, 2016, for review).

In summary, the above review of related theories sets the stage for a detailed evaluation of advantages and disadvantages of offering the option to opt out in educational settings. This evaluation will guide assessment of opting out effectiveness both as a theoretical concept and as a practical skill deserving dedicated instructional design. Our overarching aim is to encourage educational researchers to reconsider opting out not merely as a means of avoiding tasks, but rather as a strategic method for effectively managing cognitive load and enhancing learning outcomes.

Advantages of Opting Out

As hinted above, opting out carries the potential for benefits for learning, assessment, and practice. The opportunity to refrain from answering when uncertain allows learners to focus their efforts on tasks that reside within their effective challenge spectrum (Kornell & Metcalfe, 2006; Metcalfe & Kornell, 2005). Although limited, the existing body of work across multiple domains consistently suggests that providing opt-out options can be advantageous. In this section, we review this research, which is also summarized in Table 1.

Research has demonstrated that adults (Pansky et al., 2009; Rhodes & Kelley, 2005; Undorf et al., 2021), as well as primary school children (ages 7–12; Koriat & Ackerman, 2010; Krebs & Roebers, 2012), and even preschoolers (ages 3–5, Lyons & Ghetti, 2013), can exploit the advantage of opting out for enhancing their output-bound accuracy. *Output-bound accuracy* refers to the precision of a learner's responses by opting out of answering questions they are unsure about, thereby potentially increasing the accuracy of assessment outcomes by avoiding guesses or incorrect answers. Within this scoring scheme, individuals who are highly motivated to provide accurate information set a high confidence threshold, leading them to offer only answers they are highly confident are correct. Increasing the costs of incorrect answers promotes opting out, resulting in improved output-bound accuracy (Koriat & Goldsmith, 1996, see Goldsmith, 2016, for a review). Similar output-bound advantages have been extended, beyond knowledge testing per se, to other thinking challenges, such as solving problems, performing reasoning tasks, and when making tough decisions, by providing explicit opting-out alternatives (e.g., “I don't know” response option, Ackerman, 2014; see Fiedler et al., 2019, for a review).

Table 1 Summary of the review regarding utilization of opting out as part of instructional design

	Opting-out effects	Citations
Advantages of Opting Out	Improve output-bound accuracy	Ackerman (2014); Ackerman and Goldsmith (2008); Ferguson et al. (2015); Fiedler et al. (2019); Goldsmith (2016); Koriat & Ackerman (2010); Koriat & Goldsmith (1996); Krebs & Roebbers (2012); Lyons & Ghetti (2013); Pansky et al. (2009); Rhodes & Kelley (2005); Undorf et al. (2021)
	Improve thinking efficiency	Ackerman (2014); Ackerman et al. (2023); Ackerman & Levontin (2024); Koriat & Ackerman (2010); Koriat et al. (2014); Metcalfe & Kornell (2005)
	Improve diagnosticity of provided reports in eye-witness research	Shapira & Pansky (2019); Scoboria & Fisco (2013); Weber & Perfect (2012)
Disadvantages of Opting Out	Obscure implicit knowledge	Harden et al. (1976); Powell et al. (2005)
	Excessive opting out	Harden et al. (1976)
	Challenges in assessment practices	Ulitzsch et al. (2020)
	Unguided opting out might harm learning outcomes	Kornell & Bjork (2008)
Factors Affecting Utilization of Opting Out	Heuristic cues; response time, familiarity, complexity, context reinstating, operationalization	Koriat & Ackerman (2010); Hanczakowski et al. (2013); Payne & Duggan (2011); Krogulska et al. (2020); Lukasik et al. (2020); Joinson et al. (2007)
	Social factors	Ackerman & Goldsmith (2008)
	Individual differences	Associated social considerations: Ryan et al. (1998, 2001); Ryan & Pintrich, (1997); Seamark & Gabriel (2016); Won, et al. (2019) Sherman (1976); Law et al. (2022); Ackerman et al., 2023

This “quality control” process is valuable beyond educational contexts, in numerous real-life and professional contexts, in which reliable answers are critical (e.g., medical contexts). So far, applications of output-bound accuracy have been mostly studied in forensic contexts, such as a witness testifying in court. This body of research revealed that encouraging individuals to provide fewer but higher-quality responses can improve the diagnosticity of the provided reports (e.g., Scoboria & Fisico, 2013; Shapira & Pansky, 2019; Weber & Perfect, 2012). Fostering higher-quality responses through selective reporting can be analogously applied to the educational domain, particularly in enhancing students’ learning and assessment outcomes. The emphasis on output-bound accuracy mirrors the need for learners to critically evaluate their knowledge and confidence before responding, akin to the deliberation an eyewitness undergoes before testifying. This evaluative process encourages students to engage in reflection about their understanding and mastery of the subject matter, prompting them to selectively participate in tasks or assessments.

Research on opting-out and output-bound accuracy can also be interpreted through the Region of Proximal Learning theory (Kornell & Metcalfe, 2006; Metcalfe & Kornell, 2005). By adjusting their confidence threshold to their motivation level and opting out of less certain responses, learners engage with tasks that present the right level of challenge, thereby maximizing the benefits of their effort allocation. This strategic approach to task engagement reflects a nuanced application of the idea that challenges are tailored to the learner’s current capabilities and lead to more effective and meaningful learning outcomes. Notably, this can be applied to a broader educational aim of cultivating a learner’s ability to judiciously manage their cognitive resources. By electing tasks that align with their current skill level, learners not only bolster their capacity to master new content but also refine their ability to gauge and navigate their learning trajectory effectively. The development of opting-out as a cognitive skill along primary school years was demonstrated by Fandakova et al. (2018). They examined the development of neuropsychological aspects of opting out, both by comparing groups of children and adults, and by longitudinally tracking its development during primary school years. They measured neural signaling of knowledge retrieval failure in the anterior prefrontal cortex—a brain region related to metacognitive processing and ongoing performance monitoring as measured by functional magnetic resonance imaging (fMRI). In line with the behavioral studies reported above, this study supports the role of metacognitive processes in the regulatory decision to opt out, as well as its function in maximizing success in the task. In particular, activity in the anterior prefrontal cortex was increased for opting out (uncertainty responses) compared to trials in which participants provided a response. Interestingly, the effect was only evident in older children (10–12 years old) and adults, but not among the younger children (8–9 years old). Over a period of about a year and a half, the younger children in Fandakova et al.’s study showed a larger increase in anterior prefrontal cortex activity related to reporting uncertainty than the older children and adults. The authors concluded that there is a slow but steady maturation of the prefrontal systems underlying cognitive control and uncertainty appraisals. Importantly, these findings are in line with studies with the same age range that empirically examined opting-out contribution to output-bound accuracy (Koriat & Ackerman, 2010; Krebs & Roebbers, 2012).

Improving *thinking efficiency* is yet another important advantage of using opting-out. Studies that did not include opting-out have consistently shown that people, both children and adults, waste the most time on tasks they acknowledge to have a small chance of being successful (Ackerman et al., 2023; Koriat & Ackerman, 2010; Koriat et al., 2014; Kornell & Metcalfe, 2006; Metcalfe & Kornell, 2005). Indeed, beyond the improvement in the quality of the provided information, initial signs from problem-solving contexts indicate that allowing opting out cuts down wasted effort on attempts doomed to fail (Ackerman, 2014). Moreover, simple manipulations, such as providing background information about the potential of the task to develop one's intelligence, allow people to invest more time in tasks more likely to yield valuable outcomes than those with a lesser chance of success (Ackerman & Levontin, 2024). Together, the reviewed studies that show output-bound accuracy improvement and those that provide directions for efficient effort allocation in the presence of opting-out options may guide instructional design to train children and adults in using opting-out effectively.

In educational practice, appropriate help-seeking is considered one of the most adaptive self-regulated activities, together with persistence, underlying motivational resilience (see Jansen et al., 2020; Skinner et al., 2013, for reviews). However, help-seeking requires the willingness to opt out from self-solving attempts in uncertain situations, akin to the process of quitting. Considering help-seeking behavior raises the question: what is the metacognitive difference between help-seeking and opting-out? To explore this, Undorf et al. (2021) had people answer a set of open-ended knowledge questions. They compared allowing withholding an answer ("I don't know" response) to asking for help in the form of a hint provided in a second opportunity to answer ("Get help later", a multiple-choice format or reviewing responses provided by others). In their experimental design, participants were required to rate their confidence in their initial open-ended answer before choosing to withhold or ask to get a hint later. The results aligned with strategic decision-making—the lower the confidence, the higher the likelihood of opting out of both types. With the option to withhold answers, initial answers with low confidence were frequently inaccurate, supporting the strategic use of opting out to enhance output-bound accuracy. Interestingly, though, the effectiveness of asking for hints in improving output-bound accuracy was inconsistent. The authors attributed this finding to the fact that individuals can only utilize hints when they possess some relevant knowledge, while withholding is effective even in the absence of any relevant knowledge. In another condition, the authors allowed both options, submitting one's answer, withholding by "I don't know", and asking for a hint by "Get help later". As expected, no option was redundant. However, there was no distinct delineation in the confidence levels that guided all three response options. Withholding was more strongly associated with low confidence levels, while asking for hints was used for a wider range of confidence levels, including answers accompanied by low and intermediate confidence levels. This study brings basic research as close as possible to real-life scenarios that allow respondents flexibility in their response choice.

Taking research further towards real-life scenarios, Ferguson et al. (2015) examined whether Internet access affects the tendency to opt out. In their study, participants answered general knowledge questions with the option to opt out (by choosing

a “don’t know” response). In the Internet access condition, participants could opt out and then look for the answer online. Their output-bound accuracy was measured based on answers they chose to provide, relying on their own knowledge. In one experiment, participants provided metacognitive judgments regarding the likelihood of their responses being correct (confidence) after answering the questions. In another experiment, participants assessed their feeling of knowing before providing their answers. Across these experiments, both confidence in provided answers and feeling of knowing before answering were lower in the Internet access condition compared to the group without Internet access, suggesting that the availability of search opportunities reduced participants’ self-assessment of their own knowledge. Moreover, participants who had Internet access opted out more and achieved higher output-bound accuracy relative to those who could opt out without the opportunity to search the Internet. This study, in conjunction with Undorf et al. (2021), highlights the advantages of allowing natural combinations of answering based on one’s own knowledge, but also allowing opting out and information search.

In sum, research across various methods and domains consistently indicates that presenting respondents, even primary-school children, with the option to opt out, can enhance success and efficiency in tasks involving knowledge tests and problem-solving (see summary in Table 1). When considering educational implications, the specifics of guiding people to effectively utilize opting-out for enhancing effort regulation, performance, and long-term learning remain to be explored. Future research directions may include the effects of allowing frequent versus limited opting-out opportunities, timing (early vs. later stage) of its introduction during skill acquisition (e.g., math education), focusing on task items at the region of proximal learning and desirable difficulties, and beneficial effort allocation, as part of instructional design inspired by the CLT. Moreover, it is an educational challenge to consider how to develop opting out as a generalizable skill, in parallel to instilling any core target knowledge (see summary of future research directions in Table 2).

Disadvantages of Opting Out

People in work contexts, education practitioners, as well as researchers in the domain of self-regulated learning typically recommend encouraging persistence and refer to opting out as a sign of low motivation and inability (e.g., Callan & Shim, 2019; Pollock et al., 2020; Zimmerman, 2023). Indeed, in many cases opting out can prove to be disadvantageous. Harden et al. (1976) have put forth two factors that discourage the provision of opting-out options in tests. First, opting out may obscure implicit knowledge that could aid in the process of elimination and accurate guessing (see also Higham, 2007; Powell et al., 2005). Second, differences in individual interpretations of opting out might lead to varying utilization rates, potentially impacting students’ relative success. Individuals who have a general aversion to guessing may excessively opt out, resulting in a low overall answer rate. For example, avoidance of effortful tasks is a characteristic behavior of individuals with certain forms of learning anxiety and deficits, including ADHD (American Psychiatric Association, 2013, DSM-5). The introduction of opting out in exams with relative scores (e.g.,

Table 2 Future research directions on opting-out

	Research directions
Advantages of Opting Out	<ul style="list-style-type: none"> • How do different learning environments influence the strategic benefits of opting out? • What are the effects of allowing frequent versus limited opting out opportunities on students' learning outcomes, engagement, and problem-solving skills? • How does the timing of introducing opting out (early vs. later stage) during skill acquisition, such as in math education, impact students' learning progress and comprehension? • How can we measure and develop the skill of using opting-out effectively? • How can we best develop an effective generalizable opting-out skill?
Disadvantages of Opting Out	<ul style="list-style-type: none"> • Does opting out have negative effects on long-term learning? • Is opting out harmful for intrinsic motivation? • Is opting out harmful for individuals with certain forms of learning anxiety and deficits? • Is opting out associated with a reactive effect similar to metacognitive judgments? • How can educators balance the use of opting out with the need for exposure to challenging content? • What strategies can mitigate the potential negative impacts of opting out?
Factors Affecting Utilization of Opting Out	<ul style="list-style-type: none"> • How do specific heuristic cues affect the decision to opt out in educational settings? • What role do social and cultural factors play in students' opting out decisions? • How do individual differences such as mindset, motivation, self-efficacy, and goal orientation affect the use of opting out as a learning strategy? • How can educators foster a classroom environment that supports and encourages opting out as a proactive and positive strategy?

SAT) could potentially alter the relative performance of these special populations, necessitating careful consideration of this factor in such assessments. Thus, scoring based on output-bound accuracy without defining the allowed rate of opting out might conceal some test-takers' full knowledge and capabilities. Another challenge in assessment practice is differentiating between items the respondent chose not to answer and those not answered due to flawed time management, such as questions at the end of the test, rather than because of self-regulation guided by uncertainty. Notably, data analysis procedures, based on response time, offer means to overcome this particular challenge (Ulitzsch et al., 2020).

From the lens of the Desirable Difficulties theory (Bjork & Bjork, 2020), opting out might also involve drawbacks. The theory's essence is that while engaging with challenging tasks feels less fluent, this engagement leads to generating rich associations with existing knowledge, which is at the core of learning that yields strong and enduring knowledge (Bjork & Bjork, 2020; Bjork, 1994a). Consequently, avoidance of difficulty may lead to superficial (or no) understanding of

the material and potentially limit long-term knowledge. Concurrently, the investment of effort that creates an intrinsic feedback loop of satisfaction from insight and achievement, along with external positive feedback and pride, are crucial for maintaining sustained engagement and encouraging ongoing exploration within a subject area (Boekaerts, 2010). Therefore, opportunities for opting out that lead to premature disengagement from difficult tasks prevent such motivational rewards. As mentioned above, we posit that there is a fine-tuned balance between the perceived challenge level of each task item and the motivation to overcome it. Difficulties introduced by educators with the purpose of being desirable might lead some students to avoid them by opting out when their skill and/or motivation levels do not accord with educators' instructional design. Furthermore, opting out reduces opportunities for feedback and improvement: avoiding challenging activities means missing out on essential feedback, crucial for advancing understanding and skill development (Hattie & Timperley, 2007).

Interestingly, opting out can be offered, not only for dealing with uncertainty but also for dealing with certainty. In Kornell and Bjork's study (2008), English-speaking participants learned Swahili vocabulary by using two sets of translation cards. Subsequent to the initial learning, under certain conditions, participants were offered the opportunity to "drop items"—to opt out of re-studying items deemed already known, thus exercising self-regulation in their learning process. The results revealed that the dropping strategy did not confer any significant advantage for learning outcomes; in fact, it was sometimes mildly detrimental. Notably, participants' self-monitoring, as assessed through Judgments of Learning, was comparatively accurate regardless of the dropping procedure. This example of yet another aspect of opting out underscores the idea that effective utilization of opting-out strategies may necessitate guided intervention even when involving identifying high-knowledge task items rather than low-knowledge ones.

Another potential disadvantage is the effect of the mere availability of an opting-out option might have on the learning and thinking process. While there is no direct research on such effects, insights can be gained through the literature on the reactivity to metacognitive judgments. Namely, there is some evidence indicating changes in the learning process caused by the mere solicitation of judgments of learning or confidence ratings (see Double & Birney, 2019, for a review). For instance, research on word-pair memorization tasks shows that judgments of learning (JOLs), reflecting one's self-assessment of being able to recall the right word when presented with the left one, can positively impact recall for related word-pairs (e.g., SOCK-SHOE; Halamish & Underdof, 2021; Soderstrom & Bjork, 2015; Tauber & Witherby, 2019), with mixed effects on unrelated word-pairs (e.g., SOCK-LAMP; Janes et al., 2018; Mitchum et al., 2016; Soderstrom & Bjork, 2015). Eliciting judgments has also been found to influence motivation and goal-setting, with reactivity associated when focused on short-term performance rather than on long-term performance, in both learning and thinking tasks (Double & Birney, 2018; Mitchum et al., 2016). Drawing on these findings, it can be posited that the awareness of an opting-out option could prompt learners in a reactive rather than only in a reflective manner, potentially affecting learning strategies and outcomes.

Taken together, there are clearly challenges associated with opting out that should be taken into account (see Table 1). Future research is encouraged to compare and potentially combine opting-out options with other instructional tools, to determine the most effective approach for enhancing learning outcomes and efficiency. An illustrative example of an instructional tool, akin to opting-out options, is metacognitive prompts. While opting-out options allow learners to manage their cognitive load by choosing when to disengage, metacognitive prompts encourage critical reflection on their learning process (Guo, 2022). Research in this direction could reveal synergies or distinctions between the two strategies, providing a more comprehensive understanding of how learners can improve allocating their efforts. In practice, an integrated approach should aim to provide nuanced and effective tools for effort allocation depending on the characteristics of the learning scenario. Finally, incorporating the opting-out option in research presents challenges in experimental design and data interpretation. Methods must be developed for recognizing the benefits of opting out within individuals' learning paths, against the potential complications it introduces in assessing the efficacy of educational interventions (see Table 2).

Factors Influencing Opting Out Usage

Thus far, the review highlights opting out as an easily applicable and potentially advantageous self-regulatory strategy. The review also highlights that opting out application must be offered with awareness of potential pitfalls. However, research has shown that people underuse this option when offered (e.g., Ackerman, 2014; Koriat & Goldsmith, 1996; Weber & Perfect, 2012). This is the case even when problem-solvers are aware that there are unsolvable problems in the task set (Lauterman & Ackerman, 2023; Payne & Duggan, 2011). Notably, when the questions are open-ended (e.g., answering by free text), people can opt out by responding nonsense (e.g., "xxx"). However, when opting out is not explicitly presented as a valid response option, it is barely used. Sauer and Hope (2016) reported a range of 0.3–0.43% of don't know responses out of all responses in two complex scene memorization tasks. While presenting the opting-out option explicitly promotes its use, the rates are still relatively low. For example, in an eyewitness study, Weber and Perfect (2012) examined participants' reports of details from a mock crime video with and without delays. They compared spontaneous open-ended reporting with no directive towards opting out to allowing explicitly to opt out (with a "don't know" option). They found that only 2.2% of the participants in the spontaneous condition opted out, compared to 19.3% who opted out when this option was explicitly presented. Similarly, Ackerman (2014) found 25% "don't know" responses with a vocabulary-based problem-solving task, but only 6% "don't know" responses with misleading math problems, even in cases of severe uncertainty. Thus, various factors clearly affect the tendency to opt out. We review below three potential factors: heuristic cues, social factors, and individual differences (see summary in Table 1).

Heuristic Cues

It is well established in metacognitive research that monitoring the chance to succeed (e.g., confidence) is based on heuristic cues that are sometimes reliable, but can also bias metacognitive judgments (Baars et al., 2018; Koriat, 1997; see Ackerman, 2019, for a review). Koriat and Ackerman (2010) found a developmental trajectory during primary school years in the association between confidence and answering time. They interpreted this result to suggest that as children get older, they learn that easier questions are answered quickly and correctly, while more difficult questions take longer to answer and even then, have a lower chance of being correct. In line with confidence change over thinking time, they found lower opting-out rates when responding quickly than when responding after lengthy thinking.

Continuing this line of thought suggests that opting out utilization is guided by the same cues that inform metacognitive judgments. For example, Hanczakowski et al. (2013) manipulated familiarity as a cue in a learning task. In a priming stage, participants rated the pleasantness of words. This stage was intended to enhance the familiarity of half the words to be learned in the following stage. Participants were then presented with a word (primed or unprimed), recalled the target or selected a don't know response, and estimated their ability to recognize the correct target in a recognition test (feeling of knowing). The final stage was a recognition test, in which participants were presented with the same words and either selected the target out of three options or selected a don't know response. Consistently across seven experiments, participants opted out less in recognition tests when facing primed compared to unprimed words, indicating that familiarity discourages opting out. Notably, the difference between primed and unprimed words was less robust when recalling the remembered words freely than when recognizing them among the three presented options. The authors suggested that recognition relies on familiarity as a cue more than recall and is thus more prone to the illusion of knowledge it generates.

Another cue found to guide opting out is perceived problem complexity. Payne and Duggan (2011) examined regulation strategies involved in solving water jar problems, a category of mathematical puzzles in which participants are tasked with achieving specific measurements by transferring water between jars of different sizes. The complexity of these problems was determined by the number of distinct states, each representing a unique combination of water levels across the jars. Participants navigated through these states via a series of actions, such as pouring water from one jar to another. The research findings, particularly from Experiment 1 and Experiment 2, indicated that problems with a larger number of states, which implies greater complexity, resulted in participants taking more time and making more moves before opting out. Notably, opting out after lengthy thinking is an inefficient strategy (Ackerman & Levontin, 2024; Kornell & Metcalfe, 2006; Metcalfe & Kornell, 2005). Furthermore, the study revealed that the decision to opt out was influenced not only by the complexity of the problem but also by participants' assessment of the likelihood of the problem being solvable, underscoring the multifaceted nature of decision-making in educational problem-solving contexts.

“Unanswerable questions” solicit information the learner never encountered (e.g., the information provided is insufficient or lacking, Waterman & Blades, 2011). In

educational settings, unknown topics are similarly unanswerable. Opting out is the recommended strategy for addressing such questions. Contextual information, like the physical setting in which the task is performed, provides cues for metacognitive judgments in addition to item-level cues, like familiarity (see Ackerman, 2019, for a review). Krogulska et al. (2020) found that context reinstating (e.g., reminding peripheral details from the learning context) for unanswerable questions reduces the frequency of “don’t know” responses while increasing the occurrence of wrong answers. Lukasik et al. (2020) replicated and extended these results by showing that context reinstating not only creates an illusion of remembering but also increases the tendency to provide detailed, yet unreliable responses. Implications for education might be that the common recommendation for context-dependent learning (e.g., learning and testing under the same conditions, Smith & Vela, 2001) might generate biases and affect the utilization of opting-out options.

Furthermore, even the specific operationalization of opting out may serve as a cue for its utilization, as demonstrated by how it interacts with the approach used to engage participants. In surveys, for instance, there are multiple options to allow participants to opt out: non-response (not selecting an option), selecting “I prefer not to answer”, or an option for free text entry. Joinson et al. (2007) found that non-personalized surveys (i.e., “Dear panel member”) increased non-responses, while presenting participants with personalized salutations (i.e., “Dear <forename>”) increased the “I prefer not to answer” response. The authors suggested that personalization may decrease the sense of anonymity, as well as increase participants’ motivation to respond “well” to the survey.

In sum, there is evidence that cues inherent to the task, as well as contextual cues, may guide the decision to opt out. As most of this evidence comes from other, though related, domains, there is a clear need for empirical investigation into cues underlying opting-out decisions in educational contexts.

Social Factors

Basic research has shown that social factors affect how individuals answer questions. Tsui (1991) suggested that opting out serves various pragmatic purposes beyond merely indicating uncertainty. In particular, declaring “I don’t know” is often motivated by a desire to save face for oneself and others. For example, opting out can function as an avoidance of making an assessment or an explicit disagreement. This is particularly relevant in professional contexts where individuals, such as medical doctors or judges, may be reluctant to openly acknowledge uncertainty to avoid losing face or diminishing their perceived expertise. For these professionals, admitting a lack of knowledge by stating “I don’t know” could be seen as a failure to meet the expectations of their role, potentially impacting their professional credibility. In such situations, opting out in the form of requesting further information becomes a more legitimate and face-saving strategy. For instance, a medical doctor might order additional medical tests rather than risk an incorrect diagnosis, and a judge may request more converging evidence to ensure a fair judgment. This approach allows them to maintain their professional standing while also acknowledging the limits of their

current knowledge in a socially acceptable manner. On the other hand, people in these professions always work under time and budget restrictions. These practical aspects guide their choice of action as well, and should not be ignored when aiming to understand the decision-making process that guides their opting-out behavior.

Ideally, people provide information to others with reasonable confidence that it is correct, at a detail level that fits partners' expectations and needs, and in a timely manner, in line with social norms (Grice, 1975; Smith & Clark, 1993). When individuals possess limited knowledge of a given topic, they may opt out, as well as use intonation and hedging, to maintain favorable self-presentation (Smith & Clark, 1993). Ackerman and Goldsmith (2008) analyzed how individuals manage the tradeoff between the social norms of being accurate and being informative from a metacognitive perspective. They suggested that people who answer questions while having low specific knowledge opt out to avoid providing an answer that is either precise but accompanied by unacceptably low confidence (e.g., "it was in the mid-70 s"), or is not informative—unacceptably coarse (e.g., "it was sometimes in the twentieth century"). Thus, basic research clearly suggests that social considerations affect opting out.

While there is no direct research specifically addressing the social effects on opting out as a strategic tool for learning and skill development in educational contexts, insights can be drawn from the literature on coping mechanisms (see Skinner & Saxton, 2019, for review). This body of work provides a foundation for understanding how social factors may influence opting-out decisions. When a student is faced with a challenge, evading situations where one's knowledge or skills might be tested or avoiding asking for help can be considered as akin to opting out. This avoidance can be seen as a form of self-protective behavior, aimed at preventing fear of failure and embarrassment rather than exposing vulnerabilities or gaps in knowledge (Ryan & Pintrich, 1997; Ryan, et al., 2001; Seamark & Gabriel, 2016). In educational settings, such opting out can take various forms. Students might refrain from asking questions, participating in discussions, or attempting to answer queries, often due to a fear of being incorrect or judged by peers and educators. Yet, this approach can be detrimental to learning, in line with desirable difficulties (Bjork, 1994a, b), as it hinders engagement in educational opportunities and reinforces a negative cycle of knowledge gaps and continued avoidance (Boykin & Noguera, 2013). In contrast, when students opt out, they may also apply adaptive coping strategies. One example is help-seeking, as mentioned above. Help-seeking behavior in educational environments is shaped by factors like classroom culture, educator attitudes, and peer dynamics (Ryan et al., 1998). A supportive and inclusive learning environment that creates a sense of belonging can encourage students to view help-seeking as a growth opportunity rather than as exposing a weakness (Won, et al., 2019). Here, opting out becomes a beneficial aspect of the learning process. We maintain that educators can be instrumental in fostering a classroom environment that supports and encourages opting out as a proactive and positive strategy. By doing so, they are expected to enhance the overall learning experience, facilitating students' long-term educational development.

Individual Differences

The notion that certain individuals exhibit a higher inclination towards utilizing the opting-out option was initially proposed by Sherman (1976). In her research, Sherman investigated the patterns of opting-out among students participating in the National Science Assessment, highlighting group disparities in its usage which displayed some association with individuals' traits. Furthermore, variations in opting out were also observed concerning background factors such as age, gender, and race. Sherman postulated that groups of students who achieved lower performance compared to their peers tended to opt out more frequently. Notably, the strength of these relationships was not strong, suggesting that other factors probably contribute to opting-out behavior. Although almost fifty years have passed since this study, we still know little about these factors.

Recently, Law et al. (2022) examined individual differences in opting out across three visual tasks embedded with the option to opt out. They also examined the relationships between the tendency to opt out, a confidence trait, cognitive ability, decision-making predispositions, and academic achievements among undergraduates. Their findings suggest that the tendency to opt out is an individual characteristic, consistent across tasks. With particular relevance to the present topic is that opting out did not correlate with the trait of confidence at the individual level (people with higher/lower confidence overall), suggesting that separated factors underlie each of the two traits. Interestingly, Law et al. (2022) also found that people with higher abilities tended to opt out strategically with the aim of improving success rates among the answers they chose to provide. This finding is highly important, because understanding how successful students utilize opting out might shed light on how to instill knowledge, as well as the opting out skill, by educational programs.

Another individual characteristic potentially associated with the tendency to opt out is mindset regarding one's intelligence, which reflects beliefs about the malleability of our cognitive abilities (Chiu et al., 1997; Hong et al., 1999). Dweck and Leggett (1988) presented two types of mindsets: fixed and growth. Individuals with a fixed (entity) mindset view their intelligence as stable, regardless of life experiences. They tend to see failure as a reflection of their limited intellectual abilities and actively avoid challenging situations (Fisher & Oyserman, 2017; Molden & Dweck, 2006). Consequently, they are more likely to view challenging situations as threats rather than growth opportunities. When faced with a task that seems beyond their perceived capacity, these individuals might opt out as a protective mechanism. Opting out in this context serves to avoid the risk of failure, which they see as a direct reflection of their unchangeable abilities. This avoidance is often rooted in the fear that struggling or failing would confirm their perceived limitations. In contrast, those with a growth (incremental) mindset perceive intelligence as malleable, attributing failure to external factors and insufficient effort. They focus on improving, learning, and adapting strategies. When encountering a task that exceeds their current capabilities, instead of opting out, they are more likely to persist, seeking ways to develop the necessary skills or knowledge. However, it is important to note that a growth mindset does not preclude opting out entirely. Individuals with a growth mindset might choose to opt out strategically if they deem the task misaligned with

their learning goals or too resource-intensive relative to its benefits (see Ackerman & Levontin, 2024).

Another aspect of individual differences to consider is motivation. Although motivation can change from state to state, people do have general motivational traits (Scheffer & Heckhausen, 2018). Learners characterized by low motivation may be more inclined to opt out. This decision might function as a deliberate strategy aimed at conserving energy and resources for tasks perceived as more meaningful or manageable. Conversely, individuals marked by high motivation are more apt to persist in the face of challenges, interpreting them as opportunities for personal growth and learning. This intrinsic motivation, frequently associated with personal interests, a sense of achievement, and the pursuit of mastery, fosters engagement with the given task (see Urhahne & Wijnia, 2023, for a comprehensive review). For these people, opting out may be utilized less frequently, as motivated learners generally exhibit a greater willingness to invest effort and time in overcoming obstacles. However, this investment tends to be applied strategically, allocating the majority of their time to tasks perceived as solvable rather than expending effort on those deemed to exceed their self-determined allotted time (Ackerman & Levontin, 2024). The related concept of *self-efficacy*, a belief in one's ability to succeed (Bandura, 1977), also intersects with motivation in the context of opting out. Learners with high self-efficacy are generally more motivated to tackle difficult tasks, believing in their capacity to overcome challenges (Schwarzer & Luszczynska, 2008). In contrast, those with lower self-efficacy might doubt their abilities and opt out to avoid potential failure.

Opting out may also be influenced by individuals' underlying goal orientations—performance-approach, performance-avoidance, and mastery (Kaplan & Maehr, 2007; Linnenbrink-Garcia et al., 2012). Both performance-approach and performance-avoidance oriented individuals are driven by the desire to maintain their image; the former might opt out of challenging tasks lacking opportunities for stand-out success to protect their image of superiority, while the latter might avoid tasks with a high risk of failure and negative evaluation to safeguard their self-esteem and public perception. Conversely, mastery-oriented individuals, seeking to deepen their skills, may opt out from tasks beyond their current level or misaligned with their learning goals, viewing opting out as a strategy to focus on achievable challenges that promote effective learning. By distinguishing between these goal orientations, we underscore that opting-out is not merely a mechanism for avoiding difficulty but can also be a strategic tool informed by an individual's underlying motivations and goals. This distinction is essential for educators and instructional designers to consider, as it highlights the need for creating learning environments that support both the acknowledgment of personal characteristics and the strategic pursuit of growth opportunities.

Finally, on a more global level, cultural differences should also be considered in the discussion of opting out. For instance, in China, students experience high levels of academic stress due to education being a key to achieving upward social mobility (Kipnis, 2019; Zhao et al., 2015). Relatedly, people from East Asian cultures tend to be high in uncertainty avoidance, meaning they become anxious when faced with unpredictable and unstructured situations (House et al., 2004). Indeed, a recent study demonstrated that Chinese students who faced highly challenging problems

could achieve higher success rates than Western people, but on the account of very lengthy thinking, reflecting very high persistence, that led to lower efficiency in using their time, and less effective giving up (Ackerman et al., 2023).

Overall, it is clear that factors other than maintaining success are in play in guiding the decision to opt out, while there is a clear paucity of research delving into these factors. Understanding the interplay of these factors can inform us how and why people choose to engage with or opt out of cognitive tasks. Further research into these factors will not only enrich the academic discourse on self-regulated learning but also provide valuable guidance for educators in designing and implementing instructional strategies that cater to the diverse traits, self-perceptions, and motivations of their students (see summary of research directions in Table 2).

Incorporating Opting Out into Curricula

So far, we delineated considerations required for evaluating advantages and disadvantages of offering opting-out options to students from both practical and research perspectives, as a means for effective self-regulated learning. In this section, we take a deeper look into an almost uncharted territory, which we see as exposing missed opportunities to incorporate opting out into curricula as a learning and assessment opportunity as well as in preparation for real-life performance. Specifically, we discuss the potential benefit of understanding opting out from the perspective of CLT as a backbone for instructional design.

Developing the Opting-Out Skill

The integration of the opting-out skill into educational curricula demands a deliberate and thoughtful approach, recognizing it as a trainable skill with pedagogical benefits, yet considering potential pitfalls. Teaching this skill while aligning with the developing capabilities of learners to make strategic choices is expected to enhance students' strategic effort regulation.

First, we recommend considering a *staged approach for incorporating opting out* into curricula. The opting-out skill development can be gradual, ideally not at the outset of a new topic, but rather at a later stage. In other words, we see effective opting out as a skill that should be developed by training, in parallel to target knowledge acquisition. Like every skill (e.g., problem-solving) and effort allocation strategy (e.g., rethinking, reframing), students should learn to opt out effectively during training as well as when facing an assessment, and ultimately in real-life tasks. By this approach, learning and assessment of opting out and target knowledge are intertwined. For example, a staged program could be implemented, where students initially focus on acquiring the target skill with a high level of determination to succeed. Only after reaching a desired level of mastery should opting out be introduced. At this stage, students might have free attentional resources to polish their additional skill of effort allocation. Utilization of opting out can allow students to improve

allocation of thinking efforts when encountering mixed materials, which include both content within students' proficiency and challenges that are beyond it.

Second, the utility of opting out is particularly pronounced in the context of more complex tasks that are not mandatory for all students. Complex tasks often require a higher level of cognitive engagement, and opting out can be employed as a strategic tool to navigate such challenges. By incorporating opting out selectively into scenarios involving intricate tasks, educators can encourage students to evaluate the complexity of a task and make informed decisions about when to opt out for more efficient resource allocation.

Finally, continuous assessment mechanisms can help gauge students' comprehension and application of the opting-out skill. Presenting reflective practices is expected to encourage students to critically assess their regulatory processes, fostering a state of continuous improvement of this skill.

Cognitive Load Theory and Opting Out

Cognitive load encompasses the various demands placed on a learner's cognitive system while performing a cognitive task (Paas et al., 2003). CLT's central proposition is that the capacity of human working memory to process new information is limited. Consequently, effective learning environments should be designed to minimize unnecessary load and facilitate the acquisition, organization, and automation of the acquired knowledge (van Merriënboer & Kirschner, 2017). Research guided by the CLT has been highly influential in instructional design. However, while effort regulation is at the heart of CLT research, the consequences of allowing learners to opt out as part of instructional design have been mostly overlooked. Here we offer directions for future research to illuminate

Table 3 Future research directions on opting-out from a CLT perspective

	Research directions
Defining Opting Out within CLT	<ul style="list-style-type: none"> • How does the inclusion of opting-out options influence intrinsic, extraneous, and germane cognitive load?
Change in Effort Allocation in the Presence of Opting-Out Options	<ul style="list-style-type: none"> • How does the presence of opting-out options affect learners' effort allocation strategies? • What strategies can optimize the efficiency of opting out in terms of time and cognitive effort? • How can opting out be effectively integrated into CLT-based instructional designs?
The Potential Effect of Cognitive Load on Opting Out	<ul style="list-style-type: none"> • What are the effects of cognitive load manipulations, such as distractions, time pressure, and dual-task, on opting-out behavior? • How does the level of cognitive load in a task influence the likelihood of learners opting out? How does it affect efficiency, in terms of the time invested before opting out? • Can opting out serve as a self-regulation tool for managing cognitive load?

the opportunities of using opting out from a CLT perspective (see Table 3 for a summary).

Defining Opting Out Within the CLT Framework

CLT introduces three distinct types of cognitive load (Paas et al., 2003; Sweller et al., 1998). The first type is *Intrinsic Load*, which represents the inherent complexity of a task, known as element interactivity. Element interactivity refers to the number of task elements that must be held in working memory simultaneously for task performance. Although the element interactivity remains the same regardless of task design, the resulting load may vary based on an individual's prior knowledge. The second type is *Extraneous Cognitive Load*, arising from cognitive activities that do not contribute to task performance, such as searching for irrelevant information or processing unnecessary data. Extraneous cognitive load is caused by inadequate task design and is expected to harm performance. Lastly, the third type is *Germane Cognitive Load*, which arises from appropriate task design and cognitive activities that enhance learning. Germane cognitive load can be promoted through integrating activities like reflection (de Jong, 2010), self-explanations (Renkl et al., 2009), or worked examples (Baars et al., 2017) into the task design.

While there is an ongoing debate on the distinction between the three types of load, as well as their interconnectedness (Schnotz & Kürschner, 2007), a first step in understanding opting out in the context of CLT could be to draw its expected effects on load using this terminology. It has been argued that conscious SRL behaviors introduce extra load (i.e., metacognitive load) to cognitive tasks (Wang & Lajoie, 2023). The option to answer "I don't know" in tests can be considered extraneous load as it adds an extra decision-making step for test-takers: Evaluating their knowledge, considering the consequences of selecting "I don't know," and making a decision. This decision-making process, along with the mental processing of uncertainty, is extraneous to the core task of demonstrating knowledge. However, while some of the above-reviewed literature points to disadvantages associated with including an opting-out option in task design (e.g., Higham, 2007; Powell et al., 2005), a large portion of the reviewed research supports the relevance of opting out as a strategy to improve performance and learning outcomes. Therefore, using opting out probably affects intrinsic and/or germane load.

On the one hand, incorporating the option to opt out within a task design could be seen as an intrinsic load, as it introduces an additional task element that interacts with others and imposes a load on working memory. On the other hand, the option to opt out can be viewed as increasing germane load which promotes metacognitive awareness. When a test-taker encounters a question they are unsure about, the decision to opt out provides opportunities for expressing monitoring output and self-regulation of effort (e.g., invest more effort on items in which confidence is higher). It also signals areas of weakness or gaps in knowledge, which can be addressed through further study or instruction. This engagement in self-assessment and identification of areas for improvement aligns with germane load, as it supports the construction of new knowledge and promotes deeper understanding (Verhoeven et al., 2009). Research inspired by CLT for delineating conditions in which opting out improves learning will help in formulating the definition and implications for instructional design including explicit opting-out options.

Changes in Effort Allocation in the Presence of Opting-Out Options

As described above, opting out involves waiving any chance of being correct. In other words, any invested effort in finding and formulating answers that one eventually decides to withhold is essentially labor in vain (Ackerman et al., 2020; Son & Sethi, 2009). Thus, the regulatory challenge of opting out is not only to decide to opt out; but to do so as quickly as possible, to avoid wasted effort. While not addressing opting out directly, this notion is related to the regulatory decisions involved in rapid decisions to skip challenging items when working under time constraints (Kornell & Metcalfe, 2006; Metcalfe & Kornell, 2005; Undorf & Ackerman, 2017), or to selecting easier vs. difficult problems to solve (Bae et al., 2021). Following the Region of Proximal Learning model (Kornell & Metcalfe, 2006; Metcalfe & Kornell, 2005), individuals should choose not to study or to allocate less time to studying materials they already know, as well as to items they see no hope in studying. Rather, they should invest most of their time in items they identify to potentially benefit from additional effort (Ackerman & Levontin, 2024).

Notably, in the metacognitive domain, even when opting out was at the focus, the time it takes to opt out has been mostly overlooked (e.g., Ackerman & Goldsmith, 2008; Koriat & Goldsmith, 1996). One potential way to tackle this open question is to measure response time for questions one chooses to answer as well as for those selected to be withheld. Efficient utilization of opting out should result in shorter response times for opting out than for submitted answers to challenging items. In contrast, inefficient opting-out utilization would be reflected in similar or even longer times for opting-out responses compared to submitted answers. Notably, in Ackerman (2014), using “don’t know” responses saved only little time from the lengthiest zone of problem solutions, yet did not change the time invested in the short and in the middle ranges of solving times.

For research inspired by the CLT, we maintain integrating methodologies from metacognitive research for shedding light on the effort required for opting out and the effort saved by using it. In particular, cognitive load is commonly measured using subjective self-report measures, regarding the difficulty of the task or the mental effort invested in it (e.g., Korbach et al., 2018). Recent studies have demonstrated that load-related subjective appraisals are strongly associated with answering time (Hoch et al., 2023). However, these associations have been only shown so far in forced-response formats, without opting-out options. Future studies are called to examine under what conditions decisions to opt out are perceived to be more or less effortful and the conditions under which they are provided quicker or slower than substantial answers. Next, we look at the reciprocal effect: What happens to opting out in tasks laden with cognitive load?

The Potential Effect of Cognitive Load on Opting Out

When considering opting out from the CLT perspective, we aim to guide people to use it strategically. In CLT terms, we aim to minimize extraneous cognitive load while amplifying germane cognitive load, thereby enhancing knowledge acquisition, learning efficiency, and time management. An important consideration is whether a higher cognitive

load is associated with a higher or a lower prevalence of opting out. We review below experimental manipulations that increase cognitive load by using situational manipulations of distractors (e.g., Emami & Chau, 2020), time pressure (Galy et al., 2012; Palada et al., 2019), and dual-task manipulations (e.g., Esmaeili Bijarsari, 2021). It is plausible that opting out can serve as a self-regulation strategy for managing cognitive load. By opting out, individuals may potentially conserve cognitive resources for tasks they perceive as more important or doable. Insights from CLT and metacognitive research can illuminate the potential relationship between situational load and opting out.

Distractions may affect cognitive load by misdirecting attention and working memory resources towards processing information that is irrelevant for learning (e.g., Frisby et al., 2018; Van Gerven et al., 2002), or by investing resources in handling the distractions (Zimmerman, 2008). Beaman et al. (2014) compared the effect of auditory distractions during learning and testing in a recognition test with and without “don’t know” options. They found that the presence of auditory distractions increased using “don’t know” responses, but also led to a lower number of correct responses chosen to be provided. This was attributed to lower confidence in correct responses when distractions were present, leading to a higher tendency to withhold them. These findings serve as initial evidence that cognitive load induced by distractions may facilitate the strategic use of opting out.

Time pressure is considered a primary contributor to cognitive load (Kalyuga, 2011), as it requires learners to process information quickly and efficiently while adding awareness to the passing time and adherence to the limit of working memory load. It is also assumed to indirectly affect cognitive load by activating negative emotions, such as stress and anxiety (Galy et al., 2012). On the one hand, it has been argued to increase extraneous load and harm performance (e.g., Barrouillet et al., 2007; Galy et al., 2012). Conversely, Gerjets and Scheiter (2003) reported that performance remained unaffected, even in situations of significant time pressure. They suggested that time pressure may increase germane load, prompting focusing and effective strategic adjustments. Ackerman (2014) compared solving problems with and without time pressure with a “don’t know” option (Experiment 4) and when forcing solution submission to all problems (Experiment 3). There was no difference between the utilization of opting out between the time conditions. However, the response time for the “don’t know” option was significantly longer than for the solution words regardless of the time constraints. Thus, it is evident that the association between time pressure, load, and opting out, is not straightforward, and warrants further investigation.

Finally, dual-task manipulations consist of requiring participants to perform two tasks simultaneously to induce cognitive load (Esmaeili Bijarsari, 2021; Park & Brünken, 2018). The cognitive load associated with managing both tasks simultaneously can exceed their cognitive capacity, leading to decreased performance and increased cognitive effort. In such instances, individuals may choose to opt out as a strategy to reduce cognitive load and prioritize the allocation of cognitive resources or avoid cognitive overload. Additionally, opting out can be influenced by individual differences in dual-task performance capabilities (e.g., Schüler et al., 2011). For example, individuals with limited dual-task processing abilities may be more inclined to opt out when confronted with high dual-task cognitive load. As our literature review revealed no direct investigation of opting out in dual-task manipulations, this remains an area for future investigation.

To summarize, while it is clear that the decision to opt out may have a significant association with the amount of cognitive load imposed by task characteristics, the exact relationships are still largely unknown. Delving into these relationships can expand the theoretical understanding of the cognitive processes and decision-making strategies involved in opting out, while shedding light on cognitive load management, and provide directions for instructional design for the benefit of learning and opting-out skill development.

Conclusion

From a theoretical standpoint, developing the study of opting out in education is expected to play a pivotal role in advancing our comprehension of self-regulated learning. It sheds light on how students manage and allocate their cognitive resources and recognize their own limitations, a crucial aspect of learner decision-making processes. We see enormous potential in expanding existing theories related to motivation, persistence, and cognitive resource allocation, reframing strategic withdrawal as a proactive learning approach. Such insights will promote exposing factors affecting learners' cognitive load, as well as in identifying knowledge and skill gaps.

Methodologically, incorporating opting-out options offers opportunities for research by adapting measures from metacognitive research, such as opting out rate (Law et al., 2022), output-bound accuracy (Koriat & Goldsmith, 1996), and control sensitivity (the within-participant association between confidence and opting-out decisions, Koriat & Goldsmith, 1996). Moreover, advanced data analysis techniques, like predictive modeling (Tomasevic et al., 2020), may further enrich identifying factors influencing these regulatory decisions.

Understanding the underlying mechanisms of opting out is also crucial for practical recommendations in instructional design. We recommend making adjustments to curricula to guide students in effective opting out, presenting it as a means for improved success and efficient effort allocation. We suggest to encourage learners to focus their cognitive resources on tasks that align with their personal goals, strengths, interests, and region of proximal learning, while choosing wisely desirable difficulties. Adaptive systems can leverage this understanding to dynamically adjust their difficulty, content, or scaffolding based on learners' opt-out decisions.

Importantly, acknowledging a lack of knowledge is critical for professionals in situations in which overconfidence can lead to severe consequences. In medicine, and other fields where errors have significant implications, ignorance acknowledgement is a daily necessity as well as a crucial step towards learning and personal development, especially as many of those fields involve rapidly changing knowledge and skills. Thus, research on opting out underscores the importance of preparing students for the challenges that they will face as future professionals, equipping them with the skills to embrace and navigate uncertainty and change. Overall, the study of opting out offers a comprehensive view of learner engagement and the strategic use of disengagement to optimize learning outcomes and performance.

Appendix

Review Methodology: Exploring the Gap in Literature

Search Terms and Strategy

The review was guided by a set of search terms selected for their relevance to our scope of interest, and a combination of these terms. These terms were: "Give up" "Giving up" "Opt-out" "Opting-out" "Withhold information" "Withhold response" "Avoidance" "Avoid answering" "Effort regulation" "Cognitive load theory" "Mental effort" combined with "education", "learning", "problem solving", and "psychology". Literature retrieval using these terms elicited research dealing with choices to cease investing thinking effort or withhold responses as forms of self-regulation when performing challenging thinking tasks.

Database Selection and Focus

We limited our search to academic databases relevant to psychology and education, including PsycINFO, ERIC, WOS, and Scopus. This selective approach was due to our specific interest in research regarding how opting out relates to self-regulation of effort in learning and problem-solving.

Inclusion and Exclusion Criteria

Our inclusion criteria were narrowly defined. We focused on papers that used the option to opt out in the context of self-regulation of effort in learning and problem-solving scenarios. We excluded papers that dealt with opting out in other contexts, such as non-participation in broader social and political contexts (e.g., opting out from military service). This exclusion was vital to focus our review only on thinking challenges when there is an objective success defined as respondents' goal.

Analysis and Synthesis

Given the scarcity of research directly addressing our topic, our review primarily focused on highlighting this gap. We critically analyzed the selected papers to understand how they approached the concept of opting out as part of self-regulation and what this might imply for addressing research gaps. We synthesized this information not just to summarize existing knowledge, but more importantly, to illuminate the areas in dire need of further exploration and study.

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Declarations

Conflict of Interest Rakefet Ackerman is an editorial board member of *Educational Psychology Review*. Otherwise, the authors have no competing interests to declare relevant to this article's content.

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