Students' Perceived Usefulness of Prompts in Blended Learning: Two Pilot Studies

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Abstract. *Prompts are often used in blended learning to support self-regulation. This paper investigates students' perceived usefulness of prompts across two pilot studies in higher education. The aim was to explore perceived usefulness of different types of prompts and how self-regulation modifies this perception. Perceived usefulness ratings were collected immediately after each prompt, while self-regulated learning was assessed prior to prompt exposure. Qualitative insights were obtained through think-aloud sessions. The results showed that students perceived all prompt types as highly useful. Higher self-regulated learning was associated with higher perceived usefulness ratings in Pilot Study 1, but not in Pilot Study 2.*

Keywords. prompts, self-regulated learning, perceived usefulness, higher education, blended learning

1 Introduction

Self-regulated learning (SRL) is considered an important factor for successful learning in higher education, particularly in digital and blended learning environments where students are expected to manage their learning processes with greater autonomy (Eggers et al., 2021; Michael et al., 2025). SRL refers to learners' active regulation of their cognition, motivation, and behavior in pursuit of learning goals (Zimmerman, 2002). However, students do not always engage in self-regulatory activities spontaneously and often require instructional support to effectively plan, monitor, and evaluate their learning.

One frequently used approach to supporting SRL is the use of prompts. Prompts are short hints, questions, or instructions designed to activate cognitive, metacognitive, motivational, or resource-management strategies that learners already possess but may not apply independently (Wirth, 2009). By directing students' attention to important aspects of the learning process, prompts can encourage reflection, self-monitoring, planning, and deeper engagement with learning tasks. Consequently, prompts have been incorporated into digital, online, and blended learning environments in higher education. Because learning in authentic educational settings differs from controlled laboratory conditions, it is important to examine how prompts function in real-world learning environments (Thomann & Deutscher, 2025).

Previous research has demonstrated that prompts can support self-regulated learning and improve learning processes in digital learning environments (Thomann & Deutscher, 2025). However, less is known about how students interpret and utilize different prompts during learning and how these perceptions relate to learner characteristics (Engelmann et al., 2021). In particular, level of self-regulation might influence how students perceive usefulness of prompts. To address this gap, this paper investigates the following research questions:

- RQ1. How do students perceive usefulness of different types of prompts in a blended learning environment?
- RQ2. What is the relationship between perceived usefulness and students' self-regulated learning score?

To answer these questions and inform the development of a larger-scale study, pilot studies were conducted at two higher education institutions. The findings provide initial insights into students' experiences with prompts and their perceived usefulness.

2 Related Work

2.1 Effectiveness of Prompts in Higher Education

Based on a meta-analysis of 68 studies published between 1999 and 2022, Thomann and Deutscher (2025) found that cognitive, metacognitive, and non-cognitive prompts have a positive effect on learning achievement (Cohen's $d = .394$; adjusted $d = .220$). The strongest effects were observed for action-based prompts, prompts tailored to specific learner groups, and combinations of generic and directed prompts. Although 44 included studies were conducted in higher education,

the findings were aggregated across educational levels, limiting conclusions about higher education context (Thomann & Deutscher, 2025).

Recent studies in higher education have reported mixed findings regarding the effectiveness of prompts. Although metacognitive prompts can support self-regulated learning processes such as planning, monitoring, and reflection (Bannert et al., 2015), their effects on learning achievement are less consistent (Juhaňák et al., 2025). Moreover, while prompt research has primarily focused on learning outcomes and learning behavior, less is known about how learners perceive different types of prompts and what factors influence these perceptions (Engelmann et al., 2021; Schumacher & Ifenthaler, 2021).

3 Methodology

3.1 Pilot Study 1

Pilot Study 1 was conducted during March and April 2023 in an undergraduate course on bibliographic organization. The course enrolled 37 second-year students. Ethical approval was obtained from the institutional ethics committee prior to the study. Participation was voluntary, and informed consent was obtained before data collection.

As shown in Fig. 1, students first completed an initial questionnaire that included demographic information and the Online Self-regulated Learning Questionnaire (OSLQ). During a face-to-face lecture session, students were presented with two prompts and rated their perceived usefulness using paper-based questionnaires. Subsequently, students were provided with anonymous access to a Learning Management System (LMS) using generic usernames and invited to complete an online practice test. Additional prompts were presented before and after the practice test, and their perceived usefulness was rated through the LMS plug-in. The intervention period lasted one week (2–9 March 2023). Following the intervention, students who had indicated their willingness to participate in follow-up activities were contacted regarding think-aloud sessions. Separate consent for audio recording was obtained prior to the sessions.

The following prompts, developed in collaboration with the course teachers and informed by previous course experiences and data, were used in Pilot Study 1:

- *mixed (face-to-face lecture 1)*: "Today, we will develop a mind map to reflect on the concepts acquired so far in the course "Introduction to Information Organization" and identify the additional knowledge and skills needed to become competent cataloguers capable of producing formal bibliographic descriptions."
- *motivational (face-to-face lecture 1)*: "You will receive an additional 2 points if you can list all the conditions for attributing authorship to a corporate body, both for institutions and for events."
- *resource-related (online, prePracticeTest)*: "Before starting the practice test, recall the mind map that we prepared at the beginning of the previous lesson. The mind map contains the information necessary for completing the practice test."
- *resource-related (online, postPracticeTest)*: "The results are presented below. For each incorrect answer, references are provided to the relevant sections of the learning materials where detailed explanations of the correct answers can be found. Please review the indicated materials before the next class session.".

3.2 Pilot Study 2

Pilot Study 2 was conducted between December 2023 and March 2024 in an undergraduate course on business analytics. The course enrolled 55 third-year students. Ethical approval was obtained from the institutional ethics committee prior to the study. Participation was voluntary, and informed consent was obtained before data collection.

As shown in Fig. 2, students first completed an initial questionnaire that included demographic information and the OSLQ. An online metacognitive prompt was provided before the first face-to-face practice session, followed by a resource-related prompt during that session. At the begining of the next face-to-face practice session, students received a metacognitive prompt, and after the session an online resource-related prompt was presented. Immediately following each prompt, students rated its perceived usefulness through the LMS plug-in. The prompts were implemented during January 2024. After the last prompt, students who had indicated their willingness to participate in follow-up activities were contacted regarding participation in think-aloud sessions. Among other activities, students participating in the think-aloud sessions were asked to rank four generic prompts and explain their perceived usefulness. Separate consent for audio recording was obtained prior to the sessions. Informed consent, the initial questionnaire, and OSLQ responses were collected using the LimeSurvey platform (LimeSurvey Project Team / C. Schmitz, 2024).

The following prompts, developed in collaboration with the course teachers and informed by previous course experiences and data, were used in Pilot Study 2:

- *metacognitive (online)*: "As preparation for the face-to-face practice session, it is useful to create notes containing the most important concepts covered during the lecture. Review the lecture and seminar materials and write down the key concepts along with their definitions."
- *resource-related (face-to-face practice session 1)*: "Before completing the exercises in this practice session, please review the solved examples available on

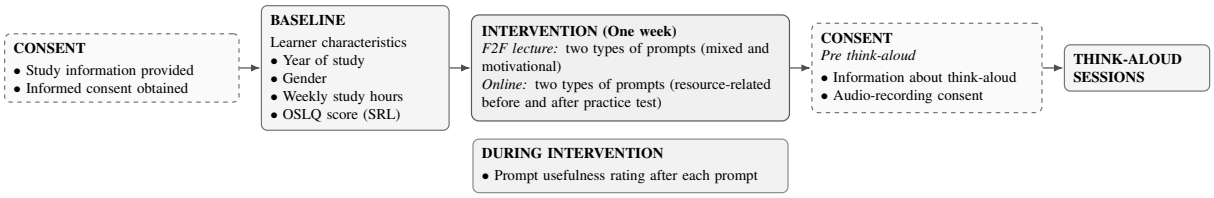


Figure 1. Design of Pilot Study 1.

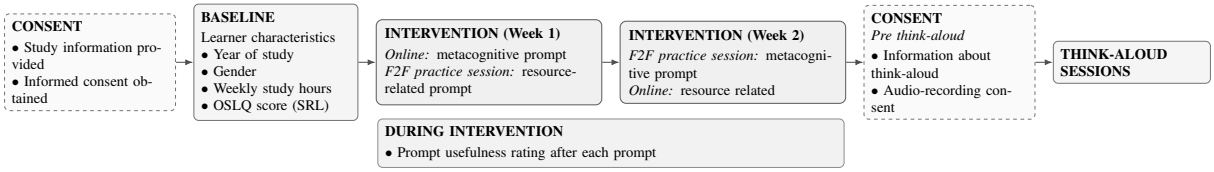


Figure 2. Design of Pilot Study 2.

[directions]."

- *metacognitive (face-to-face practice session 2)*: "Following this face-to-face practice session, you will be required to complete an online self-assessment test. Before starting the test, prepare notes summarizing the key concepts covered to date based on the available course materials. Please, avoid postponing the practice test until the last minute."
- *resource-related (online, prePracticeTest)*: "Materials for preparation for the online test are available within the Network Analysis topic. Please review these materials before attempting the test."

3.3 Measurement Instruments

The perceived usefulness construct was measured using the six-item Perceived Usefulness scale from the Technology Acceptance Model (TAM) (Davis, 1989). Responses were recorded on a visual analog rating scale ranging from 1 (strongly disagree) to 10 (strongly agree), and an overall perceived usefulness score was computed as the mean of the six items. The prompt usefulness rating interface implemented in the LMS is shown in Fig. 3.

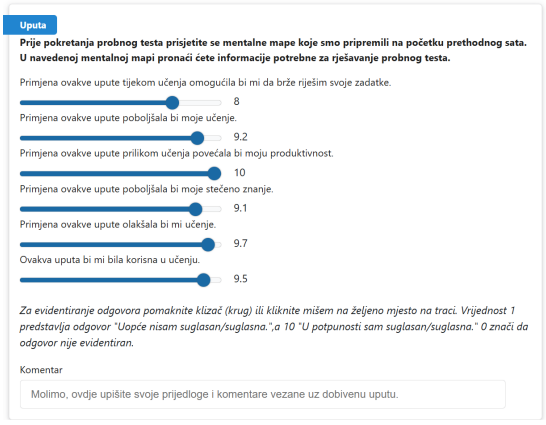


Figure 3. Prompt usefulness rating interface implemented in the LMS.

Within our context, standard Cronbach's alpha reflects how reliably perceived usefulness scale differentiates between students. However, our research question is related to differences in perceived usefulness among prompt types. Generalizability Theory (Brennan, 1992) offers an alternative approach enabling estimation of both between-student and within-student (i.e., among prompt types) reliabilities. To evaluate the reliability of the six-item perceived usefulness scale, variance components were estimated using a linear mixed-effects model with crossed random effects for students, prompt types, perceived usefulness items, and their two-way interactions. Following Generalizability Theory, these variance components were used to compute reliability coefficients for within-student differences across prompt types (R_C) and between-student differences (R_{1F}) (Bolger & Laurenceau, 2013). The perceived usefulness scale showed high reliability in both pilot studies for within-student differences across prompt types ($R_C = .88$ for Pilot 1 and $R_C = .87$ for Pilot 2) and between-student differences ($R_{1F} = .95$ for Pilot 1 and $R_{1F} = .85$ for Pilot 2).

Self-regulated learning was measured using the Online Self-regulated Learning Questionnaire (OSLQ) (Barnard et al., 2009), which consists of 24 items and has been validated in both online and blended learning environments. Responses were recorded on a 7-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree). In Pilot 2, students could additionally select the option "I don't understand this statement.". An overall self-regulated learning score was calculated as the mean across all items, with higher scores indicating greater self-regulated learning.

The overall OSLQ score used to represent self-regulated learning showed high internal consistency (Cronbach's α = .90 for Pilot 1 and .88 for Pilot 2).

Both measurement instruments were reviewed through cognitive testing following the cross-cultural adaptation procedure recommended by Beaton et al. (2000).

3.4 Data Analysis

For RQ1, a linear mixed-effects model (LMM) was used to examine differences in perceived usefulness ratings across prompt types, with prompt type included as a fixed effect and student as a random intercept:

$$Rating \sim PromptType + (1 \mid StudentID)$$

Think-aloud sessions were audio-recorded, transcribed, and analyzed to identify students' explanations for the perceived usefulness of different prompts.

For RQ2, the relationship between self-regulated learning (OSLQ score) and perceived usefulness ratings was examined using a LMM. OSLQ score, cohorts (Pilot Study 1 vs. Pilot Study 2), and their interaction were included as fixed effects, while student was included as a random intercept to account for repeated ratings provided by the same student:

$$Rating \sim OSLQ_score * Cohort + (1 \mid StudentID)$$

Assumptions for all LMMs were assessed using graphical diagnostics (normality of residuals, homogeneity of residual variance, and normality of random effects), and no substantial violations were detected.

Data were analyzed in R (R Core Team, 2026) using the RStudio integrated development environment (Posit team, 2026) and packages `psych` (William Revelle, 2026), `lmerTest` (Kuznetsova et al., 2017), `lme4` (Bates et al., 2015), `tidyverse` (Wickham et al., 2019) and `ggplot2` (Wickham, 2016).

4 Results

Participant characteristics for both pilot studies are presented in Table 1.

Table 1. Participant characteristics and prompt rating response counts

Characteristic	Pilot Study 1	Pilot Study 2
OSLQ completed, n	30	40
Year of study	Second	Third
Female, n (%)	20 (66.7%)	20 (50.0%)
Weekly study hours, M (SD)	9.1 (6.7)	11.9 (8.0)
OSLQ score (1–7), M (SD)	5.0 (1.0)	4.6 (0.8)
Prompt 1 ratings, n	30	31
Prompt 2 ratings, n	30	31
Prompt 3 ratings, n	17	28
Prompt 4 ratings, n	17	26

The following sections report results for each research question.

4.1 RQ1: Perceived Usefulness of Different Types of Prompts

In both pilot studies, students rated all prompt types as highly useful (Fig. 4). Fig. 4 indicates that usefulness ratings were consistently high across prompt types in both pilot studies, with slightly higher median ratings in Pilot Study 2.

Linear mixed-effects models indicated no significant differences in perceived usefulness across prompt types in either Pilot Study 1, $F(3, 62.9) = 1.34$, $p = .268$, or Pilot Study 2, $F(3, 78.8) = 0.26$, $p = .855$.

Although prompt types were not directly comparable across pilot studies, the resource-related online prompt provided before the practice test received higher ratings in Pilot Study 2 ($M = 8.49$, $SD = 1.46$, $n = 26$) than the conceptually similar prompt in Pilot Study 1 ($M = 6.91$, $SD = 1.66$, $n = 17$). However, the prompts were not identical, which limits the direct comparability of the results.

In both pilot studies, six students participated in think-aloud sessions: two in Pilot Study 1 and four in Pilot Study 2.

In Pilot Study 1, students primarily commented on the technical aspects of the prompt implementation (e.g., the slider used to evaluate prompts). They generally perceived the prompts as helpful and appreciated the additional support for learning.

In Pilot Study 2, students commented prompt types. For motivational prompt, students most frequently highlighted bonus points as a key motivator for participation, while also recognizing learning activity for bonus points (the outcome) as relevant. One student remarked that the prompt "offers something concrete". Metacognitive prompt was generally perceived as beneficial. However, students often attributed their value to the associated learning activity rather than the metacognitive guidance itself. For resource-related prompt, students valued being directed to relevant resources, particularly because this reduced the effort required to locate correct information. As one student noted, “it is much easier when I have guidance on where to find the correct information”. For cognitive prompt, students appreciated reminders of important concepts and their interconnections, but generally considered this prompt less useful than motivational, metacognitive, or resource-related prompts because the information was expected to be learned through regular studying. But, one student explained, “Simply reading it can create a picture of what has been learned so far and help make connections”.

4.2 RQ2: Relationship between Perceived Usefulness and Self-regulated Learning

A linear mixed-effects model revealed a significant positive association between self-regulated learning (OSLQ) score and perceived usefulness ratings ($b = 1.32$, $SE = 0.27$, $p < .001$). A significant interaction between OSLQ score and cohort ($b = -1.41$, $SE = 0.38$, $p < .001$) indicated that this relationship differed between the two pilot studies. Specifically, higher OSLQ scores were associated with higher perceived usefulness ratings in Pilot Study 1, whereas

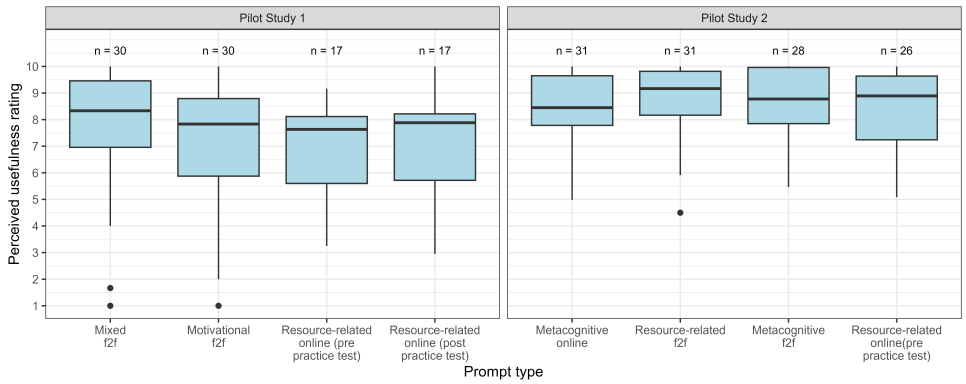


Figure 4. Perceived usefulness ratings across prompt types in Pilot Studies 1 and 2. Numbers above boxplots indicate the number of available ratings.

no meaningful association was observed in Pilot Study 2 (Fig. 5).

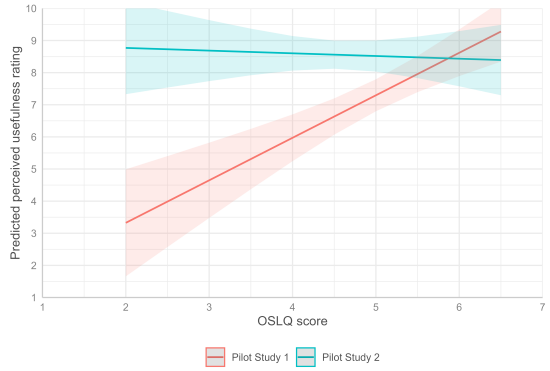


Figure 5. Model-predicted perceived usefulness ratings vs. self-regulated learning (OSLQ) scores in Pilot Studies 1 and 2 with 95% prediction band.

5 Conclusions, Limitations and Future Work

The findings suggest that students generally perceived motivational, metacognitive, resource-related, and mixed prompts as useful for supporting learning in blended learning environments. No significant differences in perceived usefulness were observed across prompt types in either pilot study. Higher self-regulated learning was associated with higher perceived usefulness ratings in Pilot Study 1, but not in Pilot Study 2. This could be a ceiling effect because perceived usefulness scores in Pilot Study 2 are higher and their variability is lower. However, further research is needed to better understand this relationship across different learning context.

This study has several limitations. The pilot studies involved relatively small samples and were conducted in different courses and institutional contexts. In addition, some prompt types were evaluated by fewer students than others, and the prompts were not identical across the two pilot studies, limiting direct comparisons. Another limitation is reduced variability and compression towards the upper limit of perceived usefulness scale in Pilot Study 2, creating potential for the ceiling effect.

Future research should examine perceived usefulness of prompts in larger and more diverse educational settings and investigate factors that may moderate the relationship between self-regulated learning and perceptions of prompt usefulness. Furthermore, it might be beneficial to develop a new measurement scale that could better differentiate students who perceive prompts as highly useful to reduce the ceiling effect. Further studies should also explore how perceived usefulness relates to actual self-regulated learning behaviours and learning outcomes.

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