Use of Self-Assessment Questionaries with Moodle Surveys to Improve Reading Comprehension and Study Habits in Preservice Teacher Education

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Abstract—Self-regulation strategies of learning are key to improving the learning process, and to teach students to use them, teachers must master them. To improve self-regulation of pre-service teachers, continuous self-assessments of their learning is included with Moodle survey resource. To measure the improvement of self-regulation, a pre-post study was conducted with two scales: ARATEX-R, for texts, and the inventory of self-regulation strategies, SRSI-SR, for study habits. Results showed a significant impact on self-regulation, specifically on planning, connecting ideas, subsequent assessment of difficulties and prior self-motivation. Continuous self-assessment has been key to improving reflection on the achievement of objectives on a weekly basis, and thus monitoring and improving learning planning throughout the course. This means that the Moodle survey resource can be very useful for self-assessment of learning in preservice teacher education, as well as being an easy to implement resource.

Keywords—self-assessment, teacher education, Moodle surveys, reading comprehension, study habits

1 Introduction

Self-assessment and self-monitoring have been found to have a high influence on learning, as they improve self-management learning skills. Therefore, continuous self-assessment can be beneficial for self-monitoring the learning process and improving its management [1]. Continuous self-assessment after each session is a system that has been in place in higher education for a long time [2], but this strategy is applied almost exclusively as a support for to improve autonomy in blended learning [3].

Self-regulation of learning (SRL) is proposed as a fundamental way for students to be able to manage their learning process [4]. Self-regulation of learning is a process that makes it possible to direct the skills that enable learning towards improving learning methods [5]; but it is not a mental skill. Since 'learning to learn' competency is fundamentally based on this self-regulation strategy [6] to develop autonomy in students, it should be more present in education [7]. Autonomous learning is considered as the knowledge of one's own learning needs, based on the given objectives, needed to guide planning [8].

According to several teachers, most students do not have the initiative to learn autonomously [9]. Student must take more responsibility for their own learning to avoid experienced educational practices as frustrating, and, to achieve this, they themselves need regulating their learning process [10]. To make SRL possible, only when strategies related to deep learning (as opposed to surface learning) are put in place [11], and to develop strategies for the SRL is require training.

Teachers need experiences in regulating their own learning in order to support self-regulated learners [10]. It is necessary to highlight the need for teacher training in the field of self-regulation [12], particularly the need for trainee teachers to view the strategies proposed to them in the subjects in a practical way [13]. Self-assessment has proved to be an appropriate way to learn about their knowledge in an area or about their competence, as in the case of digital competence [14].

Several teachers are not able to identify SRL in their students [15], and this is partially because they themselves are not able to use it themselves [12]. In the university teacher training curriculum, the need to include the SRL instruction has been highlighted to foster self-regulated approaches to teaching and learning, and to improve self-efficacy for training pupils to become self-regulated learners [16]. In pre-service teacher education, exist a progressive increase in the task control when training programs incorporate reflective practice, which improve the establishment of relationships and learning outcomes [17].

Among the most influential models in SRL, are authors, who developed a model with three phases: anticipation, performance, and self-reflection [5]. Others who emphasized the role of motivation [18], and others who highlighted the role of metacognition in self-regulation [19].

Currently, self-regulation is measured through instruments such as self-assessment questionnaires, structured interviews, teacher judgements, the error method, etc. [20]. Self-reports have traditionally been one of the most widely used instruments for SRL (e.g., see [21]). However, complementary assessments should also be considered as they allow for comparison of results [22].

Likewise, to develop the ability to SRL, had been proposed prior reflection followed by goal setting, planning, and evaluation of results [23]. Another important consideration is how to get learners to successfully apply strategies for self-regulation. Also, is proposed four key characteristics: appreciating feedback processes, developing judgmental skills, managing affect, and knowing how to improve with feedback [24]. A posterior study added further guidelines such as referring to teamwork skills, setting limited but concrete goals along with implementation intentions, and monitoring development [25].

Useful strategies include offering activity self-assessment rubrics [26], [27] or scripts [28] at the start of prior reflection. These types of tools facilitate the self-assessment of learning, in addition to allowing the monitoring of learning and its possible orientation towards the improvement of the process. To include self-assessment in a digital way, teachers have few options, because even in the Moodle tool the proposals are created from PHP applications [29].

Thus, it is important to consider continuous self-assessment to improve learning. Although a final self-assessment can be useful to reflect on the objectives achieved and improve future learning, continuous self-assessment is needed to monitor and regulate

the next steps to achieve complete learning as the process occurs [30]. However, in most cases, the introduction of monitoring strategies, on the one hand, and self-assessment tools, on the other hand, is proposed (i.e., [31]). However, the possibilities offered by the combination of both types of strategies for the self-regulation of learning are not exploited.

The aim of this study is to test whether a simple digital resource, such as the surveys provided by Moodle that can be taken from smartphones, can improve aspects of self-regulation of learning, specifically in reading comprehension and study habits through continuous self-assessment of the learning process.

2 Materials and methods

2.1 Participants

The study population consists of pre-service teachers in secondary education at face-to-face universities. To participate in the study, students had to complete all questions on the Moodle questionnaires, without any omissions. After excluding students who had not completed all questionnaires, a total of 131 valid participants, 71 men and 60 women (54% and 46%, respectively), remained.

As the teacher training is divided into groups according to the area of knowledge, the participants pertain to four disciplines of teacher education: social sciences (34 participants), physics and chemistry (31 participants), mathematics (32 participants) and computer science and technology (34 participants).

2.2 Research design and data analysis

To test whether aspects of self-regulation of learning, specifically study habits and reading comprehension, improve with the use of continuous self-assessment, an exploratory, quasi-experimental study was carried out in which the participants were trainee teachers. The study consisted of a pre-post design to test whether there are differences between self-regulation of learning before and after the didactic intervention.

For this purpose, we first studied the frequencies of responses in the standardised tests, and then applied the Wilcoxon signed-rank test for related samples (same subjects, before and after) to determine whether there are significant differences in the distribution of scores before and after the intervention.

Frequencies and the Wilcoxon signed-rank test were used because the items in both tests are ordinal categorical, have few response categories (4–5, depending on the test) and there is a limited sample.

2.3 Instruments and materials

For the assessment of self-regulation of learning, two standardised tests were used: ARATEX-R which assesses self-regulation based on reading texts, and SRSI-SR which assesses self-regulation based on study habits.

ARATEX-R test [32] consists of 23 items distributed in five dimensions: planning, cognition management, motivation management, comprehension assessment and context management. Regarding the psychometric analysis of this test, it obtained an acceptable overall internal consistency with Cronbach's alpha (0.86). This scale is used to measure the degree of agreement with all statements, from 1= never to 5=always.

For study habits, Self-Regulation Strategies Inventory (SRSI-SR) [33], translated and adapted for university students, was used [34]. There are a total of 18 items distributed in four dimensions: organisation of the environment, organisation of the task, search for information and inadequate regulation habits. The SRSI-SR inventory in Spanish offers acceptable psychometric properties, obtaining an internal consistency of 0.81 [34]. Participants rate responses using a four-point Likert scale, with 1 being the lowest value, corresponding to never, and 4 being the highest value, corresponding to always.

As digital material for self-evaluation, students are supported by simple evaluation questionnaires created with Moodle surveys resource, a very simple resource for professors to use. Other Moodle resources that could be used to create this type of self-assessment questionnaires are not so easy to use from mobile devices, so the use of surveys is ideal for all students to access the survey easily in the classroom.

Each evaluation questionnaire includes questions with each of the learning objectives studied until that session. They had to fill them at the end of each of the sessions of the course. The questions are answered on a 5-point Likert scale: with 1 being "I have learned nothing about this" and 5 being "I fully understand this.".

2.4   Procedure

The educational intervention applied was conducted in one term, corresponding to the beginning and end of the didactic subjects applied to the different disciplines. The didactics subject lasts ten sessions: the first and the last one were used for the pre-test and post-test, leaving eight sessions to work on the learning objectives of the subject.

On the first day of the course, the learning objectives for the four-month period were explained, always relating them to the content taught in the subject. In addition, the assessment of the subject was explained from the evaluation activities to be carried out, including self-assessment of their learning after each classroom session, that is, continuously. Self-assessment activity is part of the final grade of the course, with a weight of 10%. Additionally, the subject of self-regulation was then discussed as a fundamental aspect in the control and management of learning, with emphasis on the guidelines proposed in the literature [24], [25]. To end with the first day of the course, students were given class time to fill in the self-regulation questionnaire, consisting of the two tests used (ARATEX-R and SRSI-SR).

During the following eight course sessions, the last 5 minutes were left to complete the self-assessment questionnaire from their mobile device, as the university's version of Moodle works well on smartphones.

In the last session of the course, students were again given the tests used to measure aspects of self-regulation of learning: reading comprehension (ARATEX-R) and study

habits (SRSI-SR). Like in the first session, the subject of self-regulation was then discussed again as a fundamental aspect in the control and management of learning.

3   Results

First, the response frequencies in the categories of each test are analyzed, both before and after the intervention, to check whether the response tendency is upward, that is, whether most of the responses move up toward the higher end of the scale in the post-test with respect to the pre-test. These frequencies can be seen in Table 1 for the text-based self-regulation scale (ARATEX-R).

Table 1. Frequencies by category of the ARATEX-R scale, for the pre-test (pre) and the post-test (post)

	1		2		3		4		5	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
T1	19.4	6.5	12.9	6.5	32.3	25.8	32.3	32.3	3.2	29.0
T2	9.7	3.2	9.7	3.2	9.7	25.8	41.9	25.8	29.0	41.9
T3	6.5	6.5	12.9	12.9	48.4	19.4	19.4	41.9	12.9	19.4
T4	0	0	0	0	22.6	12.9	58.1	41.9	19.4	45.2
T5	0	0	6.5	6.5	38.7	22.6	41.9	45.2	12.9	25.8
T6	6.5	0	22.6	9.7	35.5	16.1	29.0	48.4	6.5	25.8
T7	9.7	3.2	6.5	3.2	41.9	29.0	29.0	48.4	12.9	16.1
T8	12.9	6.5	25.8	12.9	22.6	32.3	32.3	22.6	6.5	25.8
T9	9.7	0	19.4	0	32.3	16.1	29.0	64.5	9.7	19.4
T10	0	0	9.7	3.2	22.6	12.9	45.2	54.8	22.6	29.0
T11	19.4	6.5	16.1	16.1	29.0	29.0	32.3	25.8	3.2	22.6
T12	16.1	3.2	9.7	6.5	19.4	12.9	45.2	61.3	9.7	16.1
T13	12.9	0	3.2	9.7	38.7	22.6	41.9	38.7	3.2	29.0
T14	16.1	3.2	6.5	6.5	25.8	16.1	45.2	51.6	6.5	22.6
T15	16.1	6.5	9.7	9.7	19.4	19.4	41.9	35.5	12.9	29.0
T16	0	3.2	3.2	0	12.9	12.9	29.0	6.5	54.8	77.4
T17	6.5	0	3.2	6.5	19.4	29.0	54.8	29.0	16.1	35.5
T18	0	0	0	0	25.8	6.5	35.5	29.0	38.7	64.5
T19	0	0	3.2	0	9.7	6.5	29.0	19.4	58.1	74.2
T20	0	0	3.2	0	6.5	3.2	48.4	35.5	41.9	61.3
T21	0	0	0	3.2	9.7	6.5	35.5	29.0	54.8	61.3
T22	12.9	3.2	9.7	12.9	41.9	25.8	25.8	35.5	9.7	22.6
T23	12.9	0	6.5	6.5	38.7	16.1	35.5	51.6	6.5	25.8

Reading the frequency table can be somewhat complex. However, given the number of variables to be compared (23 each in the pre- and post-tests, 46 in total) it was thought more convenient to show the frequency table rather than grouped graphs or graphs for each of the variables measured before and after the intervention.

Thus, Table 1 shows that the percentages of the lower-end scale selections decrease in the post-test in favor of the higher-end scale selections in the sample.

Table 2 shows the frequencies of the SRSI-SR inventory, with the same distribution of data as in Table 1, i.e., the pre- and post-test results for each item by score (1–4), so that the change in the distribution of responses towards the higher-end of the scale can be verified.

Table 2. Frequencies by score (1–4) of the SRSI-SR
inventory, for the pre-test (pre) and the post-test (post)

	1		2		3		4	
	Pre	**Post**	**Pre**	**Post**	**Pre**	**Post**	**Pre**	**Post**
SR1	0	0	19.4	16.1	48.4	45.2	32.3	38.7
SR2	41.9	29.0	38.7	41.9	19.4	22.6	0	6.5
SR3	64.5	51.6	25.8	32.3	3.2	12.9	6.5	3.2
SR4	51.6	51.6	38.7	41.9	9.7	3.2	0	3.2
SR5	9.7	9.7	38.7	32.3	38.7	38.7	12.9	19.4
SR6	3.2	0	3.2	0	19.4	19.4	74.2	80.6
SR7	6.5	0	3.2	3.2	22.6	29.0	67.7	67.7
SR8	6.5	3.2	16.1	12.9	32.3	45.2	45.2	38.7
SR9	16.1	16.1	51.6	45.2	32.3	35.5	0	3.2
SR10	25.8	16.1	19.4	22.6	45.2	45.2	9.7	16.1
SR11	9.7	3.2	25.8	29.0	51.6	48.4	12.9	19.4
SR12	6.5	6.5	35.5	35.5	45.2	38.7	12.9	19.4
SR13	3.2	0	9.7	12.9	45.2	45.2	41.9	41.9
SR14	6.5	6.5	16.1	16.1	35.5	25.8	41.9	51.6
SR15	9.7	0	9.7	3.2	41.9	45.2	38.7	51.6
SR16	16.1	9.7	16.1	22.6	48.4	29.0	19.4	38.7
SR17	9.7	3.2	35.5	19.4	29.0	48.4	25.8	29.0
SR18	6.5	0	19.4	12.9	48.4	45.2	25.8	41.9

Given the information provided by the response frequencies per score in Tables 1 and 2, and in order to obtain a clear answer on the actual improvement in each item, next, the Wilcoxon signed-rank test for related samples is applied to check whether the score increase in responses can be considered significant or not.

From the analysis of the significant changes, we can interpret in which aspects the use of continuous self-assessments for self-regulated learning has been most beneficial.

The p-value tells us, with a confidence level of 95%, which changes can be considered significant, and the p-value must be less than 0.05 to show differences between the

groups compared, these being the pre-test and post-test responses for each item. If the p-value results are greater than alpha (0.05), the null hypothesis of equality is accepted, so it cannot be confirmed that the differences are significant. Table 3 shows the values obtained in the Wilcoxon signed-rank test for the ARATEX-R scale.

Table 3. Wilcoxon signed-rank test for the items of the ARATEX-R scale

	Z	**p-Valor**
T1	−3.023	.002
T2	−1.267	.205
T3	−1.599	.110
T4	−2.016	.044
T5	−1.430	.153
T6	−3.965	.000
T7	−2.168	.030
T8	−2.007	.045
T9	−3.227	.001
T10	−1.437	.151
T11	−1.913	.056
T12	−2.024	.043
T13	−2.456	.014
T14	−2.571	.010
T15	−1.594	.111
T16	−.839	.402
T17	−1.055	.291
T18	−2.738	.006
T19	−1.265	.206
T20	−1.571	.116
T21	−.362	.717
T22	−1.722	.085
T23	−3.086	.002

The items whose improvement can be considered significant after applying the intervention are T1, T4, T6–T9, T12–T14, T18 and T23, while the items whose improvement cannot be considered significant are T2–T4, T10, T11, T15–T17, T19–T22. If these results are analysed according to the dimensions to which these items belong, a clearer interpretation of how this intervention affects students can be obtained, remembering that the dimensions are planning, management of cognition, management of motivation, evaluation of understanding and management of context.

All items related to planning showed significant improvement (T6, T7, T9, T12, T14 and T23), which leads to the conclusion that this didactic experience allows us to improve planning in reading texts to obtain great learning outcomes.

Regarding the management of cognition, almost none of the items showed significant improvement (T10, T17, T19, T20 and T21), except for T18, which refers to the connection of ideas as they are extracted from the reading.

In terms of motivation management, the improvements in items T1 and T8 were significant, but this was not the case for items T3, T11 and T15. The aspects that have improved refer to students' level of motivation before starting a supposedly boring reading; the first in terms of motivational activities they can do after reading, and the second in terms of their importance for passing and finishing the course.

On the other hand, with respect to the evaluation of comprehension, significant improvement was shown in half of the items (T5 and T13, but not T4 and T22). The items that have improved significantly refer to the final evaluation if the text has not been understood well by reflecting on the causes (T5) and by thinking about the process (T13).

Finally, in context management, none of the items were significant (T2 and T16), so the experience cannot be considered to have served to improve context management.

With these results, we confirmed that continuous self-assessments has served to improve (1) all aspects of planning when approaching text reading, (2) the connection between ideas as they progress in reading, (3) self-motivation when starting to read a text and (4) the final evaluation if a text has not been adequately understood.

If we also compare the results of each item with the specific phase it affects in self-regulation, we obtain interesting interpretations. The three phases of self-regulation are thinking before, thinking during and thinking after (Núñez, et al., 2015).

The non-significant items (T2–T4, T10, T11, T15–T17, T19–T22) are distributed between phase 1 of thinking before (whose phase is composed of items T1, T2, T4, T7–T9, T15, T16 and T22) and phase 2 of thinking during (whose phase is composed of items T3, T10–T12, T17–T21).

In phase 1, five of the nine items are not significant; while in phase 2, seven of the nine items are not significant.

Therefore, it can be interpreted that the intervention designed with continuous self-assessments has the highest incidence in phase 3 of thinking after, followed by phase 1 of thinking before (medium incidence) and, finally, a very low incidence in phase 2 of thinking during.

As the self-assessments are carried out at the end of each session, they allow reflection on the process afterwards, corresponding to phase 3 of thinking after, and in a way, they help to think before (phase 1) about the next week's session.

In addition, the Wilcoxon signed-rank test for paired samples is performed to determine whether the differences in the responses of the SRSI-SR inventory are significant, considering the p-value at a confidence level of 95%. The results obtained can be seen in Table 4.

Table 4. Wilcoxon signed-rank test for the SRSI-SR inventory items

	Z	**p-Valor**
SR1	−.905	.366
SR2	−2.324	.020
SR3	−1.249	.212
SR4	−.277	.782

(Continued)

Table 4. Wilcoxon signed-rank test for the SRSI-SR inventory items *(Continued)*

	Z	p-Valor
SR5	−.973	.331
SR6	−1.508	.132
SR7	−1.000	.317
SR8	−.225	.822
SR9	−.714	.475
SR10	−1.020	.308
SR11	−.894	.371
SR12	−.500	.617
SR13	−.225	.822
SR14	−.474	.635
SR15	−2.294	.022
SR16	−1.789	.074
SR17	−1.811	.070
SR18	−2.082	.037

In this case, most of the items have not obtained results with significant differences, meaning that the proposed self-regulation of learning experience is not sufficient to fully develop self-regulation, although it has allowed us to improve specific aspects of some of the four factors measured here: inadequate regulation habits, organisation of the environment, search for information and organisation of the task.

The items whose improvement has been significant are SR2, SR15 and SR18. In the habits factor, there has been an improvement in the aspect of asking questions in class (SR2), which is not measured in the previous scale because it is not related to reading texts. In the factors of organising the environment and searching for information, there has been no improvement in either item.

Finally, in the factor of task organisation, there was an improvement in the coordination of time according to the tasks (SR15) and in the reflection prior to study to do it in an optimal way (SR16). These results are in line with those obtained in the scale on reading texts (ARATEX-R), as they correspond to planning tasks.

4   Discussion and conclusions

This study has provided key knowledge for include simple experiences with Moodle surveys to improve self-regulated learning, as it can be affirmed that the use of continuous self-assessments has served to improve two aspects of self-regulation, reading comprehension and study habits, in line with previous experiences such as those reported [20].

Self-assessments have proved to be a good tool to know their knowledge about the subject, as it happened in the case of [14] to know their digital competence. In addition, it has proven to be positive for autonomy in study habits in a presential modality, a modality less studied than blended learning (see, e.g. [3]). It is great news to have simple tools that Moodle offers as standard to be able to create self-assessments based on

learning objectives, unlike other tools which include programming specific extensions for Moodle [29].

According to the results of [27], self-assessment through questionnaires with specific criteria has made it easier for students to identify and better understand the levels of knowledge for new content. In the self-assessment questionnaires, students should rate themselves after reflecting on their achievement of the assessment criteria corresponding to the learning objectives of the subject, since according to [28], the practice of requesting a grade from the students does not prove to be very effective.

The planning of text reading and general study, due to reflection on the organisation of time in terms of tasks, stands out. Self-assessment has enabled greater use of deep cognitive and metacognitive strategies related to goal planning, which facilitates self-regulation [11], [20].

On the other hand, the use of these tools has also served to achieve greater connection between ideas while the reading of a text [35], and to carry out a reflective evaluation after finishing reading about the contents that are difficult to understand to improve students' future reading, which is a priority in self-regulation development programmes [6].

In this sense, the improvements presented so far coincide with the phases proposed by [5] in his model: foresight would be improved with increased planning, performance would be improved by having a better connection between ideas during learning and self-reflection would be increased as a result of the evaluation step taken after finishing a complex reading.

Regarding the phases proposed by [23] to develop self-regulated learning, these results highlight the importance of goal-based planning and evaluation of results. However, the proposal of these authors would need to be reinforced with dynamics to improve performance, or rather, to improve the process of self-regulation during the task, which occurs between planning and evaluation of results. In this study we have included the combination of strategies, performing a weekly and continuous self-evaluation of the results to guide and improve goal-based planning, which has allowed us to improve the self-regulation process during the task. These results provide a key innovation for the inclusion of self-regulation strategies for learning in education.

In addition, this experience has helped students understand the importance of asking questions in class about concepts they do not understand, which aligns with results presented in [20], in which more behaviours related to seeking academic help in the face of difficulties are observed. In this sense, the experience has served to reflect on the knowledge students should have acquired after each session, contrary to what usually happens, since students do not typically review the contents until the end of the subject, which when they find themselves doubtful of having solidified their understanding of concepts presented throughout the course.

Considering the complexity inherent in the development of self-regulation, future experiences in the university teacher training can be designed based on these findings. According to [10], teachers need experiences in regulating their own learning in order to support self-regulated learners.

In conclusion, we can highlight the importance of these results, which have confirmed that a simple tool such as surveys, which come as standard in Moodle, can help self-regulation of learning, specifically improving text comprehension and study habits through continuous self-assessment of learning objectives.

In this regard, the use of a self-assessment questionnaire including evaluation criteria should be considered to ensure the development of planning, connecting ideas and subsequent reflection on the understanding of concepts, as well as to improve self-motivation prior to a task and self-efficacy for instructing SRL in the classroom [16].

One limitation is the lack of students understanding about the importance in some aspect of the dimensions of self-regulation learning. Future studies should improve the implemented strategy to explicitly cover the aspects of the dimensions in which significant results have not been obtained. Additionally, in the future we hope to implement this strategy in different populations, to generalise the results and to check possible differences.

5   References

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