

Improving Self-regulated Learning through personalized weekly e-Learning Journals: a time series quasi-experimental study

Chorng Yuan Fung *

Faculty of Business, Design and Arts,
Swinburne University of Technology Sarawak, Malaysia
Email: cfung@swinburne.edu.my

*Corresponding Author

Melissa Ng Lee Yen Abdullah

School of Educational Studies,
Universiti Sains Malaysia, Malaysia

Shahabuddin Hashim

School of Educational Studies,
Universiti Sains Malaysia, Malaysia

Abstract

This study provides an insight into using personalized weekly e-Learning Journals to improve self-regulated learning (SRL) of university students. Quasi-experimental method with time series data analysis was used. Pre and post-tests together with time series data over an intervention period on SRL were collected. 54 students in an undergraduate course wrote personalized weekly e-Learning Journals (e-LJs) in the Learning Management System (LMS) over a 10-week period. The e-LJs contained self-reflection prompts designed according to the course curriculum activities and assessments to scaffold students' SRL. It was found that students' SRL improved significantly over the intervention period. The time series data on SRL shows that students' SRL varied according to the timing of assessments. Academic staff can help university students improve their SRL by providing personalized weekly e-LJs that contained self-reflection prompts. These prompts need to be personalized according to the course curriculum activities and assessments.

Keywords: Self-regulated Learning; self-reflection; learning journal; learning management system; e-learning.

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PsycINFO Classification: 3550

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Introduction

The learning culture in higher education requires students to be independent learners (Ming, 2009; Ming & Alias, 2007). They need to self-regulate their learning effectively (Bembenutty, 2011). However, self-regulated learning has not been emphasized in primary and secondary education. Students in higher education are often under-prepared for such a learning approach (Beaumont, Moscrop & Canning, 2016; Johnston, 2010; Krause, Hartley, James, & McInnis, 2005; McInnis & James, 2004). Indeed, students need scaffolding in order to be effective self-regulated learners (Karpicke, Butler & Roediger III, 2009). They need to self-reflect regularly and effectively in order to improve in self-regulated learning (Ewijk, Fabriz, & Büttner, 2015; Zimmerman, 1989). However, self-regulated learning cannot be improved in a natural setting nor with aging (Ng, 2010). Hence, it is vital to deploy self-reflection prompts to effectively help university students to improve in their self-regulated learning. With the increased popularity of online Learning Management System (LMS) among universities, LMS offers various learning tools that are inviting and engaging for students' learning (Dabbagh & Kitsantas, 2004, 2005). Some of these tools can be used to stimulate students' self-reflection in their learning. However, previous studies that investigated the utilization of these tools and its effects on self-regulated learning are limited. Many of these studies did not use personalized e-learning journals with self-reflection prompts designed according to the curriculum activities and assessment tasks (e.g. Guvenc, 2010; Ewijk, et al, 2015; Schmitz, & Perels, 2011). This study aims to fill the gap by providing insights into the design and deployment of personalized weekly e-Learning Journals on the LMS with self-reflection prompts to improve students' self-regulated learning.

There were two research questions in this study and theses lead to the 2 null-hypothesis to be tested:

- *RQ 1 – Have students' self-regulated learning improved through personalized weekly e-Learning Journals?*
- **Ho1:** *Weekly use of personalized e-Learning Journals will not improve the self-regulated learning of students'.*
- *RQ 2 – How did students' self-regulated learning change over the intervention period?*
- **Ho2:** *Self-regulated learning will not change over the intervention period.*

Literature Review

There are many models of self-regulated learning (SRL) found in the literature. This study is based on the SRL model developed by Pintrich (1999). Pintrich theorized self-regulated learning as the process of self-regulation of own cognition and regulation of cognitive strategies. These consist of knowledge of cognition and strategies of cognition self-regulation. However, though students often have knowledge about cognition, many were unable to exercise strategies to self-regulate their cognition effectively (Ng, 2010). Cognitive strategies consist of strategies to organize, elaborate and recall information learned. Organization strategies include note taking while elaboration includes strategies of expanding the notes taken during a class. Recall or rehearsal strategies include revision and recall of previously learned materials. Self-regulation of cognition requires students to plan, monitor and regulate their learning in order to achieve the learning outcomes. These strategies include critical thinking and metacognitive strategies. Pintrich emphasized that effective use of these strategies should help students to adjust their learning behaviors in order to achieve the learning goals. This often requires scaffolding before students can internalize them. Self-

reflection, a good form of scaffolding, is a self-examining exercise where students need to think critically about their beliefs and behavior (Brookfield, 1987; Moon, 2004). Often, it requires the assistance of teachers or peers in order to self-reflect effectively as most students cannot think critically about their own learning process (Brookfield, 1987). Self-reflection can aid the improvement of self-regulated learning (Buzza, Kotsopoulos, Mueller & Johnston, 2013). However, self-reflection needs to be relevant to the students' learning in order to be effective.

In the 21st century, with the advancement of technology and the internet, academic staff members in universities can utilize various learning tools in LMS for teaching and learning (Dabbagh & Kitsantas, 2004; Nagy, 2016). Some of these tools promote self-reflection on learning (Sharma & Hanafin, 2007). However, Findik and Özkan (2013) believe that academic members have not fully utilised these tools due to its perceived complexity and academic members' lack of self-efficacy in the usage. Walker, et al, (2014) concur with similar synthesis. Muries and Masele (2017) have similar findings and highlighted the need to explore further the use of these tools for SRL.

University students need to exercise self-regulated learning when engaging in their learning on LMS (Hashemyolia, Asmuni, Ayub, Daud & Shah, 2014). They need to plan their own learning schedules, monitor their learning progress, evaluate their learning outcomes and adjust their learning strategies to ensure that their learning objectives are achieved. Pintrich (1999) posited that students need to feel motivated in order to sustain the use of self-regulated learning strategies. Unfortunately, many students enter higher education without adequate preparation for such a learning approach. Ming and Alias (2007) and Ming (2009) examined samples of students from several public and private universities regarding their learning styles. They discovered that a significant number of the students preferred the teacher-centered approach in learning. This was because the students still prefer to rely on the teacher as a resource for their learning, even as they recognize the need to be autonomous in their learning. Such a preference might be attributed to the learning styles they learned and cultivated from their primary and secondary education. These findings highlighted the need to scaffold university students for effective use of self-regulated learning strategies. This was particularly critical in view of the fact that many students found the learning styles in higher education difficult to adapt to. This has led to drop-outs and poor academic achievements in higher education (Beaumont, Moscrop & Canning, 2016; Bembenutty, 2011;).

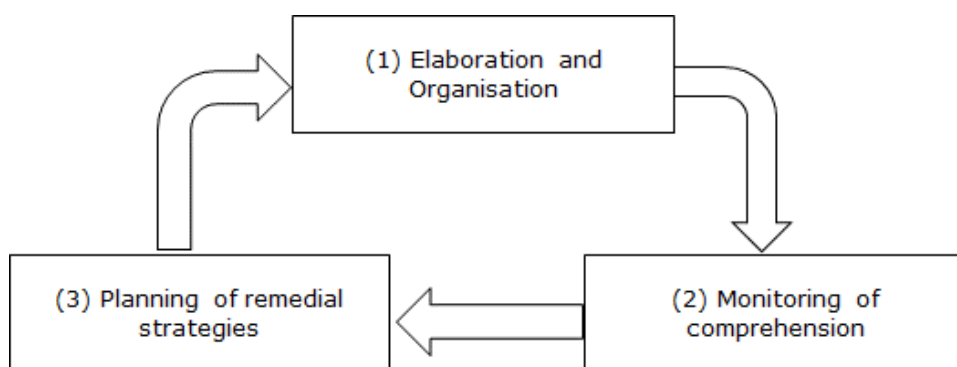
Self-reflection and self-regulated learning were intertwined with each other (Buzza, Kotsopoulos, Mueller & Johnston, 2013). Regular self-reflection can promote better self-regulated learning. However, self-reflection is not an exercise that students can carry out automatically or effectively (Pintrich, 1999). They need to be guided and feel motivated to do so (Geisbers, et al, 2013; Ewijk, et al, 2015; Ng, 2010; Schmitz & Wiese, 2006). In addition, effective self-reflection needs to be context specific (Ben-Eliyahu & Bernacki, 2015; McCardle & Hadwin, 2015; Rotgans & Schmidt, 2009). Students need to relate the subject of their self-reflection to their learning processes.

There are two methods of helping students to improve their SRL strategies. The first one is to have a dedicated course teaching SRL. However, such an approach was costly and not well received by the students. SRL strategies, when taught without a context, were difficult to transfer to other subjects (Hofer & Yu, 2003; Ng, 2010). In addition, it might not be cost effective to run such a course (Fung, Melissa & Shahabuddin, 2019).

Another approach that is more cost effective is the use of learning journals (e.g. Schmitz & Wiser, 2006). Learning journals can be embedded into any course to help students self-reflect. Karpicke, Butler and Roediger III (2009) examined students'

retrieval practices, where they need to recall the lessons learned, and their use of self-regulated learning strategies. They found it necessary for students to be aware of the need to exercise self-regulated learning strategies, while recalling the lessons. This suggests that self-regulated learning is not automatic. Students are in need of an effective tool to scaffold the usage of self-regulated learning strategies while learning. Nückles, Hübner and Renkl (2012) discovered that students' self-regulated learning can be improved through writing learning journals. They synthesized from their findings that journal writing not only promotes the use of cognitive strategies but also metacognitive. Figure 1 pointed out that while in writing learning journals, students need to self-reflect on their learning progress and the outcome iteratively. Such iterative process of plan, monitor and adjust have aided the students to master their self-regulated learning strategies more effectively. This suggested that learning journals should contain certain prompts that can scaffold students to self-reflect effectively.

Figure 1:
Cyclical Model of Cognitive and Metacognitive Processes involved in Journal Writing



Source: Adapted from Nückles, Hübner & Renkl, (2012)

Scaffolding students in their learning can be carried out immediately after their lessons to maximise its effectiveness. Berthold, Nuckles and Renkl (2007) used self-reflection prompts to scaffold students in their learning right after each lesson. Students need to be prompted effectively in order for them to improve in their self-regulated learning. Indeed, the use of self-regulated learning strategies was not automatic but needed intentional effort. Often, students would not exercise such strategies if they had a choice. They might have inherited this attitude from their past experience where such strategies were not emphasized. In another study, Guvenc (2010) examined the effect of an intervention on self-regulated learning. A mixed method quasi-experimental research with e-journal writing was carried out as treatment on 44 students over a ten-week period. Students were required to write a reflective journal at the end of each week. Content analysis of student journals revealed that students' reflections were more focused on the lesson content and learning processes. It was found that students' self-regulated learning strategies usage, with the exception of rehearsal, had improved at the end of the intervention period. Guvenc (2010) synthesized that students' focus of self-reflection on their learning might have helped them to improve their self-regulated learning.

Self-reflection, using diary, can be carried out on a weekly basis. Arsal (2010) examined the effects of weekly diary report on the pre-service teachers. At the end of the intervention period, it was discovered that there was an improvement in students' self-regulated learning strategies, specifically in critical thinking and metacognitive strategies. Surprisingly, there was no significant improvement in their cognitive strategies.

With the rapid development of internet technology, diary or journal can be in electronic form as well. Ewijk, Fabriz and Büttner (2015) used weekly e-learning journals to improve students' self-regulated learning over a 14-week semester. A weekly e-learning journal (e-LJ) was sent to the students through email. Students needed to complete the weekly e-LJ and return it to the researchers through email. The pre-test post-test scores showed a significant increase over the 14-week period. Apart from these, Ewijk, et al, also examined students' study time over the intervention period. This was consistent with the increase in the pre and post-test scores of SRL. However, these e-learning journals have been standardized across 14 weeks, making no reference to the curriculum and assessments of the course. Students' feedback at the end of the semester revealed that they lacked the motivation to complete the e-learning journals. This was partly due to the lack of relevance of the e-learning journals to students' curriculum and assessments throughout the period. This study highlighted the need to incorporate prompts which are personalised according to the curriculum and assessments of the subject in order to optimize the interventional effects. There was also an attempt to integrate the learning journals into the existing curriculum.

Schmitz and Wiese (2006) carried out a quasi-experimental study using time-series and pre-test post-test data taken from 40 civil engineering students. They answered standardised learning journals over a 5-week period. The results show that there was a significant increase in students' self-regulated learning at the end of the intervention period. The data on self-regulated learning collected in the journals have demonstrated the changes over the intervention period. These behaviours include study time, study outcome and study effort. All behaviours demonstrated positive changes over the intervention period with the exception of study time which showed a negative trend over the period. Schmitz and Wiese attributed the positive changes to the increase in understanding learning materials as measured in the journals over the period. This is worth further examination in future studies. Although effective, Schmitz and Wiese warned that journal writing needs to be relevant to the students

Jado (2015) used journal writing as an intervention tool to improve SRL of 61 participants. These students were required to self-reflect using journals on certain topics taught after their classes. It was found that SRL had improved by the end of the intervention period. It has been synthesized that journal writing needs to be relevant to students' learning. Similarly, Arsal (2010) incorporated learning journal writing as part of the curriculum of the 30 pre-service science teacher students. Students were required to record and reflect on their learning activities on a weekly basis in hard copy learning journals. It was found that students' self-regulated learning strategies had improved by the end of the semester. The qualitative data in the learning journal revealed that students were able to self-reflect on their learning activities more effectively through journal writing. However, with the development of online LMS, the journal writing should be digitized and made online for the students. This will make journal writing more engaging for the students (Hshemyolia, Asmuni, Ayub, Daud & Shah, 2014; Schmitz & Wiese, 2006).

Method

Research Design

A quasi-experimental design with time series data analysis was used in this study. Self-regulated learning is multi-faceted hence it requires multi-methods to capture relevant data to understand its changes (Ben-Eliyahu & Bernacki, 2015; Dörrenbächer & Perels, 2016; Järvenoja, Järvelä, & Malmberg, 2015; Klug, Ogrin, Keller, Ihringer, & Schmitz, 2011). Students were required to answer a pre-test and a post-test in Week One and Week Eleven respectively in a full 12-week semester. From Week Two to Week Ten, including a one-week Semester Break, the students were required to write

personalized weekly e-learning journals. Self-reflection prompts were incorporated in the e-learning journals. These prompts included those that collected time series data on self-regulated learning over these ten weeks. There was no teaching in Weeks eleven and twelve, only revision and self-study. Hence students were not required to write the e-learning journals during these two weeks. Students' writing in the self-reflection prompts was also analyzed based on the literature to understand students' experience in using the self-reflection prompts. These data were interpreted corroboratively to understand the effects of self-reflection prompts on students' self-regulated learning strategies.

Participants

A total of 54 students (N=54, male = 26, female = 28) taking a Year Two subject in an undergraduate course of a university participated in this study. Their participation was voluntary and no financial reward was involved. In addition, their academic performance was not affected should they choose to withdraw from this study during the semester. This was to prevent the Hawthorne effect, intimidation threat and any other threats that might impair the reliability of the outcome (Ewijk, et al, 2015; Gay, Mills & Airasian, 2011).

Data Collection

The participating students were required to complete a hard copy of pre-test and post-test questionnaires distributed in Study Week One and Week Eleven.

These students were also required to complete personalized weekly e-learning journals starting from Week Two and continuing through to Week Ten, inclusive of a week-long semester break in between. The content of the weekly e-learning journal was based on the curriculum activities and assessments in the previous weeks. This was to ensure that students have sufficient time and content to reflect on (Schmitz and Wiese, 2006). The last two weeks of the semester were for revision and self-study hence the students were not required to complete any weekly e-learning journal, then.

Instruments

In this study, two instruments were used, i.e. the personalized weekly e-Learning Journal and Motivated Strategies for Learning Questionnaire (MSLQ). The weekly e-learning journals not only functioned as a tool for intervention but also to collect time series data on students' SRL throughout the ten-week period. MSLQ was used as pre-test and post-test of self-regulated learning.

Personalized Weekly e-Learning Journal

The main objective of the personalized weekly e-learning journal was to prompt students to regularly self-reflect on their learning (Nückles, Hübner, & Renkl, 2012; Perels, Dignath & Schmitz, 2009; Perels, Merget-Kullmann, Wende, Schmitz, & Buchbinder, 2009; Schmitz & Perels, 2011; Schmitz & Wiese, 2006). This weekly e-learning journal was developed using the 'Survey' function of the Learning Management System (LMS). Self-reflection prompts were incorporated into the weekly e-learning journal to scaffold students' self-reflection. The focus of these self-reflections included curriculum activities, assessment tasks or learning processes. These prompts were adapted and personalized from the literature (Cottrell, 2013; Ewijk, et al, 2015; Klug, Ogrin, Keller, Ihringer & Schmitz, 2011; Schmitz & Wiese, 2006). They were designed according to the curriculum activities and assessments of the subject in order to make them more relevant to the students. This also served as a better guide for the students to reflect on their own learning effectively.

Table 1:

Sample of Self-reflection Prompts in the Personalized Weekly e-Learning Journals and its Purposes

Study Week and Prompt in the e-Learning Journal	Purposes
Study Week No. 5 In Week 5, what were the learning problems you faced? Which topics did you find difficult? What about your presentation and assignment?	This prompt covers two areas, i.e. the lecture topics as well as the group presentation done in Week 5, to make the reflection more relevant.
Concerning the learning problems identified, what can you do to overcome them? Think about the thoughts you had over the past 3-4 weeks, have you carried out the actions to help yourself to learn better?	This prompt attempts to link the actions needed to the planned actions captured in previous weeks' e-learning journal. It acts as a reminder for evaluation of learning progress.

Prompts to capture time series data were developed based on the literature and tested reliability. These prompts were incorporated into the weekly e-learning journal. Table 2 shows some examples of prompts to capture the time series data.

Table 2:

Prompts to collect time series data over a 10-week period

Question**	Area of self-reflection	Reliability *
1. I have a study plan for the following week	SRL - Forethought	.979
2. I have allocated enough study time for this week	SRL - Monitoring	.977
3. I think I have put in enough effort into my study this week	SRL - Monitoring	.981
4. I think I have understood all the topics up to now!	SRL - Monitoring	.948

Note: * Reliability was calculated as Guttman Split-Half coefficient (Dörrenbächer & Perels, 2016, Schmitz & Wiese, 2006) for data aggregated in Week 1 of the e-LJ

** 5-Point Likert Scale was used (1 – Strongly disagree; 5 – Strongly agree)

The time series data include:

- (i) Study Plan (for the following week),
- (ii) Perceived sufficient study time,
- (iii) Perceived sufficient study effort; and
- (iv) Understanding of topics to-date.

These prompts were adapted from Ewijk, et al (2015) and Schmitz and Wiese (2006). These activities were good proxies of students' self-regulated learning (Fung, Melissa & Shahabuddin, 2019).

Motivated Strategies for Learning Questionnaire (MSLQ)

The pre-test and post-test questionnaires were adapted from MSLQ developed by Pintrich, Smith, Gracia and McKeachie (1991). Self-regulated learning of the students were measured using the cognitive and metacognitive strategies subscales of MSLQ. It consisted of 5 subscales with 31 items and used a 7-point Likert scale of rating (1=not at all true of me to 7=very true of me). The Cronbach alpha reliability coefficient value

ranged from 0.687 to 0.863 (Table 3). These coefficient values were considered reliable (Artino Jr, 2005; Duncan & McKeachie, 2005; Garcia and Pintrich, 1995 & 1996; Rotgans & Schmidt, 2010; Roth, Ogrin & Schmitz, 2015).

Table 3:
Subscales of Cognitive and Metacognitive Strategies of MSLQ

Subscales of Cognitive and Metacognitive Strategies	Items	Cronbach
Rehearsal	4	0.705
Elaboration	6	0.827
Organization	4	0.687
Critical Thinking	5	0.863
Metacognitive Self-Regulation (Total 31 items)	12	0.827

Data Analysis Procedure

The data from both the pre-test and post-test questionnaires as well as time series data from the personalized weekly e-Learning Journal were keyed into Statistical Package for Social Science (SPSS) version 23. Data was screened to ensure fulfillment of the assumptions needed. Paired Sample t-test was used to examine the significance of the difference between pre-test and post-test mean scores of SRL and its sub-dimensions. The time series data were analyzed using Repeated Measures ANOVA to identify any significant changes over the intervention period (Shaddish, et al, 2002). The significance level was set at 0.05 in this study. In addition, line graphs were plotted using the time series data to ascertain the trends over the intervention period.

Results

Null-hypothesis Ho1

- *Ho1: Weekly use of personalized e-learning journals will not improve the self-regulated learning of students’.*

The objective was to determine whether there was a significant improvement in the self-regulated learning of the students. This paired sample t-test analyses showed that there was a significant difference in the pre-test and post-test mean scores of SRL strategies use as well as its sub-dimensions, with the exception of organization. A comparison of the mean scores showed that all the post-test mean scores were significantly higher than the pre-test mean scores (Table 4).

Table 4:
Descriptive Statistics and Paired Sample t-test results of Self-Regulated Learning (overall) and its sub-dimensions

Variables	Pre-Test			Post-Test		T	Sig. (2-tailed)
	N	Mean	S.D.	Mean	S.D.		
SRL (overall)	54	4.60	.75	5.05	.79	-3.189	.002*
Metacognitive strategies	54	4.57	.79	4.93	.83	-2.484	.016*
Critical Thinking	54	4.31	1.05	4.86	.93	-3.270	.002*
Elaboration	54	4.65	.94	5.17	.94	-2.913	.005*
Organisation	54	4.70	.91	5.02	.96	-1.735	.089
Rehearsal	54	4.77	1.03	5.24	1.04	-2.305	.025*

* Significant at the p< .05

Null-hypothesis Ho2

- *Ho2: Self-regulated learning will not change over the intervention period.*

One-Way repeated measures of ANOVA were used to determine whether there is a significant difference in the weekly scores of these three variables over a ten-week period. The Alpha level of .05 was used for all statistical tests.

There was a significant difference in the weekly Study Plan mean scores, $F(9, 409) = 3.057, p < .05$. as well as Study Effort mean scores, $F(9, 407) = 2.504, p < .05$.

Table 5:

Descriptive Statistics for Study Plan, Perceived Sufficient Study Time and Study Effort Weekly scores

Study Week (Number in x-axis)	Study Plan		Study Time		Study Effort		Understanding of topics	
	Mean	Std. Dev	Mean	Std. Dev	Mean	Std. Dev	Mean	Std Dev
Two (2)	3.10	.73	3.14	.64	2.98	.72	3.67	.90
Three (3)	3.19	.80	3.21	.68	3.17	.85	3.55	.94
Four (4)	2.98	.98	2.95	.85	3.10	.82	3.33	.72
Five (5)	3.13	.93	3.05	.85	3.21	.84	3.40	.81
Six (6)	3.41	.94	3.05	.93	3.40	.87	3.03	.86
Semester break (7)	3.15	.85	3.41	.92	3.56	.84	3.51	.71
Seven (8)	3.28	.73	3.20	.70	3.20	.79	3.29	.67
Eight (9)	3.43	.73	3.14	.80	3.40	.73	3.20	.82
Nine (10)	3.47	.76	3.00	.83	3.05	.82	3.12	.66
Ten (11)	3.72	.80	3.26	.94	3.48	.67	3.28	.83

Table 6:

Repeated Measures of ANOVA for Study Plan, Study Time, Study Effort and Understanding of topics Weekly scores

	Sum of Squares	df	Mean Square	F	Sig.
Study Plan					
Between Groups	18.788	9	2.088	3.057	.001*
Within Groups	279.269	409	.683		
Total	298.057	418			
Study Time					
Between Groups	7.087	9	.787	1.177	.308
Within Groups	274.342	410	.669		
Total	281.429	419			
Study Effort					
Between Groups	14.298	9	1.589	2.504	.009*
Within Groups	258.263	407	.635		
Total	272.561	416			
Understanding of topic					
Between Groups	14.840	9	1.649	2.587	.007
Within Groups	257.491	404	.637		
Total	272.331	413			

The mean scores of these SRL activities were plotted on a graph to identify the changes and the trends. It was discovered that study plan, study time and study effort showed a positive trend over the intervention period (Figure 2). However, it fluctuated over the period. The graph for study plan demonstrated a consistent positive trend over the period while study time and study effort fluctuated. The peak for study time as well as study effort was in the semester break week (Study Week 7 on the graph).

Figure 2:
Weekly Scores of Study Plan

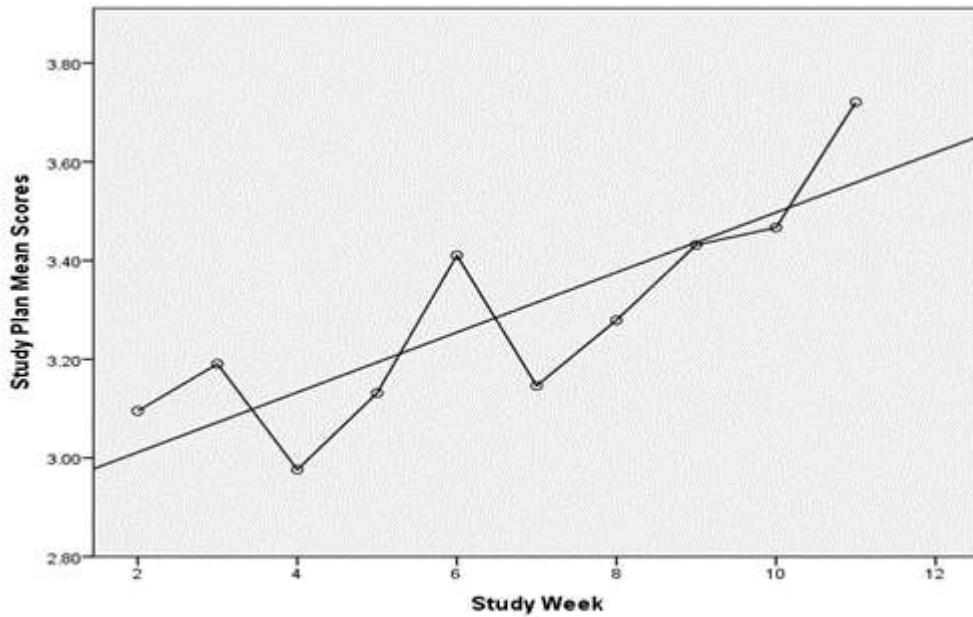


Figure 3:
Weekly Scores of Study Time

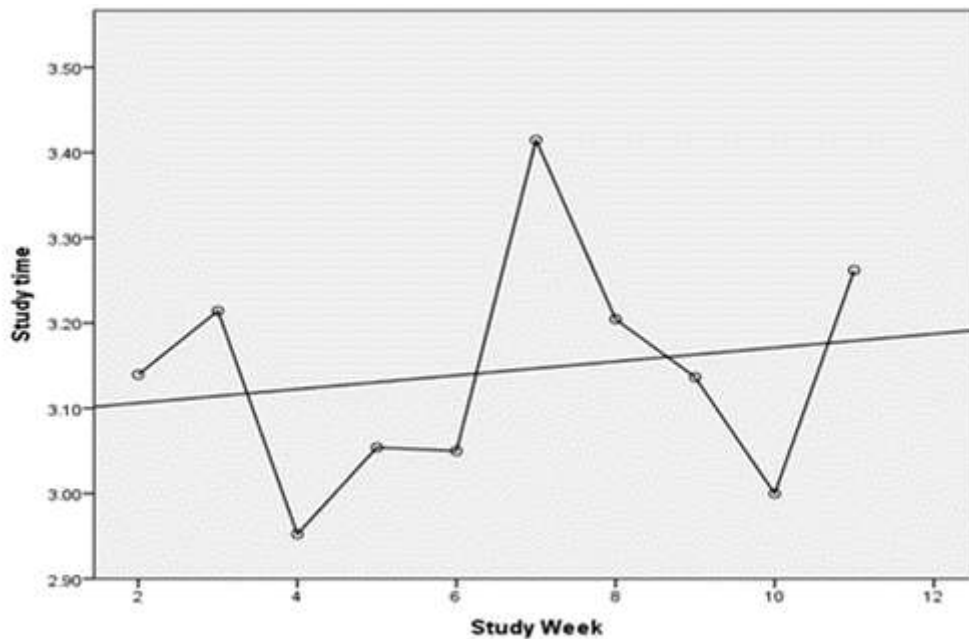


Figure 4:
Weekly Scores of Study Effort

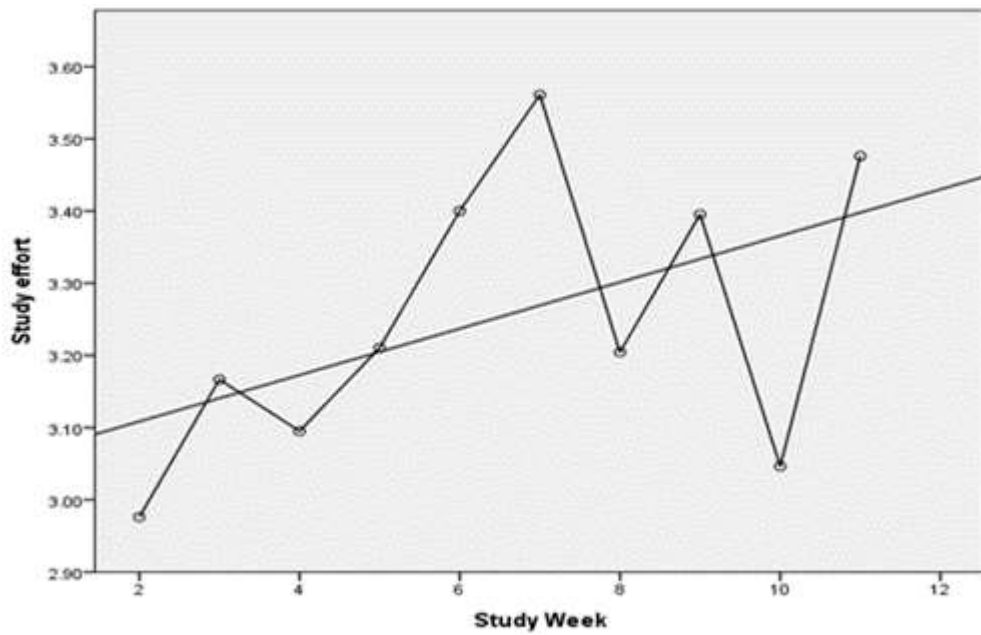
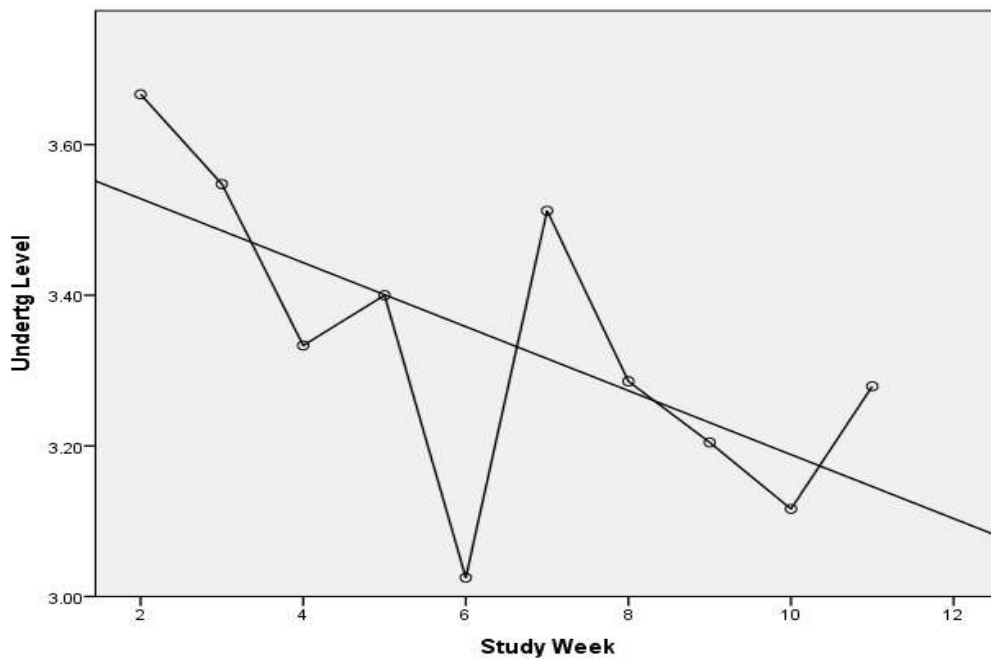


Figure 5:
Weekly Scores of Understanding of Topics



Discussion

The objective of this study was to investigate the effect of personalized weekly e-LJ on students' self-regulated learning. The results showed that self-reflection prompts in the personalized weekly e-learning journals were effective for improving students' use of self-regulated learning. This suggests that the self-reflection prompts designed were holistic and relevant to the students in helping them to be effective self-regulated learners. This finding adds to the knowledge of past studies where learning journals were used (Arsal, 2010; Berthold, et al, 2007; Buzza, et al, 2013; Guvenc, 2010; Ewijk, et al, 2015, Nückles, et al, 2012). It provides an insight on how SRL of students have improved. The time series data analysis shows that improvement of self-regulated learning was due to the constant self-reflection carried out hence the awareness of students understanding of the topics learned over the semester. One would be more willing to invest more time in study when there is an awareness of the lack of understanding in the topics learned.

The use of digital learning journals could have sustained the students' motivation to write the weekly e-Learning Journals over a 10-week period. This digital version might have made the journal writing more convenient and engaging for the students (Ewijk, et al, 2015, Schmitz & Wiese, 2006). Indeed, self-reflection needs to be carried out not only more effectively but more regularly (Brookfield, 1987). The writing of personalized weekly e-learning journals would have helped the students to cultivate such behaviors and reaped the fruits. Self-reflection is intertwined with self-regulated learning (Buzza, et al, 2013). When students' self-efficacy in self-reflection increases, so do their ability to be effective self-regulated learners. The prompts in the personalized weekly e-learning journal made clear the purposes of self-reflection by linking it to the curriculum activities and assessments. Students can relate the self-reflection prompts to their current study. Particularly in the prompts, students have been directed to challenge the effectiveness of their learning strategies and their plans. This might have propelled the students to drill into certain topics hence exercising more self-regulated learning strategies. Such forms of self-reflection must have sustained students' motivation to self-reflect regularly (Karpicke, et al, 2009).

Apart from being a tool for intervention, the personalized weekly e-Learning Journals can be a tool for capturing time series data on students' self-regulated learning. Indeed, SRL is context specific (Ben-Eliyahu & Bernacki, 2015; McCardle & Hadwin, 2015; Rotgans & Schmidt, 2009). This study, utilizing the time series data extracted from the personalized e-learning journals, have shown that SRL changes are not in linearity. It provides an understanding how SRL changes with the curriculum and assessment tasks. In addition, since the e-Learning Journals were designed using tools on the Learning Management Systems (LMS), the findings could encourage academic staff members to optimize the tools available on LMS in teaching and learning.

This study suggests that academic staff members can design personalized weekly e-learning journals by incorporating relevant self-reflection prompts to improve students' self-regulated learning. However, such endeavor would demand more time and effort, at the initial stage, for analyzing and matching the prompts in the weekly e-learning journals with the curriculum and assessment tasks. For instance, the self-reflection prompt should require students to reflect on the result of their progress test. In addition, it should prompt them for further planning should the result be not satisfactory. Relevant prompting on a regular basis not only scaffolds self-reflection but promotes the use of metacognitive strategies. This also could help improve motivation to learn since it creates a mastery experience (Bandura, 1986; Pintrich, 1999). This supports the proposition that students need to be adequately prepared for the

independent learning culture in higher education. This was also consistent with the syntheses of Berthold, et al (2007) and Pintrich (1999) that students need aids in order to self-reflect effectively and to become better self-regulated learners (Ewijk, et al, 2015; Karpicke, et al, 2009; Ng, 2010).

Conclusión

This study has discovered that personalized weekly e-Learning Journals incorporating relevant self-reflection prompts can be an effective tool to improve university students' self-regulated learning. These self-reflection prompts have helped the students to focus on the relevant areas for effective self-reflection. In addition, students' SRL changes were not in linearity but with the curriculum activities and assessment tasks over the semester.

Suggestions for Future Research

The participants of this study were from the business discipline. It might reveal more insight if the study is enlarged to other discipline, for example applied science or engineering where extensive SRL is required. In addition, future studies may examine the effect of self-reflection on self-regulated learning in massive open online courses (MOOC). Students' learning styles and the structure of MOOC may aid to foster students' self-regulated learning. These are potential studies that might shed more light on the kinds of interventions for self-regulated learning in higher education.

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