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Introducing Spaced Repetition Software (SRS) for vocabulary acquisition in a university-level Arabic language course: A case study

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Abstract

Spaced repetition (SR) is a proven memory technique, yet few L2 classrooms implement it for vocabulary acquisition and retention. This paper details a case study that introduced spaced repetition software (SRS) for L2 vocabulary acquisition in a university Arabic language course. The paper analyzes the results of a questionnaire about the effectiveness of SRS distributed to twenty-two beginning Arabic students at a major university who were required to use the method for vocabulary acquisition. A discussion of the theoretical benefits of SRS versus actual classroom results follows. The paper concludes with a reflection on various problems encountered, including student motivation, and makes recommendations for introducing SRS in the L2 classroom based on the experiment.

1. Classroom Context

In the first-semester beginning Arabic course I teach, the textbook our program uses introduces a disproportionately large amount of vocabulary near the beginning of the semester. Unfortunately, this large vocabulary burden coincides with another important task students are focusing on during these first weeks: learning the Arabic alphabet. In this paper I reflect on my experience trying to remedy this situation. I focus particularly on my attempt to help students learn vocabulary by introducing a Spaced Repetition (SR) memorization technique in my classroom and on the results of a survey I administered to my students. Reflections on these results, including struggles and insights that accompanied the experiment, comprise the body of the paper. In the conclusion I offer recommendations based on my experience and suggest ways other language teachers could successfully use some of the techniques I discuss in the paper. Throughout the paper I note successes and failures and describe the project's evolution from a research study to a piece of practitioner research.

Over the course of more than fifteen years teaching beginning Arabic, I have noticed that often, likely because of the heavy workload entailed in trying to learn the new sounds of a language very different from English together with a right-to-left script that in no way resembles the Latin alphabet, while simultaneously attempting to

memorize a large amount of vocabulary (approximately 225 words and phrases in both Modern Standard Arabic and Egyptian or Levantine dialect), a majority of my students tends to forget much of the core vocabulary introduced during this time by the end of the semester. This situation—coupled with the observation that even the few exceptional students who do memorize and retain most of the early vocabulary seem to do so mostly through sheer determination and perseverance in the face of such a large workload—is what led me to introduce a spaced repetition software (SRS) component in my classroom.

2. Purpose

I set out to apply this proven technique to Arabic vocabulary acquisition in a college-level class in order to improve vocabulary acquisition among my students. I thought this would prove especially beneficial during these first weeks when students were simultaneously learning the letters and sounds of the Arabic language and studying a significant amount of core vocabulary, and I assumed that even after this initial phase it would continue to provide benefits throughout the course of their language studies. This paper is a case study detailing my attempt to implement SRS in my classroom together with all its challenges and difficulties. I share insights I gained and lessons I learned and discuss some of the inherent challenges I faced along the way.

The idea to introduce SRS to my students arose from my own positive experience with the method. As a non-

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native speaker of Arabic, I had been faced with learning this language so remote from my own through study and effort, and I had developed over the years a number of strategies that suited my purpose. In college, I became excited by the prospect of the seemingly endless knowledge-acquisition ability SR promised. I subsequently found success using SR for L2 vocabulary acquisition, and when I later discovered SRS, I happily incorporated it into my vocabulary learning regimen. Later, as a language teacher, I wanted to share the tools I had successfully used myself with my students, who I had no reason to doubt would benefit as much as I had. With this in mind, I set out to introduce SRS in my Beginning Arabic courses.

After surveying the well-established benefits of SR, discussing its underuse in the L2 classroom, and comparing several of the various SRS programs available, I describe how I introduced an SRS program for vocabulary acquisition in a first-semester university Arabic class and how students reacted to it, then discuss the insights I gained from teaching the class with SRS. I also report on the results of a survey of 22 first-semester Arabic students who responded to questions about the effectiveness of SRS in their vocabulary study, while addressing student motivation. Finally, I discuss the challenges of implementing SRS in the L2 classroom, reflect on the experience, and offer recommendations to address some of the problems I faced.

3. Literature Review

3.1. Vocabulary Acquisition

Two interrelated problems prompted my original idea to introduce SRS in my beginning Arabic course: 1) the fact that L2 learners need vocabulary to function (see Schmitt, 2008, pp. 330-333, who addresses English vocabulary specifically); and 2) the reality that vocabulary teaching is often undervalued (Coady & Huckin, 1997, p. 273). Having been guilty in the past myself of requiring students to memorize vocabulary without teaching them how to do it, I thought that introducing SRS to them would give them the tools they needed to address the challenge of learning a large amount of vocabulary. I considered SRS a particularly useful method based on the assumption that if students do not have time to review newly learned information very soon after first learning it (i.e., within not much more than twenty-four hours), they are unlikely to retain it (Spitzer, 1939, p. 646), and that without a systematized way for them to study it within this narrow window, the likely result—which I had witnessed in my classes—is forgetting a majority of it.

3.2. History of SRS

SR is a learning technique in which to-be-remembered material is presented at intervals that increase over time. These increasingly spaced repetitions

cause the learner's memory to fade to a certain point before he or she is presented with a review of the learned material. The algorithm that determines the length of each interval works on the principle that increasing the time between repetitions of learned items increases both the duration and the strength of the memory according to Jost's Law, which states:

> *1. The proposition that if two learnt associations are of equal strength but of different durations, then repetition will increase the strength of the older one more than that of the more recent one. 2. The proposition that if two learnt associations are of equal strength but of different durations, then the older one will decay more slowly than the more recent one.* (Colman, 2015, p. 398)

The effects of this technique can be represented by a chart showing the forgetting curve, which dramatically illustrates the increasing length of time a piece of information can be retained in memory if reviewed at the right moment. After only five review sessions, for example, a learned item (such as a vocabulary word) should be able to be retained for many months, as shown in Figure 1.
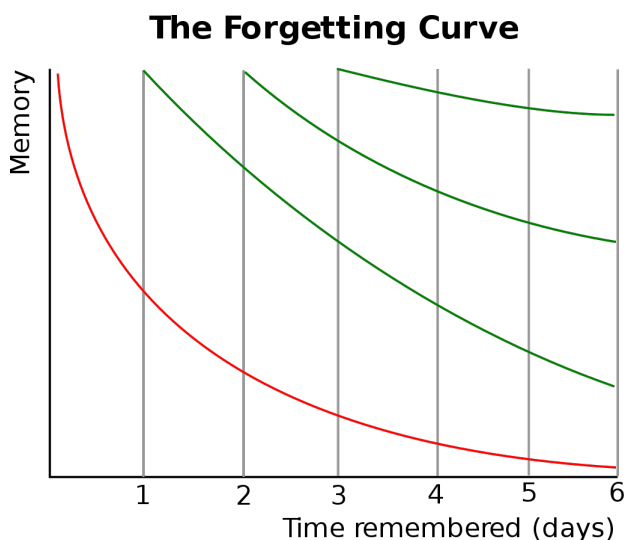

Figure 1. The Forgetting Curve[1]

SR as a principle for effective memorization is not controversial. Since Hermann Ebbinghaus (1885) published the results of his memory experiments—in which he memorized lists of thousands of made-up words, testing himself repeatedly over a period of years to discover the minimum gap between review sessions necessary to retain a word in memory—the effectiveness of spaced repetition has been tested and verified many times over (Dempster, 1988; Hintzman, 1974; Melton, 1970; Underwood, 1970; Von Wright, 1971). In the first half of the twentieth century, Spitzer (1939) published the results of an experiment that tested the spacing effect on 3,600 Iowan sixth graders. His results widely confirmed Ebbinghaus's findings that forgetting occurs very rapidly after only one presentation of a to-be-learned item, and

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[1] Decreasing rate of forgetting over time with spaced repetitions. The vertical axis represents memory capacity from 0 (at the bottom) to 100 percent (at the top). Each line of the horizontal axis represents one day. The red curve signifies the rate of

forgetting after the initial learning of an item and the green curves signify the forgetting rate after repetitions of the item made on subsequent days.

that this interval exponentially increases after each successive repetition. In the same year, Cain and Willey (1939) published the results of tests on the spacing effect that they carried out on a group of 59 college students, which aligned with Spitzer's findings. Their test hearkened back to Ebbinghaus's own method in that it used three-syllable nonsense words.

3.3. Effectiveness of SRS

Although the effectiveness of SR in memorization had been demonstrated by numerous scholars (see Cepeda et al., 2006, for a thorough literature review), I agreed with Dempster (1988, p. 631) that "the relative lack of applied research in educational settings [was], from an educational perspective, the most serious shortcoming of research on the spacing effect." And, if few studies had been undertaken on the spacing effect in general, fewer still—I could not find any—had looked at SR in the Arabic language classroom.

Starting as early as the 1980s, computer programmers began to develop flashcard software that utilized the principles of SR (see Teninbaum, 2017, pp. 289-293, for a brief review). Since their introduction, a number of SRS programs have enjoyed a limited amount of popularity among language learning enthusiasts and others, but have not become widely used, a case which may mirror a general failure to apply SR methods in the classroom (Dempster, 1988). These programs are based on an SR algorithm that automatically schedules the electronic flashcards that users have created for material they want to learn. Many use the SM-2 algorithm developed by Piotr Wozniak (2018). Each day the user opens the program and sees a list of all cards scheduled for that day according to the SR algorithm. Users review these cards, rating each one based on how well they remember the information. Although programs differ in how they implement ratings, most are based on a zero-to-five scale similar to Supermemo's shown in Table 1 . These ratings, in connection with the base algorithm, trigger automatic scheduling of future repetitions. Terms that are well remembered are spaced so as not to be presented until the point where they begin to fade from memory, while terms that users forget are "recycled," i.e., they are placed back at the beginning of the cycle with unlearned material. The algorithm that determines whether an item will be started over completely from scratch or will be placed on a modified spacing plan differs from program to program and can depend on how many times the user has reviewed the particular card, and how many times, if any, it has been forgotten in the past. The result is that when users open the program each day, they only see flashcards they need to study for that day, plus any new flashcards they have created but have not yet reviewed. The algorithm and not the user, therefore, determines which cards will be studied on any given day, and so it is not necessary (and depending on the program, not always possible) to "get ahead" on memorization, or to "cram" for a test. The program selects which terms the user should be able to recall, and which ones are in need of review.

Table 1. Supermemo's Card Grading System[2]

Bright (5), excellent response
Good (4), correct response provided after some hesitation
Pass (3), answer recalled with difficulty; perhaps slightly incorrect
Fail (2), wrong response that makes you say *I knew it!*
Bad (1), wrong response; the correct answer seems to be familiar
Null (0), complete blackout; you do not even recall ever knowing the answer

4. Study

4.1. Framework

Steel and Levy (2013, p. 319), in the conclusion to their study of the evolution of language students' technologies over five years note, "There appears to be a gap or disconnect between what students are actually doing and where research directions in CALL [computer assisted language learning] are taking us." Even when reliable and proven techniques are known, they are often not used (Dempster, 1988). This is also true in the case of SR, yet despite the evidence in its favor, there seem to be few efforts to implement this or indeed any vocabulary-learning strategy in the L2 classroom (Bower & Rutson-Griffiths, 2016; Dempster, 1988).

In order to test the effectiveness of SRS in a classroom setting, I introduced the program Mnemosyne during the first week of my beginning Arabic course, which consists mainly of college freshmen. I required students to download this software onto their devices and asked them to use it for every vocabulary item we studied during the semester. During the first week of class, I dedicated one entire class period to explaining what SR is and how it can be applied to memorizing (Arabic) vocabulary. I began with a brief history of SR and explained how it works with human memory. I then projected the Mnemosyne program onto a big screen and showed students how to create flashcards, how to navigate the software and use the features, and how to back up their information. For a very few students, Mnemosyne would not load onto their machines, or had significant problems in display or operation. For these students, I recommended that they use another program; one decided to use Supermemo online and another downloaded Anki (the free version) to her laptop.

Mnemosyne is one of a number of programs (including websites—see Table 2) available that use some form of the expanding-schedule SR algorithm. The most popular of these at the time of the study (based on web searches for "spaced repetition software") were Anki, Supermemo, and Mnemosyne in that order. The popular online flashcard website Quizlet also gives users the ability to incorporate an SR algorithm into their flashcards. Originally included only with a paid subscription to Quizlet Plus and known as "Long-Term Learning," it is now available without charge to all users. Various SRS

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2 Grading system first introduced by Supermemo in 1987. This scale, or some version of it, has subsequently been used by most

other SRS programs, including Mnemosyne and Anki.

programs include a variety of benefits of the most popular options available today. Nakata (2011) compared nine of the most popular ones, and most are still available at the time of this writing. However, in the thirteen years since that article was published, the program he deemed best (iKnow!), as well as WordChamp, have become defunct. Of the four programs I considered, only Mnemosyne was completely free and non-commercial at the time I introduced the study to my students in the fall of 2017. Supermemo and Anki both offered free options, but these were either older versions (in the case of Supermemo) or computer-based versions that did not include the mobile application (in the case of Anki). Quizlet, as noted above, only offered SR with its premium subscription "Quizlet Plus" at the time. Each of these programs uses some version of an algorithm originally developed by Supermemo,[3] although the current Supermemo algorithm is more refined than those of the other programs (Wozniak, 2018).

Table 2. Features of Popular SRS Programs[4]

	Supports Arabic	Creates Sister Cards[5]	Ability to attach audio/images/video	Ability to change card score	Web-based or installed	Cost	Ability to customize style[6]
Anki	yes	yes	yes	yes	installed	Free (iOS mobile application, $24.99)	yes
Supermemo	yes[7]	yes[8]	yes	yes	installed (web-based also available)	$70 (older versions/web-based version free)	yes
Mnemosyne	yes	yes	yes	no	installed	free	yes
Quizlet	yes	no[9]	yes	yes	web-based	free	yes
Quizlet Plus	yes	no[9]	yes	yes	web-based	$2.99/month	yes

After introducing SR and ensuring that students were set up with Mnemosyne (or a similar program), I asked them to create vocabulary cards in their program of choice as we learned each new vocabulary list in the textbook. I checked in with students at least weekly as a class to ask how their vocabulary study was going, to address any issues they were having and to encourage them to continue using the program, assuring them that it should help them remember a great deal of vocabulary, which I had found to be the case in my own study. Occasionally, I helped individual students who were having technical difficulties with the program, and noted early on that these students seemed less enthused about the program than I had anticipated. Still, with weekly encouragement and my own knowledge of the benefits of SR, I assumed that the majority of students were likely benefitting from using the program. I continued in that assumption until after the academic year was completed and I began analyzing the results of the questionnaire.

4.2. Questionnaire

The idea for distributing a questionnaire to my students arose out of a desire to understand how they were reacting to and interacting with SRS. The purpose of the survey was to ask students questions that would elicit their perceptions of how well using SRS worked for them in their vocabulary study, and how this compared to how they were used to studying vocabulary. I wanted to find out how easy students found SRS to use, how motivating it was, whether it made their vocabulary study sessions faster, and whether the overall experience of using SRS benefited them.

The survey was intended for students in all sections of the first and second-semester beginning Arabic courses I teach (four classes total over fall semester, 2017 and spring semester, 2018), and was administered after the end of the spring semester to students enrolled in any section over the course of the academic year. I did not compel students to complete the survey, but I did encourage them to do so, and I expected that it would take no more than five to ten minutes to complete. The survey was electronic, administered through Google Forms, and consisted of fourteen questions, including two questions for statistical purposes, as seen in Appendix. Out of 41 students across all four sections,[10] 22 participated.

The results of the survey surprised me, especially since students did not seem to find SRS significantly more helpful or easier to use than traditional study methods. It also became apparent that students procrastinated, often skipping flashcard reviews several days in a row. While this type of typical student behavior may not present a problem for most forms of study, it adversely affects SRS study because of the necessarily rigid scheduling demanded by the algorithm. If students postpone their cards for one day, they will have approximately double the number of flashcards to review the following day. If they procrastinate too many days in a row, the accumulated cards can become overwhelming. This may have been one of the factors that led several of my students to give up on SRS altogether.

The questionnaire asked students about their experiences using SRS compared to using traditional flashcards and to using no particular method at all. Table

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[3] This is the SM-2 algorithm, which the company now offers as open source.

[4] Important features of the major SRS programs discussed in this paper.

[5] Sister card creation refers to the ability to produce a second card that tests the vocabulary in the other direction. For example, if the user creates an English-Arabic vocabulary card, an Arabic-English card for the same term would also be created.

[6] E.g., font, font size, color, etc.

[7] Although Supermemo supports Arabic, right-to-left formatting is not automatic.

[8] This function is not automatic in Supermemo, but can be accomplished manually.

[9] Separate sister cards are not created, but the user is allowed to study definitions (foreign-language to native-language display) or terms (native-language to foreign-language display), although it is not clear whether or how Quizlet's algorithm scores each side of a card.

[10] Total combined enrollment over these sections was 51 students. However, ten of those enrolled in Beginning Arabic II had also taken a section of my Beginning Arabic I course.

3 shows the results of the main body of the survey, which consists of two sets of four questions each about SRS and "traditional" methods respectively. I intentionally left "traditional" undefined in these questions to allow students to compare SRS study with any other study method they currently use or had used in the past. This could include studying non-SR, paper flashcards, or any other method students perceive as traditional, such as rote repetition, L2-L1 translation, or any other common study method (Barcroft, 2009). Results indicate that most students found both SRS and traditional methods helpful, although a majority also found SRS more time-consuming and more difficult than traditional study. However, students on average found studying with SRS more motivating than traditional methods, a significant point since research suggests that motivation is an important factor in determining student success in L2 acquisition (Gardner & Lambert, 1972), and that teaching students strategies tends to improve their motivation (Dörnyei, 1994).

Table 3. SRS vs. "Traditional" Study[11]

	5[12]	4	3	2	1
How helpful do you find SRS?[13]	32%[14]	50%	18%	0%	0%
How helpful do you find studying using traditional methods?	23%	55%	18%	5%	0%
How easy or difficult do you find using SRS?	23%	27%	23%	23%	5%
How easy or difficult do you find studying using traditional methods?	5%	50%	41%	5%	0%
Do you find using SRS takes more or less time than traditional methods (including traditional flashcard methods)?	14%	32%	18%	36%	0%
Do you find using traditional methods (including traditional flashcard methods) takes more or less time than SRS?	0%	32%	14%	45%	9%
How motivating do you find studying with SRS compared with traditional methods (including traditional flashcard methods)?	9%	32%	27%	27%	5%
How motivating do you find studying with traditional methods (including traditional flashcard methods) compared with SRS?	5%	27%	50%	9%	9%

Despite the increase in motivation that students reported, I was disheartened to note that the majority of them reviewed their flashcards only two or fewer days per week, as seen in Figure 2, and that that almost all students skipped reviewing flashcards on some days of the week, with weekend days conspicuously overrepresented (see Figure 3).
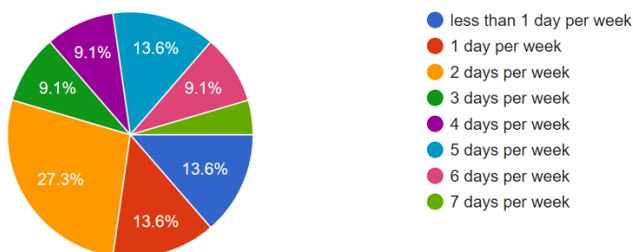

Figure 3. Flashcard Review Avoidance[16]
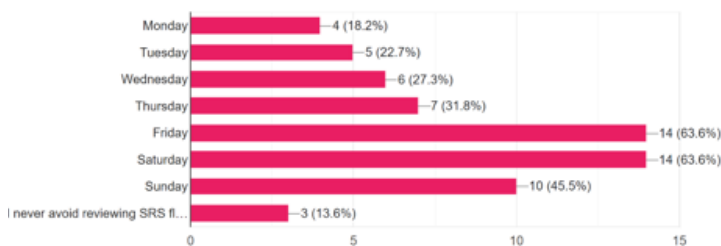
4.3. SRS: Theory vs. Practice

My memories of memorizing large amounts of Greek, Latin and Arabic vocabulary using SR flashcards (paper flashcards at the time) are almost all happy ones. Since SR had helped me, I assumed it would help my students as well. However, I failed to consider one of the most important differences between the theoretical benefits of SRS that can be obtained in a laboratory or a controlled experiment and L2 learners' actual performance in a classroom: the degree to which students actually implement SRS into their study. SRS works best, or perhaps only works, if users complete all of their

Figure 2. Flashcard Review Frequency[15]

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[11] Table corresponding to Questions 2–9 of questionnaire (excluding first two statistical questions), which focus on aspects of SRS vs. traditional study.

[12] Numbers 5–1 at the top of the table represent the most favorable (5) to the least favorable (1) responses and correspond to the multiple-choice answers for Questions 2–9 of the questionnaire as follows (see Appendix for full text):
I find studying using SRS/traditional methods:
- 5 – extremely (helpful/easy/motivating) / takes much less time
- 4 – somewhat (helpful/easy/motivating) / takes somewhat less time
- 3 – neither (helpful/easy/motivating) nor (unhelpful/difficult/unmotivating) / takes neither more nor less time

- 2 – somewhat (unhelpful/difficult/unmotivating) / takes somewhat more time
- 1 – extremely (unhelpful/difficult/unmotivating) / takes much more time

[13] The first column contains questions 2–9 of questionnaire. Please note that questions are regrouped here for clarity, and appear in a different order in the original questionnaire (see Appendix).

[14] Percentages indicate proportion of students that chose the response corresponding to the number given in column.

[15] Chart corresponding to Question 10 of the questionnaire showing how often students reported reviewing flashcards.

[16] Graph corresponding to Question 11 of the questionnaire showing which days students reported avoiding flashcard review.

repetitions at the scheduled times. I found that students often missed some of their flashcard reviews, or did them late, or even quit doing them altogether after a certain period of time, which probably negated most of the benefits I had hoped SRS would provide.

In theory, SRS should not only improve vocabulary acquisition, but it should also save time in doing so. According to the questionnaire, however, more students found that SRS either took more time or that there was no time difference between SRS and traditional study methods. Theoretically, SRS's algorithm, which increases the intervals at which students study a particular vocabulary item, will mean that they spend much less time learning and maintaining knowledge on a specific subject. The reality, however, is that if students do not use the method properly, or do not use it at all, its benefits will be negligible.

5. Discussion and Conclusions

5.1. Summary

In this article I have recounted my experience introducing SRS flashcard study to my college-level Beginning Arabic students in an effort to help them with vocabulary acquisition, especially during the first several weeks of the course, a time when students are struggling to learn the sounds of Arabic together with its writing system. I have reviewed the literature that demonstrates the effectiveness of SR, and have reviewed the results of a questionnaire that surveyed my students' reactions to using SRS for L2 vocabulary learning. The process of introducing SRS in my Beginning Arabic classroom and surveying students' attitudes toward it points to some of the challenges inherent in incorporating SRS for vocabulary acquisition in a L2 course. Chief among these challenges seems to be the problem of motivating students to use SRS as part of a regular and consistent learning regimen.

5.2. Challenges

Motivation was the most serious obstacle I faced in my attempt to implement SRS in my Beginning Arabic class, and beyond that, according to Gardner and Lambert (1972), motivation, or the lack thereof, can be among the determining factors in why some students are better at L2 learning than others. Intrinsic motivation in particular (e.g., feelings of accomplishment a student might gain from successfully completing a difficult activity) is key to success in motivating students to adopt a new strategy such as SRS (Dörnyei, 1994, p. 275, cited in Deci & Ryan, 1985). Extrinsic motivation on the other hand (e.g., rewards and punishments such as grades imposed by the instructor), can actually negatively influence intrinsic motivation (Dörnyei, 1994, pp. 275-276). However, if the extrinsic rewards are self-determined (autonomous) and internalized, they can lead to intrinsic motivation (Dörnyei, 1994, p. 276).

I was aware at the beginning of my study that motivation could be a problem, and because of this I decided to allow some flexibility in software choice,

although I strongly encouraged students to use Mnemosyne, which I preferred both because I was familiar with it, because it was free, and because it seemed to be more trouble-free than some other programs. At the time I began the study, I was not aware of Quizlet Plus, which several of my students, I learned, used voluntarily, even though it charged a modest fee ($1.67—now $2.99—per student, per month). Those students who used it reported it to be motivating because of its features, which included sending reminder emails, making games out of the memorization cards, and allowing students to compete against other users. These last two features tap into the phenomenon researchers call "gamification" of learning, which recent research has found to help motivate L2 students in several ways, including by "promoting students as agents of their own learning" (Abrams & Walsh, 2014, pp. 55-56), by improving accuracy in L2 conjugation, while at the same time improving students' confidence (Castañeda & Cho, 2016), and by moving students from extrinsic to intrinsic motivation (Hanson-Smith, 2016).

5.3. Reflections

SR for vocabulary acquisition was a positive experience for me. It was fun, I found it exciting, and it was intrinsically motivating. My reward for reviewing flashcards on an SR schedule was that I got to review flashcards on an SR schedule. Having spent decades learning languages through various techniques, for me SR was an intriguing experiment I could conduct on myself. This was not necessarily the case for my students. The best of them certainly succeeded in learning their vocabulary well, and some seemed excited to use SRS, but many students in my class take Arabic not because of a passion for the language, but do so to fulfill a requirement of their school or department or to fill out their credits with an interesting (albeit difficult) elective. These students, if they were intrinsically motivated to any degree, still failed to adhere to the rigorous schedule SRS flashcards require, ultimately dooming any chance of the method meaningfully benefitting them in their acquisition of vocabulary.

My goal had been to give students tools that I myself had used to great success, and more than that, that I had found enjoyable. What I did not consider was how or whether it would actually work for them. I also failed to take into account how it might impact my students' "quality of life," a consideration which Allwright (2005) stresses should be an important component of practitioner research. This paper was originally intended as a quantitative research study that would show a successful implementation of SRS in the language classroom. Upon reflection, and after a questionnaire that failed to demonstrate my original hypothesis, it has become a piece of practitioner research in which rather than teaching my students a new method to acquire vocabulary—I did do this, and to be fair, some of them eagerly continued to use their SRS flashcards even after class ended—the process taught me something. It gave me insights into the "life" of the language classroom, and helped me realize that just because something works for a seasoned and motivated researcher, it may not necessarily work for a majority of

students, and that even if it does work, "quality of life" according to the model Allwright (2005) has laid out should be taken into account.

Whatever failures I may have experienced in my attempt to implement SRS in my classroom, there were still successes. A number of individual students found SRS to be a useful method, and continued to use it both for Arabic and to study other subjects after class ended. In addition to this, the firsthand knowledge I gained about the importance of "quality of life" in the language classroom was useful to me both personally and on a larger level. If, for instance, at some point in the future I decide to introduce a new method or consider other curricular changes, I am now aware of what types of problems and challenges I may face. My relationship with my students has also shifted; where before I saw myself as the expert and them as the learners, I now view the classroom as a learning venue for students and teacher alike. Their experiences, their insights can help guide whatever changes I might consider beneficial to the whole class.

5.4. Recommendations

Beyond noting that SRS failed to have the desired effect in my classes and reviewing some of the reasons for this, it is appropriate here to make some recommendations for anyone wishing to introduce a new learning method such as SRS in the L2 classroom. First and foremost, curriculum designers should consider how much (extra) effort they are asking students to expend. Although SRS has been shown to save study time in the long run, the initial setup and first stages of the method can prove time consuming. I asked students to download and become familiar with a new program, to use the program to make flashcards for every new vocabulary item they learned and then to study those items using the software every day. All of this was in addition to their regular homework, including written and online drills, speaking assignments they had to record and submit and preparing for quizzes and tests. Although I told them about my positive experiences and tried to encourage them with regular reminders in class, I did not have time to delve deeply into SRS studies or to show them the kind of success stories that had convinced me of the benefits of SRS. One way to improve this situation would simply be to devote more time to exploring the history, benefits, and theoretical underpinnings of SRS with students. Schedules would have to be taken into consideration, and homework load would probably have to be lightened somewhat to make this practicable. Making SRS compulsory may have demotivated students from using the technique. Some amount of compulsion may be unavoidable in introducing a new study method, but letting students choose their own program may help them not to feel that a possibly unappealing program, or one lacking in features, is being forced on them (Dörnyei, 1994, pp. 275-276).

Allowing students flexibility in choosing their own SRS program and explaining the benefits and drawbacks of each program could improve student motivation (Dörnyei, 1994, p. 281). If students can find an SRS program that contains features that appeal to them, that could serve to keep them motivated. Instructors, therefore,

should be aware of differences between the various SRS programs available so that they are able to help students choose a program that suits them. My students found Quizlet Plus more "modern-looking" than other programs. This point should not be overlooked, as research suggests that increasing "attractiveness" of course content can increase student motivation (Dörnyei, 1994, p. 281). If students perceive an SRS program as being "plain" or "old-fashioned," they may find it off-putting or unenticing, which could dissuade them from doing their daily practice. One student told me that Mnemosyne's interface looked like something from the 1990s. This was not a compliment.

To help students adhere to a consistent study schedule, it may be beneficial to encourage them to self-monitor their flashcard reviews. This could help them recognize the link between effort and outcome (Dörnyei, 1994, p. 281). Another important step would be to discuss classroom goals with students (Dörnyei, 1994, p. 282), and to encourage them to set their own goals (Dörnyei, 1994, p. 281). Regular, informal, in-class group check-ups could therefore play an important role.

5.5. Future Plans

Students' struggles to learn vocabulary led me to introduce SRS, design a survey, and plan a research paper. My struggle with the process led me to revise the way I teach the first weeks of Beginning Arabic I. Rather than continuing my search for *the* method that will enable students to learn the daunting number of vocabulary words the textbook introduces, I have deemphasized this vocabulary during the first weeks of class, preferring to focus instead on the sounds of Arabic and on its alphabet. I do reintroduce and review this vocabulary in later lessons, but taking the focus off of vocabulary in the early days of class has helped students learn the alphabet in a less stressful environment (for the reslationship between anxiety and L2 learning, see Krashen, 1982), which has improved the quality of life in the classroom for students and teacher alike.

I still believe that SRS can be a valid method to acquire L2 vocabulary and may still use it to some extent in my Arabic language classes. It is, however, only one of a number of methods that students can use to successfully increase their Arabic vocabulary. Such learning strategies as mass exposure to comprehensible input, the use of mnemonic devices and even rote memorization can all benefit students to one degree or another. Students need intrinsic motivation whichever method they use, and in the end, the method that is best may be the one that they will stick with.

helping me format the tables and figures.

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Conflict of Interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Appendix[17]

Spaced Repetition Software in Arabic Vocabulary Acquisition

Please take this anonymous, online survey to help us understand Arabic students' usage of spaced repetition software flashcards (such as Mnemosyne or Anki).

If you choose to participate, you will be asked questions about your study habits. Your responses will help to improve future Arabic courses at GWU.

Participation is completely voluntary and anonymous. Your choice to participate or not will not affect your standing at this university nor your grade in any way.

If you have questions or comments about this survey, please email Prof. Cory Jorgensen (cjor@gwu.edu).

This survey has been designed to assess your perception of the usefulness of spaced repetition software learning strategies. The information you provide will remain anonymous.

What is your major?
If you have an Arabic language course this semester, who is your professor?
1. How would you rate your ability at learning languages?*[18]
Mark only one oval.
very good
good
fair
poor
very poor

The following questions refer to studying using spaced repetition flashcard software (SRS) such as Mnemosyne.
2. How helpful do you find SRS?*
Mark only one oval.
I find studying using SRS extremely helpful.
I find studying using SRS somewhat helpful.
I find studying using SRS neither helpful nor unhelpful.
I find studying using SRS somewhat unhelpful.
I find studying using SRS extremely unhelpful.

3. How easy or difficult do you find using SRS?*
Mark only one oval.
I find studying using SRS extremely easy.
I find studying using SRS somewhat easy.
I find studying using SRS neither easy nor difficult.
I find studying using SRS somewhat difficult.
I find studying using SRS extremely difficult.

4. Do you find using SRS takes more or less time than traditional methods (including traditional flashcard methods)?*
Mark only one oval.

I find studying using SRS takes much less time.
I find studying using SRS takes somewhat less time.
I find studying using SRS takes neither more nor less time.
I find studying using SRS takes somewhat more time.
I find studying using SRS takes much more time.

5. How motivating do you find studying with SRS compared with traditional methods (including traditional flashcard methods)?*
Mark only one oval.
I find studying using SRS extremely motivating.
I find studying using SRS somewhat motivating.
I find studying using SRS neither motivating nor unmotivating.
I find studying using SRS somewhat unmotivating.
I find studying using SRS extremely unmotivating.

The following questions refer to studying using traditional methods (including traditional flashcard methods).
6. How helpful do you find studying using traditional methods?*
Mark only one oval.
I find studying using traditional methods extremely helpful.
I find studying using traditional methods somewhat helpful.
I find studying using traditional methods neither helpful nor unhelpful.
I find studying using traditional methods somewhat unhelpful.
I find studying using traditional methods extremely unhelpful.

7. How easy or difficult do you find studying using traditional methods?*
Mark only one oval.
I find studying using traditional methods extremely easy.
I find studying using traditional methods somewhat easy.
I find studying using traditional methods neither easy nor difficult.
I find studying using traditional methods somewhat difficult.
I find studying using traditional methods extremely difficult.

8. Do you find using traditional methods (including traditional flashcard methods) takes more or less time than SRS?*
Mark only one oval.
I find studying using traditional methods takes much less time.
I find studying using traditional methods takes somewhat less time.
I find studying using traditional methods takes neither more nor less time.
I find studying using traditional methods takes somewhat more time.
I find studying using traditional methods takes much more time.

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[17] Text of electronic questionnaire distributed to students.

[18] Asterisk indicates required field.

9. How motivating do you find studying with traditional methods (including traditional flashcard methods) compared with SRS?*
Mark only one oval.
I find studying using traditional methods extremely motivating.
I find studying using traditional methods somewhat motivating.
I find studying using traditional methods neither motivating nor unmotivating.
I find studying using traditional methods somewhat unmotivating.
I find studying using traditional methods extremely unmotivating.

The following questions refer to your SRS study habits.
10. How many days per week do you typically review your SRS flashcards?*
Mark only one oval.
less than 1 day per week
1 day per week
2 days per week
3 days per week
4 days per week
5 days per week
6 days per week
7 days per week

11. Which days per week, if any, do you typically avoid reviewing your SRS flashcards (check each that applies)?
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Sunday
I never avoid reviewing SRS flashcards

12. According to the "statistics" window In Mnemosyne, what is your average percentage (estimated) on the "retention score" tab?