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Written Socratic Dialogue as a self-learning technique in a Pharm.D programme

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Abstract

As part of a reform of the Pharm.D programme at the Université de Montréal's Faculty of Pharmacy in 2007, self-learning was proposed as a valued instructional technique to develop lifelong learning competencies for the students. In this context, Written Socratic Dialogue (WSD) emerged as the primary technique used by professors. WSD is to be conducted in three steps: (1) self-learning activities; (2) student-faculty interaction sessions; and (3) wrap-up activities. The objectives of this study were to evaluate the place of WSD as part of a range of instructional techniques and eventually to formulate recommendations. Student perception on diverse instructional techniques was determined using a validated survey, which also allowed technique appreciation and ranking analysis, as well as a better understanding of student-faculty interactions. The survey results showed that the benefits of WSD are improved time management, faster learning, and opportunities for in-depth learning.

Keywords: *Instructional Techniques, Self-Learning, Self-Paced Learning, Socio-Constructivist Approach, Socratic Dialogue*

Introduction

Since 2007, there has been a shift in pedagogical philosophy at the Université de Montréal's Faculty of Pharmacy, which is resulting in the establishment of a competency-based learning environment and a learner-centred curriculum. In order to respect the students' pace and learning styles, professors have explored a variety of instructional techniques and coaching methods to foster student autonomy in learning (constructivist approach) and collaborative learning (socio-constructivist approach) (Université de Montréal, 2004). As a result, the Faculty has witnessed a broad and consistent integration of self-paced learning techniques within the undergraduate Pharm.D curriculum. One of these instructional techniques is the Socratic Dialogue defined by Reigeluth (1996: p.16) "as a type of conversational tutorial in which the tutor guides the learner to discovery through a series of questions". This technique is usually exploited orally as an oriented conversation between the trainer and the learners. In order to create self-learning material, we transformed this technique into written form. The professor creates a sequence of questions that will help the learner grasp the content; we named this structured questioning Written Socratic Dialogue (WSD). It allows learners to grasp scientific knowledge by answering the questions at their own pace, according to their schedule.

It is believed that consistent use of WSD will allow students to develop efficient, lifelong learning strategies (Tremblay, 2003), as well as help them acquire the planning, organisational, and time management skills required for pharmacy practice. Based on Freeman *et al*.'s (2014) meta analysis, active learning is also expected to reduce failure rate. In fact, Hake (1998), who studied a cohort of 6,542 high school and university students enrolled in physics classes, clearly demonstrated that interactive engagement techniques increase student commitment, leading to significantly better results in comparison with traditional techniques (see also Kuh *et al*., 2005). In the specific case of pharmacy education, a study by Pierce and Fox (2012) reveals the positive potential of non-traditional instructional techniques; indeed, they show that the flipped-classroom, a non-traditional instructional technique, is more efficient than traditional lectures, improves grades, and is preferred by students.

Active learning is in line with the vision, values, and principles that guided the design of our Pharm.D curriculum. It is an important change in paradigm and constitutes a notable innovation of our professional pharmacy curriculum. WSD was one of the many selected techniques because it fosters the development of new roles: instructors become facilitators of learning instead of purveyors of information. "[Educators] are there to observe, support students in the learning process and provide feedback when necessary. They are not instructing in the group space or even providing all the answers to questions" (Nederveld & Berge, 2015: p.163).

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As mentioned by King (1993), they have to transform themselves from "Sage on the Stage to Guide on the Side". This change of paradigm is healthy for both learners and instructors (Voorhees & Voorhees, 2017: p.45).

Programme Description

Courses within the Pharm.D curriculum belong to five modules.

Module 1: Pharmaceutical care courses, which address a large amount of scientific knowledge such as pharmacotherapy, pharmacology and pharmacokinetics related to specific classes of drugs.

Module 2: Drugs and society courses, which are oriented towards communication between the pharmacists and the patient, and scientific communication between scientists and pharmacists.

Module 3: Professional practice courses, which offer concrete activities to improve communication skills and specific professional skills.

Module 4: Service learning, which is devoted to the design and implementation of a project that will be deployed in the community.

Module 5: Seven clerkship activities, which are offered from the first to the last year of the curriculum.

As illustrated in Table I, WSDs are mainly used in pharmaceutical care modules (to address scientific content) as well as modules on drugs and society. WSDs provide a reliable alternative to traditional lectures, in part and sometimes in whole, to promote greater cognitive involvement by students.

A prominent place was given to WSDs within the Pharm.D programme. The combination of WSD and other learning techniques adds value to the overall learning experience of this programme (Table I). However, students did not actively seek out scheduled interactions with Faculty, as proposed by our WSD implementation model. It could be beneficial to facilitate and encourage such quality interactions, as they are known to improve learning efficiency (Cornelius-White, 2007).

WSD consists of a logical sequence of questions, activities or assignments centred around a metaphor or based on previously acquired knowledge. This technique allows students to build new knowledge at their own pace. It is particularly useful for declarative and strategic knowledge. It was thus expected that WSD would be an effective teaching technique for scientific knowledge, which is often declarative within the Pharm.D curriculum. Figure 1 shows an example of a WSD related to cell biology.

Figure 1: Example of WSD

8. The figure below shows 4 types of membrane-bound receptors, which interact with hydrophilic ligands. Identify which family they are belonging to.

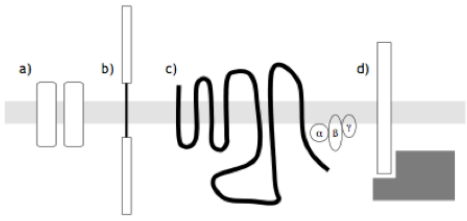

Figure 3 - Membrane-bound receptors

a) _____

b) _____

c) _____

d) _____

9. Describe the mechanism of action of receptor A shown above.

_____

_____

_____

10. Describe the particular property of receptor B.?

_____

_____

_____

11. What is the enzymatic activity found in receptor B.?

_____

_____

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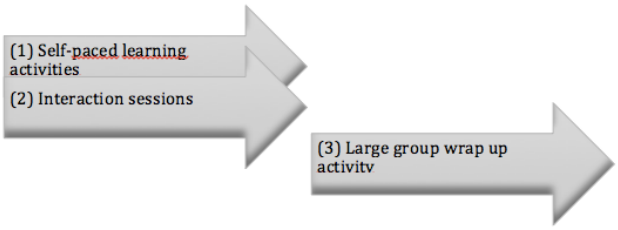
Table I: Distribution of instructional techniques within each module of the Pharm.D curriculum

Modules	WSD	Wrap up activities	Lectures	Skill labs	Oral presentation	Teamwork experiential learning	Clerkship experiential learning
Pharmaceutical care (71 credits)	40%	9%	50%		1%		
Drugs and society (19 credits)	29%	9%	57%		5%		
Professional practice (15 credits)			24%	69%	7%		
Service learning (19 credits)	1%		12%		7%	80%	
Clerkships (40 credits)							100%
Whole programme	**21%**	**5%**	**32%**	**6%**	**3%**	**9%**	**24%**

In order to answer these questions, the students would have to read a section of their textbook, consult recommended references, discuss with their peers, or consult their professor. The integration of WSDs was done using a flipped-classroom model combining: (1) self-paced learning activities; (2) optional student-faculty interaction sessions; and (3) a wrap-up activity concluding the learning sequence (Figure 2).

Figure 2: WSD implementation based on a flipped-classroom model



Self-paced learning activities offered students the freedom to work at their own rhythm, either alone or within a team, on campus or elsewhere. We provided students with spaces to work individually or in teams, but they were free to decide how to realise their self-learning activities, which we did not monitor. Meeting periods, in person or by email, could be scheduled between students and professors. Wrap-up activities could take the form of conventional lectures (multimedia presentation), case studies (a case is presented to the group for discussion) or Q&A sessions (the professor answers students' questions). The flipped-classroom model was achieved as students had previously learned by themselves before wrap-up activities were held with the professor.

In practice, self-paced learning activities consist of WSDs, which are available on the intranet, along with their correction keys. They provide a faculty-established cognitive path and are valuable learning tools for exam preparation. Biggs and Tang (2007) show the importance of high-level cognitive processing for effective learning, something that traditional approaches do not foster. Allowing students to actively build knowledge on their own has many benefits (Jensen *et al.*, 2015). As demonstrated by Touchton (2015), active learning is more difficult than passive learning; however, the payoff is greater, as it cements concepts more firmly.

This study will examine students' perspectives on WSD activities and learning tools, as implemented, to understand its added value and potential for improvement compared to other techniques in our programme.

Objectives

The evaluation of WSD activities was conducted to (1) identify the advantages and disadvantages of the WSD compared to other selected techniques; (2) describe how faculty and students interact in the context of WSD; and (3) make recommendations for improvements to the current WSD implementation.

Methodology

To gauge students' satisfaction and measure the perceived value of the instructional techniques, we developed a survey that called for responses using different scales, from the common Likert Scale to ranking scales, and also included short-answer and multiple-choice questions (MCQs).

A first version of the survey was submitted to a small group of volunteers. These volunteers were students (n=3) in the final year of the programme who had experienced several teaching techniques, including WSD. Student comments were collected to fine-tune the survey. The alignment of the survey with the objectives of the study was confirmed. Furthermore, students provided insight on the relevance and completeness of the MCQs. The same students repeated the process with a revised version of the survey, and the final version was subsequently produced. This final online version contained 22 elements.

In April 2014, the study protocol was presented to the three cohorts of students (583 in total), via a short oral presentation, prior to the administration of the survey, to encourage students' participation and clarify the intent of the survey. Two weeks later, students received an email inviting them to complete the online survey. A request for student consent was included in the survey. Thirty-one students provided only demographic data and these answers were discarded from the sample. Accordingly, 135 students were included in the sample (n=135).

Statistical analysis was performed using SPSS v.19. Descriptive statistics and *chi*-square analyses were used to interpret the data. The protocol was approved by the Institutional Health Research Ethics Committee.

About a quarter of the targeted student population responded to the questionnaire (23%, 135 out of 583). The gender ratio was considered representative (56 males: 79 females).

Survey analysis

The survey was analysed according to three components: (1) a general appreciation of the techniques; (2) a specific evaluation of each instructional technique; and (3) an analysis of student-faculty interactions in the context of the WSD.

General appreciation of the techniques

The satisfaction rate was evaluated for each instructional technique (very satisfied, satisfied, dissatisfied, very dissatisfied). WSD (73%, $p<0.0001$), lectures (89%, $p<0.0001$) and skill labs (95%, $p<0.0001$) were

appreciated or very appreciated by students, but all for different reasons. On one hand, skill labs were believed to provide students with a more authentic, case-based and peer-based learning experience. On the other hand, lectures appeared more comforting for students, as they offered thorough knowledge coverage and facilitated a common understanding of concepts. Finally, WSD offered a more flexible and convenient learning experience, allowing students to study whenever and wherever they liked. From these results, it can be inferred that combining diverse instructional techniques fostered the development of the various professional skills required of future pharmacists. Nonetheless, skill labs were statistically more popular than all other techniques (p<0.001).

Table II: Selected reasons for appreciating the three preferred instructional techniques

	WSD (%)	Lectures (%)	Skill labs (%)
I learn with my peers	19	18	**93**
I learn with case studies	37	33	**93**
I learn in a simulated context	11	15	84
I can easily reach the faculty	4	70	74
I can build a solid knowledge base	35	66	51
I am comforted regarding my understanding	13	**75**	47
I take responsibility of my learning	**74**	5	47
I acquire an in depth knowledge	35	45	32
I use the objectives as a base of learning	32	18	18
I study wherever and whenever I want	**93**	2	5
I have a clear overview of the content	26	**81**	26

Table II lists the reasons invoked by students to explain their appreciation of skill labs, lectures, and WSD in the Pharm.D programme. Having a diversity of instructional techniques proved beneficial in meeting the expectations of most students.

Specific evaluation of the techniques

In addition to providing their appreciation of each technique, students were also asked to compare techniques and establish a rank of preference. Students thus ranked some techniques first (preferred techniques), and others, last (least preferred techniques).

Techniques most often ranked first - preferred techniques.

Table III highlights the reasons given by students explaining their preference for a technique.

Skill labs, lectures, wrap-up activities and WSDs were ranked first by 61, 29, 24, and 21 students, respectively. Oral presentations and teamwork experiential learning activities were ranked first by 1 and 2 students, respectively. There was a statistical difference in the appreciation of these two groups of instructional techniques (p<0.0001).

Several reasons explain the interest shown by students in skill labs. Almost all (98%) who ranked this technique first (61 students) argued that skill labs allowed them to quickly learn useful and relevant knowledge for practice. This instructional technique most likely provided meaningful exposure to a model of practice and offered a case-based learning context.

The 29 students who ranked lectures at the top stated that lectures ensured a common and uniform knowledge-based delivery for all students (76%); fostered quicker learning (69%); helped acquire practice-relevant knowledge and skills (69%); and helped them grasp all the content (66%). Lectures provided a setting for immediate interaction and allowed live questions and clarifications. A student explained that "lectures facilitated understanding since the faculty interacts with students and can spend more time on the most difficult concepts and explain them in different ways" (#155).

The 24 students who ranked wrap-up activities in first place asserted that they facilitated exam preparation (79%) and fostered quick learning (63%) of relevant knowledge for practice (71%). According to one student: "*The objective of wrap-up activities is to bridge the gap between knowledge acquisition and pharmaceutical care by integrating all the material*" (#60).

Table III: Reasons invoked by students to rank an instructional technique first

	WSD (n=21) (%)	Wrap up activity (n=24) (%)	Lectures (n=29) (%)	Skill labs (n=61) (%)	Oral presentation (n=1) (%)	Teamwork experiential learning (n=2) (%)
Learn useful things for pharmacy practice	10	**71**	**69**	**98**	**100**	50
Learn fast	**76**	**63**	**69**	**64**	**100**	50
Interact with faculty	0	21	55	61	**100**	50
Acquire in depth learning	43	13	24	38	0	**100**
Grasp all the content	5	46	**66**	13	0	0
Manage my time	**100**	25	52	10	0	0
Make sure all students are exposed to the same content	38	54	**76**	10	0	0
Allow a good focus on exam requirements	33	**79**	38	7	0	0

Techniques most often ranked last - least preferred techniques.

Oral presentations (66%) and teamwork experiential learning (21%) were ranked last by students. Moreover, the difference between oral presentations and the other techniques was statistically significant ($p<0.0001$) with respect to the number of students who ranked it last.

Table IV lists the reasons invoked by students for ranking these instructional techniques last.

Ninety-three students ranked oral presentations as their least preferred instructional technique. They were concerned by the risk of incomplete exposure to content (69%) and the risk of variable content exposure between students (68%). They considered that oral presentations could even lead to misleading and false knowledge acquisition: "*Even with follow-up faculty interventions, it may become hard for students to unravel facts from fiction*" (#155). Other students commented: "*This technique is used too often*" (#166), "*it is a waste of time*" (#148) and "*it is often applied to knowledge that could better be learned in self-paced learning*" (#138).

The students who ranked teamwork experiential learning last (n=30) considered that this technique does not allow quick learning (61%) and is very time consuming (57%). One student reported that "*investment in teamwork experiential learning consumes time that could be allocated for exam preparation*" (#9).

WSD ranking

The 21 students who ranked WSD first found that this learning technique allowed them to manage their time efficiently (100%), learn quickly (76%), and learn in depth (43%). As one student said: "*I can better manage my study time*" (#83). This instructional technique allows students to become more accountable for their own learning.

Interestingly, the twelve students who ranked WSD last feared they would miss important knowledge (92%). Surprisingly, those students considered that WSDs do not facilitate student-faculty interactions (75%). For them, this instructional technique required much more work and readings during a short period of time. Therefore, they said, "*it is difficult to target key concepts and to assimilate new knowledge*" (#118) and "*WSD is not appropriate for learning relevant and important knowledge*" (#21).

Student-faculty interactions within the WSD model

Our research also sought to explain the reasons for the limited student-faculty interactions during WSD consultation periods, as shown in Table V for each mode of communication.

Table V: Consultation rate by mode of communication

	Weekly (%)	3 to 5 times per semester (%)	1 or 2 times per semester (%)	No consultation
By email	0	**11**	**35**	**54**
During breaks of after lectures	4	**12**	**35**	**49**
Scheduled meeting	0	1	8	**91**

Table V reveals that 46% of the students consulted their professor by email from one to five times per semester, 51% talked to their professor before or after the wrap-up activities every week, or one to five times during the semester, and only 9% of them asked for a schedule meeting. Student-faculty interactions occurred mainly during breaks or after lectures (wrap-up activities), or alternatively by email. Breaks during lectures seemed to be more convenient for students, as they allowed easy consultation. Email also offered flexibility, as it did not require time and space synchronicity.

Table IV: Reasons invoked by students to rank these instructional techniques last

	WSD (n=12) (%)	Wrap up activity (n=2) (%)	Lectures (n=2) (%)	Skill labs (n=1) (%)	Oral presentations (n=93) (%)	Teamwork experiential learning (n=30) (%)
Risk of incomplete exposure to content	**92**	0	50	0	**69**	0
Risk of variable content exposure between students	50	50	0	0	**68**	50
Does not facilitate in-depth learning	58	0	0	100	57	54
Does not allow fast learning	58	100	0	0	42	**61**
Does not leave time for other activities	50	0	50	100	33	**57**
Not focused on the content required for the exam	42	50	0	0	31	50
Does not facilitate own time management	17	0	50	0	30	50
Generates frictions within the team	0	0	0	100	24	32
Does not allow interactions with faculty	**75**	0	50	0	20	14
Content is not focused on knowledge required for practice	58	50	0	100	20	47

Student perception of faculty availability

Finally, students' perception of the faculty's availability is described in Table VI.

Table VI: Perception of students regarding faculty availability

	Available (%)	Poorly available (%)	Not available (%)	I don't know (%)
By email	**52**	4	0	44
During breaks of after lectures	**50**	13	0	37
Scheduled meeting	11	6	2	81

From the first column, we can understand that students who needed help preferred emailing their professors or asking questions during wrap-up activities, while a few of them chose to meet their professor. On the other hand (last column), we noted that many students couldn't even assess the availability of their professors, as they did not even ask for help.

Future plans

The Pharm.D programme was designed from the ground up to incorporate diverse instructional techniques, thus providing a rich learning environment in accordance with the programme's objectives. However, we found that the abundant use of WSD had unexpected effects. The following sections present recommendations to facilitate the implementation of WSD within undergraduate programmes and to avoid pitfalls.

We noted that satisfaction with WSD varies between students. According to our research, we believe that timing, workload, and implementation problems were intrinsic issues and may have interfered with the implementation of the WSD model.

Timing problems

Autonomy means freedom to act according to one's principles and choices. For a student, this can mean choosing the time, means, and aims of learning (Legendre, 2005). Moreover, Brydges *et al*. (2010) reveal that unsupervised learning is problematic and that a level of supervision must be maintained. Yet, the learner must be able to determine their training needs, formulate objectives, identify resources, select and use appropriate strategies, and evaluate learning outcomes. To reconcile these elements, the implemented WSD model provided guidance to students and set limits to their autonomy. It was expected that students would accomplish their self-paced learning activities within the scheduled periods. It was also expected that teachers would apply the technique and make themselves available during those scheduled periods.

The collected data revealed that students exercised their autonomy by choosing to work when and where they wished. We observed that they preferred to realise their self-paced learning activities during evenings and weekends, and at home rather than on campus.

Recommendation 1: Establish and promote asynchronous communication techniques to enhance the WSD experience.

Workload problems

Another unexpected effect was related to the density of activities scheduled in the Pharm.D programme. The workload is sizeable and activities take place at a rapid pace. Students must therefore often prioritise some activities and postpone others they consider less critical. An example would be to privilege the preparation of an upcoming exam rather than working on a WSD activity, as planned in the programme schedule. According to students, WSDs are not completed during the hours allocated for it. One student reported: "*Self-paced learning periods are used to catch up, or study for the next exam* […]" (#93).

Thus, the way the programme is organised is the reason why teachers were rarely consulted during their availability periods. From the perspective of students, consultation periods come too quickly and would be more useful just before an exam. As reported by one student: "[…] *when I deepen my knowledge and I realise really in-depth study, consultation periods are generally things of the past* […]" (#6).

Recommendation 2: Consider adjusting the workload within the programme either by extending the programme length or reducing the total content.

Implementation problems

In its current form, the WSD model consists of a logical sequence of questions to be answered, in electronic PDF format. Students can record their answers on the electronic form or print the document and write their answers manually. The correction key is the only feedback provided to the students to validate their answers. Typically, many students do not even try to perform the self-paced activity on their own. They simply study the correction key. Furthermore, teachers cannot assess the progress of their students during self-paced activities.

However, WSD is a technique that lends itself to an interactive, online delivery. It would be easy to upload questions and provide answers as immediate feedback after the students enter their own answers. Accordingly, students would only have access to the key after answering the question. Such an online version could also allow professors to monitor the student learning progress. Indeed, if they were able to "look over the students' shoulders," professors could provide rapid feedback to students based on their progress. Training teachers to use digital tools, especially for coaching and feedback, would improve students' learning experiences.

Pashler *et al.* (2007) conclude that feedback is a critical component of learning and it is particularly effective after errors have been made.

Recommendation 3: Convert WSD static material into interactive online material, and train teachers to monitor students online.

Limitations

Gender and number of years in the programme most likely had an impact on student answers for some sub-scales and items. This impact was not formally evaluated; results and conclusions should therefore be interpreted accordingly.

Conclusion

In this article, we compared students' perceptions of WSD with other instructional techniques used in the undergraduate Pharm.D programme of the Faculty of Pharmacy at the Université de Montréal. The benefits of WSD, as mentioned by students, are the self-management of their time, faster learning, and the opportunity for in-depth learning. The disadvantages students cited include the fear of missing concepts and limited interaction with teachers.

This study highlighted and provided an understanding of the scarce interaction between students and faculty. Our results explain this situation as follow: time and space synchronicity did not facilitate interaction; the programme workload reduced the availability of students; and finally, the static nature of the WSD implementation could not be adapted to the reality of today's students.

The Pharm.D programme was designed to include a diversity of learning techniques, and it has progressed from being a teacher-centred to a learner-centred paradigm. In line with this philosophy, we propose three recommendations to enrich the learning experience: (1) promote asynchronous communication channels; (2) adjust the workload of the programme; and (3) convert static WSD material to interactive, online learning material.

We believe that a balanced mix of teaching techniques (lectures) and learning techniques (self-paced activities) would be beneficial and rewarding for both students and teachers. WSD allows students to interact with peers to build knowledge in accordance with a competency-based curriculum.

Finally, it is important to consider that this study only takes into account students' perspectives on a single implemented model of WSD. Although student perception is certainly important, the choice of a particular instructional technique should primarily be based on the faculty pedagogical philosophy and desired curriculum outcomes.

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