Enhancing Nursing Students’ Drug Calculation Skills Through Self-directed Learning

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The ability to do self-directed learning (SDL) is beneficial to nursing students in developing a lifelong learning habit that will stand them in good stead in their future careers. This is because nurses not only have to acquire medical knowledge throughout their formal education, they also need to constantly refresh and update their knowledge even after they graduate. For example, the correct methods of doing drug calculation can easily be forgotten without regular practice. If nurses are able to regularly refresh their knowledge of the correct mathematical calculations and important formulae for drug calculation through an easily accessible learning interface, medical errors would less likely occur in hospitals. With the advent of information technology, online resources for honing one’s skills in SDL are widely available. Nevertheless, the habit of using these resources frequently and effectively still needs to be cultivated.

Outcomes and Methodology

This project aims to study whether SDL using online resources can improve our nursing students’ ability to do drug calculation. A website which aimed to foster SDL skills was created for nursing students who took the module NUR2114 “Medical-Surgical Nursing I”. This website (Figure 1) emphasised the drug calculation component in the module. Students could access the website at any time and from any place that they prefer, and they could study the drug calculations as many times as they wished.

Figure 1. The main page of the website on drug calculation for NUR2114.
The website not only facilitated the learning of the basics of drug calculation, it also included resources and functions which would enhance students’ knowledge of this component of NUR2114. The website’s exercise section (see Figure 2) allowed students to practice the calculations they learnt, and the website’s forum enabled them to post and discuss questions with their peers. The students could also communicate with their tutors through emails, in addition to regular lectures and office hours. Other useful links to additional learning resources were also provided in the website.

A pre-test/post-test research design experiment was used to measure the impact of such an intervention. The subjects were second year nursing students who took NUR2114 in the first semester of Academic Year 2010/2011. A total of 93 students enrolled for this module. While all the students had the same rights in accessing the web resources, participation in this teaching experiment was voluntary and anonymous.

Among the 81 students who completed the pre-course assessment and survey in the first lecture, 80 of them also completed the post-course assessment and survey towards the end of the semester.

**Data Collection**

The assessments and surveys were administered before and after the practicum to measure the impact of online SDL. Specifically, the pre-course drug calculation assessment and survey were conducted at the very beginning of the semester before students embarked on any online SDL activities. This served as the baseline data. Students took the post-course drug calculation assessment and survey after using the website for ten weeks. The two sets of results were compared and analysed to evaluate the impact of the intervention on students’ SDL skills. The SPSS statistical software package was used to analyse the data collected.
Table 1. Results of the pre- and post-course self-directed learning tests.

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<tr>
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<th>Pre-course Self-Directed Learning</th>
<th>Post-course Self-Directed Learning</th>
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<tbody>
<tr>
<td>Mean (SD)</td>
<td>80.75 (2.463)</td>
<td>99.5 (0.303)</td>
</tr>
<tr>
<td>Minimum-Maximum</td>
<td>10-100</td>
<td>80-100</td>
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Figure 3. Histograms showing the results of the pre- and post-course SDL tests.
Results & Analysis

The pre- and post-course SDL assessments and surveys were analysed and summarised as follows:

Profile of students

- Before doing the SDL activities in the course, 85% of the participating students had not learnt about drug calculation, and only half of these participants had ever used online resources as a study aid in the past. Additionally, more than 83% preferred traditional pedagogies (e.g., lectures, tutorials, and laboratory sessions) to online learning.

Improvements in learning

- The participants experienced a dramatic improvement in their knowledge of drug calculation after doing the SDL activities (See Table 1 and Figure 3). The average score in the pre-course SDL test was 80.75 (with a standard deviation of 2.46), but it significantly improved to 99.5 (with a standard deviation of 0.30) in the post-course SDL test.

In addition, the data also indicated the following:

- 89% of the participants used the online web resources provided in this project throughout the experiment.
- 90% of the participants enjoyed the website’s SDL activities.
- 96% of the participants believed that for basic drug calculation, the SDL activities can be good substitutes for traditional pedagogies.
- 96% of the participants agreed that after this project, they were more confident about doing drug calculations during their hospital attachments.

The participants also shared their experiences regarding the use SDL as a teaching method. Some of the representative comments we garnered were as follows.

The topic is suitable for SDL activities

On whether drug calculation is a subject that is suitable to be learnt through SDL activities:

- “Drug calculation can be learnt easily through self-directed learning.”
- “It’s a very easy topic so do not need a lecture on it. Self-learning is sufficient.”
- “Basic [d]rug [c]alculation is easily learnt and is simple math. Therefore it can be a self-directed learning.”
- “No need to waste time we can learn ourselves.”

Sufficient foundation knowledge in mathematics facilitates SDL

On whether students have sufficient knowledge in mathematics to conduct SDL:

- “Basic drug calculation is easy to learn by self-directed learning as we have already have the foundation for basic math and thus easy to learn and do the calculations.”

SDL makes it less stressful

On whether SDL for drug calculation is less stressful than learning the same knowledge in a class:

- “I find it better to learn without stress [and] at my own.”

SDL offers flexibility in learning

On whether the SDL approach was more flexible for learning drug calculation, students can study the materials at their preferred pace:

- “Self-directed learning is suitable for calculation as different people require different pace to comprehending time. Able to understand more.”
- “Different people have different ways of understanding formula/concepts during calculation.”
Immediate feedback provided

On whether the SDL interface provided immediate feedback to the students:

- “[The] online quiz was helpful as it provides information and we can get back the results immediately. In this way, we can learn from our mistakes.”

Sufficient resources in the SDL interface

On whether the SDL interface provided adequate resources:

- “The online resource and materials had sufficient information to learn.”

Other positive comments from students included the following:

- “Helps us to understand better”
- “Self-directed learning is awesome.”
- “Self-direction leads to have discovery.”
- “We will remember more if self-directed.”

Concluding Remarks

In conclusion, current knowledge about drug calculation is essential for nurses to reduce their risk of committing medication errors and enhancing patient safety. In this regard, nurses need to keep maintaining and updating their knowledge of drug calculation. In this teaching experiment, we introduced an SDL interface with online resources to our nursing students, and the impact of this learning method was evaluated. A comparison between the pre-course and post-course assessments and surveys suggested that the learning method using SDL interface enhances our students’ learning experience. They felt that the SDL interface was a suitable tool for learning drug calculation. Overall, the teaching practicum was successful. Colleagues from other disciplines can consider incorporating such an online learning interface to cultivate SDL skills in their modules in the future to test its general applicability.

References


About the Author

Ms Chen Hui-Chen teaches NUR2114 and NUR2116 “Medical-Surgical Nursing I& II”. She believes that future healthcare providers should be encouraged to enhance their clinical knowledge and skills with a self-directed learning (SDL) approach in order to promote self-management and self-monitoring as well as stimulate motivation.