

The effect of the Cornell method on the quality of grade production and learning performance of nursing students

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ABSTRACT

Introduction. *Note-taking* is a learning strategy that requires tremendous importance in the teaching/learning process. It therefore allows for better information processing and deeper encoding (long-term memory) of information. Its adoption and mastery can improve students' learning performance. Nevertheless, it has been poorly explored in the academic environment, particularly at the higher institutes of nursing professions and health techniques in Morocco. The present research aims to determine the effect of the Cornell method on the quality of note production and learning performance among second-semester students of the Higher Institute of Nursing and Technical Health Agadir-Annex of Guelmim.

Methods. This is a research project consisting of two primary studies. The first is related to a descriptive cross-sectional study exploring the practice of note-taking among students based on a self-administered questionnaire. The second is a two-group quasi-experimental study divided into two parts. The first part is devoted to determining the effect of the Cornell method on grade production quality, and the second is related to the effect on learning performance. This is based on a grid for analyzing the quality of mark production and a QUIZ for assessing students' knowledge, respectively. The study was conducted with a sample of 128 students divided into an intervention group (n=62), which received note-taking using the Cornell method, and a control group (n=66), which did not receive this training.

Results. Most of the students participating in the study reported the adoption of note-taking as a learning strategy. On the other hand, more than half of them do not master it. In addition, a quarter of the students revise notes taken in the raw during exams and use this learning strategy to feel secure. The Cornell training had a positive effect on the quality of note production as well as on the student's learning performance.

Conclusions. The Cornell note-taking method is recommended to be integrated into the preparation cycle of studies for the benefit of students in the first semester of Higher Institute of Nursing and Technical Health Agadir-Annex of Guelmim.

Keywords: note taking, Cornell method, learning performance, quality of note production, nursing students

INTRODUCTION

Several research studies have specified that teachers need to teach the note taking to achieve three skills, namely, comprehension through note-taking, note production, and conscious management of the whole activity, while Jenée and Jean Simonet define note-taking as an active process of recording information in writing (Boch & Piolat, 2005; Bouguesba, 2020). More than that, it has the function of collecting information distributed in the course, in a book or in any other situation, which it will be appropriate to remember (Saffah & Yousfi, 2020).

Many studies of failure in mass higher education have identified note-taking as a poorly mastered skill for university entry (Chiali, 2018). Thus, many teachers in the final years of secondary school ask their students for this complex skill, which needs to be implemented from the beginning of secondary school by developing methodological micro-skills adapted to each level of education. Pupils must get into the habit of taking notes (Frenay et al., 1998). From a theoretical point of view, it can be argued that there is a strong link between the teaching of note-taking strategies and students' academic success. There are several explanations to support such a theory since note-taking instruction plays an essential role in the recall and learning of ideas (Lee et al., 2008). Several models and methods have been used to analyze writing production in note-taking. Notably, Hayes and

Flower's (1980) model, which has three components: the task environment; knowledge stored in long-term memory; and the writing process, aimed to identify writing processes, determine the origins of difficulties encountered by writers during the writing process, and consider conditions for improving productions. Nevertheless, the Cornell note-taking method was the most widely used, as 4,800 schools in 48 states include it as part of their AVID (advancement via individual determination) curriculum. AVID focuses on students who are low achieving or poorly performing but who have the potential to succeed. A body of research shows that it can improve understanding and achievement (Fisher et al., 2009). Furthermore, students who were taught the Cornell method performed significantly better than students who were not taught the method (Faber et al., 2000). In this regard, another study of students in science classes at Western High School in the United States using the Cornell note-taking method scored 10-12% higher than students in the previous semester not using the method (Donohoo, 2010). Thus, when the same high school determined an action plan for improving the learning performance of these students, they incorporated the Cornell note-taking system into it.

Throughout his academic career at the level of higher institutes of nursing and health techniques, the student nurse was faced with a significant flow of information. This, on the theoretical level but also in clinical learning. As a result, he is faced with an abundance of new knowledge from different disciplines in the training program. Indeed, the lack of initiation in note taking as well as the absence, in most cases, of physical or electronic course materials and specific course outlines for each module taught, pushes him to be content with following the explanations and memorizing them. A situation that exposes them to forgetfulness and consequently incites the student to intuitively develop strategies and study methods in order to facilitate the learning and assimilation of the courses received (Kharbach, 2022).

The present research aims to determine the effect of the Cornell method on the quality of note production and learning performance of students in semester two at Higher Institute of Nursing and Technical Health Agadir-Annex of Guelmim in southern Morocco.

METHODS

Design of Study

This is a two-group (control group, intervention group) quasi-experimental study to determine the effect of the Cornell note-taking method on the quality of note production and learning performance in nursing students.

Study Environment

The present study was conducted at the Higher Institute of Nursing and Technical Health of the Agadir-Guelmim Annex. This is an annex created in 2012 and currently provides training for three options in the nursing field: general nurse, community and family health nurse, and anesthesia and intensive care nurse.

Study Population

This study was interested in all semesters (two) students of the following options: general nurse, family and community health nurse, and intensive care nurse. This represented a total of (n=128) students for the academic year 2021/2022.

The distribution was done in two groups. The control group consisted of the students of the general nurse option with a total number (n=66). These students did not receive any training in the Cornell note-taking method. Intervention group composed of family and community nursing students (n=32) and anesthesia and intensive care nursing students (n=30) and trained in the Cornell method of note taking in class (n=62).

Study Design and Data Collection Methods and Instruments

The taught element, "therapeutic routes of administration", is part of module 2 of basic nursing care. It was learned as a lecture based on uncondensed slides. The teacher opted for explication, additions and writing on the board. This helped to focus the students' attention on note taking.

To ensure that the study went well, the same teacher supervised both groups. In agreement with the coordinators of the option, the sessions were conducted in the morning, in the middle of the week. This ensured vigilance and avoided fatigue at the beginning and end of the week.

Cornel method training

To introduce the intervention group, consisting of anesthesia and intensive care nursing students and family and community health nurse options, to the practice of note-taking as a learning strategy. A training session in Cornell method will be organized and facilitated to emphasize the importance of note-taking and the Cornell model. This will be done according to the modalities detailed in the data sheet designed for this purpose. In this perspective, a grid for analyzing the quality of note production will be used to analyze the corpus of notes taken by the students of the two groups (intervention and control) throughout the sessions programmed in the framework of the study, according to **Figure 1**.

Analysis Grid for the Quality of Note Production

To assess the quality of the notes, we designed an analysis grid based on a literature review. Several references (guides, articles) were consulted (Cartier & Théorêt, 2004; Saffah & Yousfi, 2020).

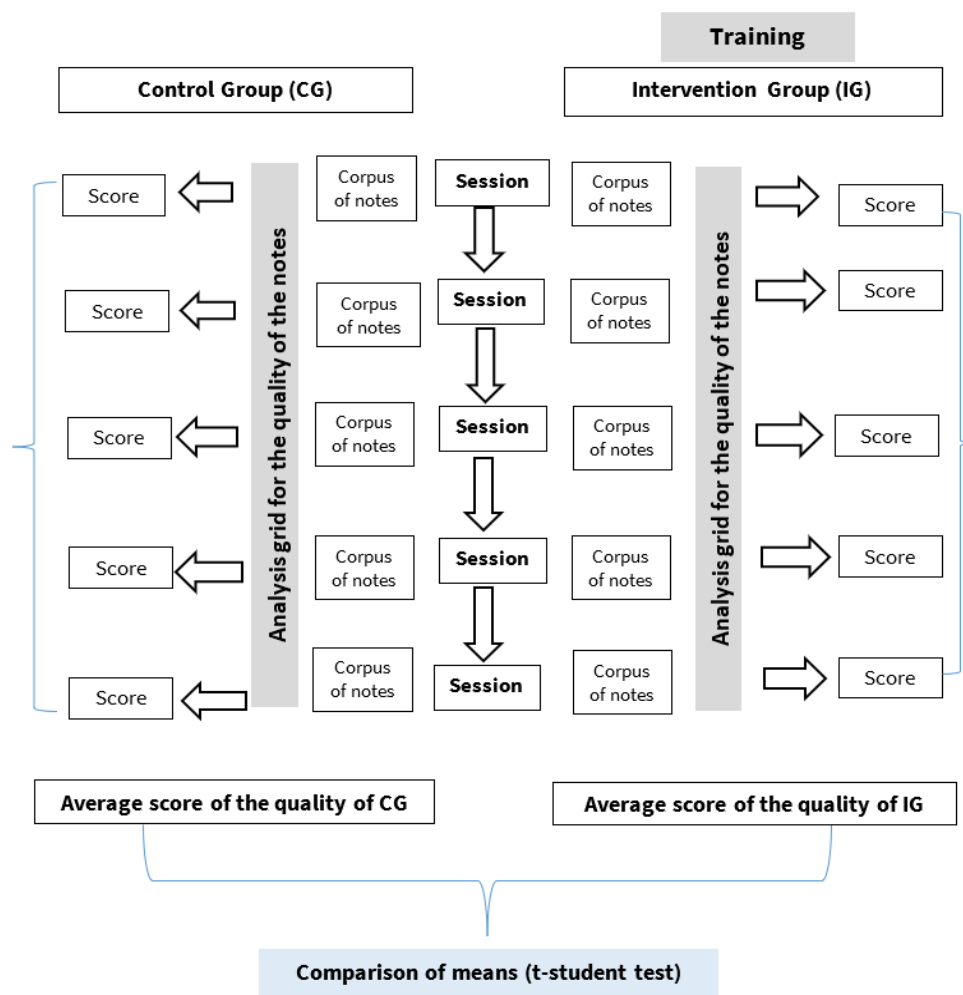


Figure 1. Study design regarding the effect of the Cornell note-taking method on the quality of note production (Source: Authors' own elaboration)

This instrument allows the analysis of the student's notes at the end of each session during the 10 programmed sessions (five for the control group and five for the intervention group). Several dimensions emerged from the literature review, including a range of elements. Consequently, this tool is made up of 20 elements spread over four dimensions, which are:

1. Page formatting, which has eight elements.
2. Note-taking methods used, which have five elements.
3. Condensation processes, which have one element.
4. Content, which has six elements.

Each element is given a mark that varies between zero and one depending on its use or absence in the corpus. A finding designates a score between zero and 20 for each corpus/session.

Quiz to Evaluate Learning Performance

In order to test the prerequisites and the knowledge of the students of both groups (intervention and control), a QUIZ was designed and validated. It was used as shown in **Figure 2**. The pre-test comprises 40 questions that are a mix of multiple choice and short answers. This pre-test will allow us to highlight the differences or similarities in the levels of the students studied. This is done while respecting the docimology criteria and Bloom's taxonomy levels, specifically the first two levels (knowledge and understanding). This knowledge assessment, which will last 60 min, will be administered at the first session for all students (n=128) of the three included options: general nurse, family and community nursing students, and anesthesia and intensive care nursing students. It should be noted that this pre-test will be administered for both groups at the same time and in the same place in order to guarantee as much as possible equal opportunities for the students (before forming the experimental group).

Post-test of students' knowledge

Keeping the pre-test's content and respecting the docimology's instructions, notably Bloom's taxonomy. This post-test will be administered at the end of the sessions scheduled for the two groups. It will assess students' knowledge in both groups (intervention and control) and focus on the effect of the Cornell method on learning performance. This will be done by comparing

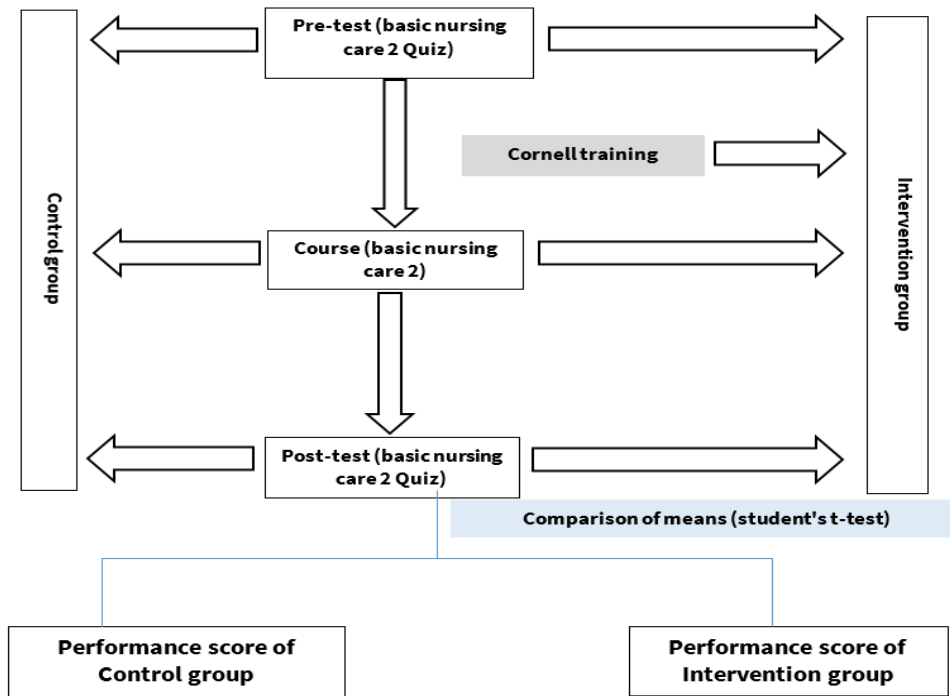


Figure 2. Study design relating to the effect of the Cornell note-taking method on learning performance (Source: Authors' own elaboration)

Table 1. Comparison of student performance scores (t-student test) pre-test

Student	Average	SD	T	ddl	p-value	AD	CI (95%)
Intervention group	11.620	1.590	0.776	126	0.439	0.230	(-0.28; 0.64)
Control group	11.800	1.000					

Note. SD: Standard deviation; AD: Average difference; & CI: Confidence interval

the scores of the two groups. Like the pre-test, the post-test will be administered for both groups simultaneously to ensure complete equality of opportunity (time, place, supervision).

Data Analysis and Processing

Two kinds of variables were used, qualitative and quantitative variables, as follows: The qualitative variables will be presented in number (n) and percentage (%), and the quantitative variables will be presented in mean (standard deviation) and median (interquartile range).

The student's t-test was conducted to test the effect of the Cornell note-taking method on the quality of note production and learning performance. After the normality analysis and if the distribution is non-Gaussian, we opted for the use of non-parametric Mann Whitney U test to compare the results between two independent groups.

Data entry in Excel and statistical analysis is in SPSS 13.0.

RESULTS

The prerequisites of groups (intervention and control) for the module element to be taught were measured by a pretest. The scores were compared. For this purpose, an independent samples t-test was performed to compare the mean score of the two groups (intervention: mean=11.62±1.59; control: mean=11.80±1.00); $t(126)=-18.64$, $p=0.439$. As $p>0.05$, the results showed the absence of a significant difference in the student's performance scores (pretest) for the two groups mentioned above, indicating that the two groups were at equal levels (**Table 1**).

The two groups performance levels (intervention and control) through the post-test scores administered to the students. An independent samples t-test was performed to compare the mean score of the two groups (intervention: mean=30.87±3.47; control: mean=17.95±4.28); $t(126)=-18.64$, $p=0.000$. As $p<0.05$, the results showed a significant difference in the student's performance scores for the two groups mentioned above, indicating that the two groups were at different levels (**Table 2**).

Table 2. Comparison of student performance scores (t-student test) post-test

Student	Average	SD	T	ddl	p-value	AD	CI (95%)
Intervention group	30.870	3.470	18.640	126	0.000	-12.910	(-14,28; -11.54)
Control group	17.950	4.280					

Note. SD: Standard deviation; AD: Average difference; & CI: Confidence interval

Table 3. Comparison of note production quality scores (t-student test)

Student	Average	SD	T	ddl	p-value	AD	CI (95%)
Intervention group	19.050	0.650	36.010	126	0.000	12.900	(12.20; 12.21)
Control group	6.140	2.740					

Note. SD: Standard deviation; AD: Average difference; & CI: Confidence interval

In order to compare the scores of the quality of note production in the two groups (intervention and control) through the scores of the analysis grid of the notes taken by the students. An independent samples t-test was performed to compare the mean score of the two groups (intervention: mean=19.05±0.65; control: mean=6.14±2.74); $t(126)=-36.01$, $p=0.000$. As $p<0.05$, the results showed a significant difference in the student's performance scores for the two groups mentioned above, indicating that the two groups were at different levels (**Table 3**).

DISCUSSION

The Effect of the Cornell Method on the Quality of Note Production

Referring to the analysis made earlier regarding the quality of note production by the two groups, the present study revealed a significant difference in the mean scores of the intervention and average groups. The present study revealed a significant difference in comparing the mean scores of the intervention group and the average group. This is because the first group obtained an average of 19.05/20 as opposed to the second group, which only had an average of 06.14/20. A result shows a difference of 12.90.

Because of the various ways in which language can be modified by note-taking, in addition to the variety of note-taking styles to be discussed, it is relatively difficult to establish quality criteria that are valid for all forms of notes. In general, notes are considered private and meaningful only to the note-taker, which makes it even more challenging to establish quality criteria for quality notes (Piolat et al., 2005). For example, single words in notes that seem meaningless to others may prompt the creator to reflect on a personal experience and its relationship to the subject of the notes. It could even be argued that the quality of the notes can only be assessed by the user of the notes, as a specific note format that is ideal for one person may not be the best quality or way to convey the content to another person (Schwanenflugel et al., 2004). In support of this claim, Kiewra et al. (1991) found that reviewing self-generated grades was more effective in recalling results than reviewing another student's grades.

Some have found that note-taking does not significantly influence learning (Broe, 2013; Dunkel et al., 1989) or even reduces learning outcomes because students were taking verbatim notes (Hufnagel & Kelly, 2018)

The Effect of the Cornell Method on Learning Performance

Several academic studies, especially quasi-experimental studies, have shown the Cornell method's positive effect on improving students' learning in terms of the scores obtained. This is consistent with the present study. The comparison of the means of the students of the two groups, control, and intervention, in pre-test and post-test reveals a very significant improvement in the scores of the intervention groups.

Comparing the scores obtained by the two groups in the pre-test shows that the levels are equal. This is because the intervention group had an average score of 11.62/20, and the control group had an average score of 11.80/20. Nevertheless, the posttest revealed a significant difference in the scores obtained in the posttest evaluation of knowledge. The intervention group obtained an average score of 30.87/40, i.e., 15.43/20, while the control group obtained an average score of only 17.95/40, i.e., 8.97/20. These scores reflect an average difference of 12.91.

It should be noted that the first group benefited from training in the Cornell method. A surplus could play a primordial role in improving the learning of these elements. This finding is in line with several studies. These studies state and defend this finding.

Quasi-experimental research entitled "differences in learning outcomes using the Cornell method and the non-Cornell method among students of the Faculty of Medicine at Universitas Baiturrahmah" was conducted from September to October 2019 at the Faculty of Medicine, Baiturrahmah University. Methodologically similar to the present study, the Cornell method positively impacted learning performance (Her et al., 2021). In the same context, another study found that students in science courses at Western High School in the United States using the Cornell note-taking method scored 10-12% higher on average than students in the previous semester who did not use this method (Donohoo, 2010). Other similar studies have been conducted on the effect of the Cornell method, including improvement in overall performance; the first study was conducted by (Jacobs, 2008), which aimed to review selected studies on the effect of note-taking methods on students' English performance. After reviewing these studies, the researcher used the same tests on the students and found the Cornell method useful. However, the students who used the guided note method performed better than the Cornell group.

CONCLUSIONS

This study aims to determine the effect of the Cornell note-taking method on the quality of note production and the learning performance of students in the second semester of the nursing course at the Higher Institute of Nursing and Technical Health of the Agadir-Guelmim Annex.

Concerning the effect of the Cornell note-taking method on the quality of note production, there was a statistically significant difference in the documentary quality scores of the note corpora of the two groups (intervention: mean=19.05±0.65; control: mean=6.14±2.74); $t(126)=-36.01$, $p<0.001$. As for the effect of this method on learning performance, the study found a positive effect on learning performance through the comparison of the average posttest scores of both groups (intervention: mean=30.87±3.47; control: mean=17.95±4.28); $t(126)=-18.64$, $p<0.001$.

In light of the results of this study, a range of actions are recommended. In the medium term, the creation of a pedagogical committee whose mission will monitor the use and development of learning strategies, including note-taking. In addition, workshops for Higher Institute of Nursing Professions and Technical Health students, especially in the first semester, introduce them to different learning strategies. This is to introduce them to different learning strategies, precisely that of note-taking, through implementing training programs concerning micro-skills related to note-taking. In addition, the development of a reference list of abbreviations of the most used conventional words or concepts in nursing education at the Higher Institute of Nursing Professions and Technical Health level is very much in demand. Concerning the long-term actions

- (a) The revitalization of the continuous training program for the benefit of the teachers operating at the level of the institute to meet their needs in the field of cognitive psychology,
- (b) The endowment of the Higher Institute of Nursing Professions and Technical Health Library in Agadir with books and guides specific to the skill of taking notes and the techniques related to its application.

Notwithstanding, the conduct of the present study faced an array of limitations. The study's sample was small, preventing the extrapolation of the results to the total student population. Thus, the study failed to consider other variables that may influence note-taking (personal factors). One of the perspectives of this study is to research the effect of factors related to the teacher, the student, and the pedagogical environment on the quality of note production and learning performance.

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Ethical statement: Authors stated that written permission was obtained to conduct the study from the Higher Institute of Nursing Professions and Technical Health Guelmim on April 5, 2022 with approval code: 275/22. Written informed consents were obtained from all participants.

Declaration of interest: No conflict of interest is declared by authors.

Data sharing statement: Data supporting the findings and conclusions are available upon request from the corresponding author.

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