



Research Article

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## The Relationship between Critical Thinking Skills, Portfolio Models and Academic Achievement of Moroccan Midwifery Students

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### Abstract

The present study investigates the relationship between critical thinking skills and portfolio models and academic achievement among midwifery students. Design: A mixed method was followed for this study. A cross-sectional study was used for reporting the results of the California critical thinking skills test (CCTST). In addition, a focus group while following the COREQ guideline to establish the categorization of portfolios. Method: the research sample consisted of 41 students, 48.78 % were registered in the third semester, and 51.21% were in the sixth semester. The CCTST was used to measure critical thinking skills (CTS). A focus group of six teachers was used to develop a classification of portfolio models. The data was analyzed using Chi-Square, and ANOVA. Results: The CCTST and all subscales are highly reliable. Age and educational level were significant variables for the portfolio models, and (CTS). Relationships were also found between the midwifery student's portfolios models and their CCTST overall scores. Moreover, the students with the highest scores in (CTS) had portfolio Toast Rack design. Conclusion: CCTST showed good validity and reliability for Moroccan midwifery students, and can be used to inform on portfolios design. Validation with large and diverse samples is recommended. It is suggested that instructors consider the dominant portfolio design of each level and use appropriate teaching methods.

**Keywords:** Research method, Critical Thinking Skills Test, Portfolio model, Academic Achievements

### 1. Introduction

Since the dawn of this millennium, reproductive health care has been required to achieve a high level of quality. The WHO states that a competent and well-trained midwife can have a considerable impact on women of reproductive age and their families. Thus, critical thinking skills are crucial to

the success of midwives student, and, inattention to this skill may not be conducive to alleviating the high burden of maternal mortality and morbidity in developing countries. It helps midwives analyze, interpret, and evaluate evidence and make informed decisions (Papathanasiou & al.,2014) (Lee & al., 2017).

However, assessing these critical thinking skills of students has been a long challenge for educators regarding its complex and difficult concept to teach and to measure in practice (Carter & al., 2015), (Ghazlane & Touri, 2020).The literature states that critical thinking is intrinsically linked to reflection, as both processes involve reflective thinking.

However, there was some literature that indicated significant relationships between development of reflective writing and critical thinking skills (Bouanani, 2015), and others found no relationship between the development of critical thinking skills and reflective writing through the administration of CCTST (Naber & Wyatt, 2014).

In the other hand, the portfolio with its two versions whether paper or digital (Gray & al., 2019) remains a pedagogical tool recognized as a highly valued attribute of nursing education (Naccache & al, 2006) (Ryan, 2011) (Hill, 2012) (Murphy & al, 2013) (Salem, 2020).

In countries that developed scientific research, such as the United States and the United Kingdom, suggest that the portfolio is a collection of evidence that can be used to demonstrate and enhance nurses' skills (Aswani, 2019).

Then, the portfolio not only allows for knowledge growth and development within the learner, but also informs the mentor, peers, and professional organizations of the acquisition of skills and knowledge relevant to the profession (Buckley & al, 2012) (Green & al, 2013) (Cope & Murray, 2018) (Harden & Laidlaw, 2013) (Assadi Hoveyzian & al, 2021).

As a result, the need for continuous learning in nursing requires nurses to adopt the reflex of portfolio development throughout their professional career in a continuous way (Daphney & al., 2020).

Thus, artifacts placed in the portfolio provide much more information about the quality of participants' critical thinking skills and reflection (Harrison & al., 2018) and the amount of nursing knowledge (Malmir & al., 2016).

Given that during the reflective writing process, students question and integrate their thoughts, assumptions, and experiences with theoretical content and evidence.

Therefore, the portfolio remains an ideal way to assess and measure critical thinking skills. Thus, literature has revealed considerable variation in terms of portfolio structure. There are different portfolio designs such as shopping trolley, toast rack design, spinal column, and cake mix design which are explored for the first time in the UK (2004), and they are particularly useful in helping to provide structure and demystify the whole process of portfolio development (McDaniel, 2012). In addition, it differentiates the writing style that is based on reflective and critical thinking.

This study attempts to find out if there is a relationship between critical thinking skills of midwifery students, and their portfolio writing strategies through the CCTST, at Casablanca Graduate Institute of Nursing and Health Technology. This study also aims to see the relationship between portfolio structure and academic achievement among study participants.

## **2. Materials and Method**

### *2.1 Design*

A mixed method was used to achieve the objectives of this study. Guidelines for quantitative descriptive study were followed for targeting critical thinking skills. Moreover, Consolidated criteria for Reporting Qualitative Studies (COREQ) guidelines were used to classify portfolios designs at midwifery students in their second and third years at the Higher Institute of Nursing Professions and Health Techniques in Casablanca-Settat region of Morocco.

## 2.2 Sample and sampling

The study sample consisted of 41 midwives students. This study chose an exhaustive sample of all students in the second and third year of the Higher Institute of Nursing and Health Techniques in Casablanca Settat.

## 2.3 Instruments

Instruments used in this study consisted of three components: first, the administration of the CCTST, which also included socio-demographic characteristics on age, marital status and level of study. A focus group of six teachers to categorize the portfolios models of all study participants and each student's average grade for the third and sixth semesters was recorded as a measure of academic achievement.

The first instrument used is the CCTST. According to previous studies, it is one of the most valid, reliable, and acceptable measures of critical thinking skills.

This scale had a multiple choice format test. Questions varied in difficulty and complexity. These items are developed in different contexts. The question itself provides specialized information needed to answer correctly (Facione, 1990). The CCTST is designed to provide both, an overall score for critical thinking and a selection of scores for the subscales of analysis, inference, evaluation, induction and deduction.

A study was conducted to test the instrument on nine nursing students to see their psychometric properties, to discover difficulties that might be encountered in its administration and to verify the suitability of the tool for Moroccan student's midwives.

The second measure focused on exploring the portfolio structure. It was based on a UK study which identified four different types of portfolio used in educational courses of nursing (Endacott & al., 2004).

In shopping trolley portfolio, there was little coherence and few attempts to link evidence to learning outcomes or competencies. Reflective narratives may be included, but they do not reflect the evidence or artifacts provided.

The Toast Rack was composed of discrete items that assessed different aspects of practice and/or theory, reflective components were included, they tended to stand alone as artifacts, rather than being integrated with other components.

Cake Mix design indicates that evidence from theory and practice were integrated into the portfolio. There was an integrated report that combined elements and the narrative reflexivity. Practice and professional development were potential attributes of this model.

Spinal column was structured around practical competencies or learning outcomes and explicit evidence that was included to demonstrate how each competency had been achieved. In this model, there may be reflective accounts that consider more than one competency, and global competencies that require multiple pieces of evidence as proof of achievement.

With regard to the assessment and categorization of portfolio types, this was based on a qualitative assessment process, developed by (Webb & al., 2003), based on the triangulation of data in the form of multiple sources of evidence for each portfolio and an internal audit system involving several teachers and external reviewers to ensure consistency between assessors.

## 2.4 Data collection

The first stage of data collection consists in the administration of CCTST. A four-week period was required to complete the recruitment of participants and data were generated by the insight assessment platform.

Each test required an average of 45 minutes. Facility, computer availability and a significant delay in receiving online results were considered.

Researchers conducted awareness and clarification sessions on the use of the tool, its relevance, and its objectives with all midwives' student. These sessions also included information about confidentiality and anonymity. Participation was ensured by obtaining informed consent from each participant.

Second stage indicates portfolio evaluation process. It followed three-steps process and was based on the use of evaluation criteria from qualitative research.

Forty-one portfolios were collected for an eventual content analysis and verification according to the objectives, action plan, clinical skills and reflective report, as well as for identification of the followed design.

Before work on focus group, reviewers established characteristics and proceeded by a content analysis of the selected portfolios.

The main assessor evaluates the portfolio, then, the same portfolio is re-evaluated by another assessor to review the concordance of the characteristics raised, and to ensure the double evaluation. Then, participants examined in advance the evidence presented in the portfolio and verification used and checked whether it was experienced, learned and reflected in the portfolio taking into consideration characteristics that separate portfolio models described in the instrument section.

During the investigation, four full time teachers participated in the study and were designed through goal-directed sampling, as internal assessors.

The investigator is a full-time teacher at the Higher Institute of Nursing and Health Technology in Casablanca, and head of the training module of the Delivery Room and Admission (DRA), and Ph.D. student in Laboratory of Sciences and Technologies of Information and Education (LASTIE) and STCED research team at Hassan II University of Casablanca.

Every evaluation of a single portfolio takes about 10 minutes. Each main reviewer gives her pre-determined assessments. This assessment brings up the objectives of the internship at the level of the admission and the obstetrical room, the reflexive aspects or section, and avoids the structure of the portfolio. Thus, other participants give their feedback. The double-checking facilitated the discussion and reached a significant agreement among all assessors.

The assessors revealed, that reflective sections were isolated and did not show the evidence designed for the majority of students in third semester. Moreover, for the majority of students, there was a trend of separate sections in the portfolio structure, so there was no overarching narrative to connect the different sections.

Data was compiled in an Excel file which included characteristics of each portfolio studied and verification and comments of internal reviewers, as well as the criteria reported in the literature, based on Guba & Lincoln (1989) and Morse (1989) cited in Fortin (2010), were discussed and applied previously.

Finally, external reviewers receive all portfolios related to a significant period. Their job is to check the accuracy of the characteristics raised in the portfolios by the internal reviewers.

By the way, the most important part of this process is to ensure quality assurance in the verification, completion, and evaluation of consistency among reviewers.

## 2.5 Statistical analysis

After collecting data, statistical software of social sciences SPSS version 25 and JASP 0.15.0.0 were used together with content analysis of portfolios. The validity and reliability of the CCTST was studied to provide evidence of internal consistency of the test on a sample of midwifery students in the bachelor's cycle.

Regarding portfolio classification process, collection and analysis are conducted in parallel, since it is a qualitative research process.

Then descriptive statistics of variables were developed using frequency, percentage, measure of central tendency (mean, median) and measure of dispersion such as standard deviation; in addition to inferential statistics, such as correlation test between age, average grade and critical thinking skills.

ANOVA was applied to examine the relationship between critical thinking skills and portfolios models together with Chi-square to investigate the relationship between the portfolios models, age, marital status, educational level and average grade.

### 3. Results

#### 3.1 Demographic information

The total study sample included 41 midwifery students, with an age group of 18 to 21 years old, and an average age of 19.63. The majority of the participants were single (87.80% of the total sample). The average was 14.13, with a range of 12.13 to 16.54 whereas sixth semester students exceed the one of third semester by 2.42 %. (Table 1).

**Table 1:** Demographic characteristics of participants.

Variable	Frequency	%
Age		
18-19	18	43.90
20-21	23	56.10
Marital Status		
Married	5	12.20
Single	36	87.80
Educational level		
Third semester	20	51.21
Sixth semester	21	48.78

#### 3.2 CCTST reliability and validity

Cronbach's alpha was calculated for each subskill, as well as for the overall instrument. Reliability was confirmed by the high value of Cronbach's alpha coefficient ( $\alpha=0.83$ ). The highest Cronbach's alpha was related to the evaluation skills with ( $\alpha=0.85$ ), and the lowest was related to inferences skills with ( $\alpha=0.78$ ).

The Kaiser-Meyer-Olkin measure of sampling adequacy was (0.62), which validates the relevance of the EFA results. In addition, the Chi-square test indicated that it was appropriate to conduct a factor analysis ( $\chi^2 = 126.72$ ;  $df = 10$ ;  $p < 0.001$ ).

Data were analyzed using principal component analysis with Varimax and Kaiser normalization to identify the factor structure of the scale. The EFA revealed two factors, explaining 86.2 % of the variance which was considered appropriate. The first factor explained 60.54 % of the variance whereas the second one scored 25.71%.

#### 3.3 Descriptive statistics

The mean of the CCTST overall score was 14.26. This value was considered to be in the moderate range of the test. Most of participants performed a moderate score on the CCTST representing 68.29 % of the sample.

The lowest and highest average scores are related to evaluation and induction skills respectively.

Regarding the descriptive statistics of the portfolio classification, the present study reveals that the Toast Rack design remains predominant with 39 %. The Shopping Trolley is chosen by 26,6 %. The Cake Mix design is applied by 12,2 % of the participants, while the spinal column is used by 9 % of the sample.

It is also relevant to mention that the shopping trolley is the most used portfolio design among

third semester students, while the Toast Rack design is dominant among sixth semester students. However, in the sixth semester, no students have adopted the shopping trolley, while five students in the third semester chose the cake mix design. Moreover, students who used spinal column design in their portfolio were senior in their sixth semester.

### 3.4 Correlational Statistics

Firstly, a significant relationship was found between the overall critical thinking skills, academic achievement, age and educational level. In addition, the scores of the subscales of the CCTST were significantly related to the academic achievement. Moreover, there was a significant relationship between the critical thinking subscales and age, except for the analytical skills. However, there was a statistically significant relationship between the analysis and inference subscales of CCTST and educational level, although the induction, deduction and evaluation skills did not show a significant relationship. However, there was no significant relationship between the total score, critical thinking subscales and marital status (Table 2).

**Table 2:** Correlation between critical thinking skills, demographic variables, and academic success.

	Age		Marital Status		Educational Level		Academic Success	
	r	p	F	p	F	p	r	P
<b>Induction</b>	0.54	<0.001	1.16	0.28	0.27	0.60	0.48	0.002
<b>Deduction</b>	0.55	<0.001	2.67	0.11	3.57	0.06	0.62	<0.001
<b>Analyze</b>	0.28	0.07	0.19	0.66	5.11	0.02	0.31	0.04
<b>Evaluation</b>	0.57	<0.001	0.90	0.34	0.005	0.94	0.59	<0.001
<b>Inference</b>	0.35	0.02	0.86	0.36	5.50	0.02	0.31	0.04
<b>Overall Score</b>	0.80	<0.001	0.48	0.49	5.47	0.02	0.92	<0.001

There is no relationship between the portfolio design and academic achievement as represented by the graduation grade, considering that the portfolio model of toast rack is the most dominant, followed by the shopping trolley design.

A statistically significant relationship exists between the age and educational level variable and the portfolio models. However, no relationship between marital status and academic achievement as represented by the semester grades of the participants study and their portfolio structures was recorded (Table 3).

**Table 3:** Correlation between portfolio models, demographic characteristics, and academic success.

Variable	Portfolio Model	
	Khi 2/F	P
<b>Age</b>	37.68	<0.001
<b>Marital Status</b>	2.43	0.48
<b>Educational level</b>	24.04	<0.001
<b>Academic Success</b>	F=95.92	0.17

Using a one-way analysis of variance, the relationship between portfolio design and critical thinking skills, as well as the comparison of the mean score for each skill across the four portfolio models, is presented in Table 4.

**Table 4:** Correlation between critical thinking skills and portfolio designs.

Portfolios Model	Shopping Trolley		Toast Rack		Cake Mix		Spinal column		P
	M	S.D	M	S.D	M	S.D	M	S.D	
<b>Induction</b>	4.54	1.43	6.37	2.47	5.40	2.50	4.54	1.43	0.001
<b>Deduction</b>	2.54	1.57	5	1.63	5.80	2.48	6	1.22	0.35
<b>Analyze</b>	2.54	0.93	3.68	0.94	3.40	1.94	3.33	1	0.08
<b>Evaluation</b>	2.00	1.18	3	1.36	2.80	0.44	3.88	0.33	0.003
<b>Inference</b>	3.27	1.55	5.62	1.92	4.80	3.56	4.88	1.61	0.02
<b>Overall score</b>	10	2.14	15.56	1.50	13.40	3.43	17.66	0.50	0.01

Results show that there is a statistically significant relationship between portfolio design and the overall score of critical thinking skills and its subscales of induction, evaluation and inference. While the inference and analysis skills showed no significant relationship.

This study highlighted the validity and reliability of a test measuring critical thinking in a Moroccan population intended to preserve maternal and reproductive health (Cronbach's Alpha is 0.83); thus, it explored the overall score and the different subscales of critical thinking skills, which is moderate.

Furthermore, this study revealed that the portfolio Toast rack design is commonly used among Moroccan midwifery student.

In addition, on the one hand, there is a significant relationship between critical thinking and academic achievement, age and educational level and, on the other hand, a significant relationship between overall score and portfolio models, and between academic achievement, age, and educational level.

#### 4. Discussion

Critical thinking is an essential element for academic and professional success in many areas, including decision making in clinical settings and quality of care in populations. To ensure these objectives, the continuous measurement of these tools is crucial.

Though rules and standards related to the normative practices of the method are not respected in most of the works, but use of rising standard tools in critical thinking open new horizons in reflexive practice (Ghazlane & Touri, 2020).

The reflective writing provides an ideal tool for assessing students' critical thinking skills where students unpack difficult and complex practical situations (Carter & al., 2017)

Firstly, among the main findings of this study is the good reliability of the CCTST in a Moroccan midwives student's environment.

Cronbach's alpha coefficient of the overall score, which was 0.83. Moreover, the coefficient of Cronbach's alpha for each skill showed high reliability.

The factor analysis indicated that the CCTST was formed from five factors namely analysis, evaluation, inference, inductive reasoning and deductive reasoning. In addition, the internal consistency showed that all subscales had a high and positive correlation with the total test score. These results revealed that the scale generated valid and reliable measures of critical thinking skills. Thus, it can be designed as a research tool, and all subscales measure a single construct (critical thinking) and are able to distinguish between people with different levels of critical thinking.

This finding is similar to the study conducted by (Khalili & Zadeh, 2003) among an Iranian population, which indicated that the Kuder Richardson value of CCTST on their participants study is acceptable as well as its subscales.

In fact, the reliability coefficient in undergraduate students in USA varies between (0.68- 0.70), which leads to the acceptability of this test.

Additionally, the present study revealed an overall moderate critical thinking score. This result corroborates that of Duran & Sendag (2012) which indicated that the overall score of the sample of their study is included in the moderate range. Similarly, Reale & al.(2018) in their review, most studies

measuring critical thinking skills reported a moderate score of critical thinking skills in the majority of participants in various scientific studies across the CCTST.

However, the study conducted by Shirazi & Heidari (2019) reveals that the scores of critical thinking skills were low among nursing students.

Thereby, some literature states that university graduates lack critical thinking and problem solving skills both in the classroom and in the workplace (Nold, 2017). However, professionals with strong critical thinking skills are successful in their professional practices (Chen & al., 2019). In addition, students who have high scores of critical thinking skills have strong problem solving skills (Heidari & Ebrahimi, 2016) (Ahmady & Shahbazi, 2020) (Kanbay & Okanlı, 2017). Consequently, students who gave up their work projects were those who lacked critical thinking skills necessary to school performance (Wallmann & Hoover, 2012).

According to a study on chemistry students, the most experienced inequalities students were experiencing relate to occupation and study level of the parents (74.1%), financial resources (44.1%), acquired working abilities (40, 7%) and family social networks (35.7%) (Soubhi & al., 2014). This shows to what extent acquiring working abilities impact success.

To solve these problems, specific and effective pedagogical strategies were implemented at all educational levels and across disciplinary areas to develop these skills.

Afterwards, although the main aim of this study is to explore the relationship between critical thinking skills measured by the CCTST and portfolio models of midwifery students, the data collected investigated the opportunity to identify different relationships that might rise.

Many studies analyze the relationship between critical thinking skills and other variables such as age, gender and other variables.

The present study indicated that there is a significant relationship between different demographic characteristics such as age, educational level, and academic achievement. However, a study conducted by Shirazi & Heidari, (2019) stated that no relationship between age and academic achievement was found. Otherwise, the educational level recorded a relationship with academic success, as the number of years of study and familiarity with the course provided a conducive environment for success.

In the same vein, the study conducted by Roya Sherafat (2015) indicated that critical thinking skills can be considered as a key to enhance academic achievement.

Moreover, a study conducted by (Ghazivakili & al., 2014) indicated that there was a relationship between critical thinking skills and previous semester grades as a criterion for determining academic success. They claimed that students' grade point average increased due to the improvement of critical thinking skills.

This study showed that there is a significant relationship between age, educational level and critical thinking, which contradicts the study of Shirazi & Heidari (2019).

Furthermore, the present study indicated that there is not a relationship between critical thinking and marital status which corroborate with the studies conducted by Ghazivakili & al. (2014) and Shirazi & Heidari (2019).

The relationship between the overall critical thinking score and educational level was significant. Thus, a relationship was observed between the analysis and inference subscales of critical thinking and educational level, which corroborate the results of Taghva et al. (2014) which revealed that there is a significant relationship between student's critical thinking and their educational level ( $p \leq 0/05$ ).

However, the study conducted by Mirmolaei & al. (2004) stated that, there isn't the relationship between the subscales of Californian Critical Thinking Skills Test and educational level.

On the other hand, the results of this study showed that Toast Rack portfolio were the most used among the participants in the study, and the least used, were Cake Mix portfolios, which involved an underlying reflective narrative written by the student that linked all the artefacts. However, this model was the most frequently used (Priscah & al., 2016).

Furthermore, the Shopping Trolley design was predominant among third-semester students, while the Toast Rack model was most dominant among sixth-semester participants. This finding

remained similar to that of the English National Nursing, Midwifery and Health Council in 2002.

Moreover, the results of this study indicate a relationship between portfolio design and age, and educational level, while no relationship was observed between portfolio design and marital status and academic achievement.

However, the reflective writing remains interrelated significantly with academic successes among midwifery students (Sweet & al., 2019) (Mirkazehi rigi & al., 2020). It has been empirically shown that there is a significant relationship between reflective writing skills and academic performance at pharmacy education (Lucas & al., 2017).

Thus, results of this study indicate that there is a significant relationship between the overall score of critical thinking skills and the portfolios structures. In particular, there is a significant relationship between the evaluation, induction and inference subscales of the CCTST and the portfolios designs.

In the same vein, a significant relationships and synergies have been established between reflection and critical thinking among professional midwives through a test developed by the authors study (Carter Assessment of Critical Thinking in Midwifery) (CACTiM) (Carter & al., 2017).

Similarly, a study conducted by (Farrell, 2019) stated that learning with a portfolio can enhance the development of critical thinking skills and dispositions in a disciplinary context.

In addition, it was empirically proved among university students in several disciplines, that the metacognitive processes underlying reflective writing and critical thinking were intertwined (Ticha & Fakude, 2015) (Bouanani, 2015) (Sani & al., 2017).

In clinical setting, analysis of the experienced nurses' data revealed that self-reflection with awareness significantly affected critical thinking skills ( $p < 0.001$ ), and the qualifications influenced self-reflection with awareness ( $p > 0.05$ ) and critical thinking ( $p < 0.001$ ) (Chen et al., 2019).

From this large body of literature, it has been found that there are differences between their outcomes may be caused by differences in contexts and characteristic of studies.

On the other hand, this study revealed predominance of Shopping Trolley design among third semester students, which reflection items were rarely included and artefacts were not linked to competency standards or learning objectives. This turns this element into a disorganized portfolio.

In addition, the predominance of the toast rack portfolio in sixth semester participants was considered as the better structured and the artefacts were organized into categories.

However, the study conducted by Priscah & al. (2016) cited that the "cake mix" design which includes an internal reflective narrative that relates all the artefacts together, is the most frequently used, but it did not specify the level and discipline of the participants.

The predominance of toast rack design means that last semester students develop adequate structure reflective writing compared to third semester students who have developed shopping trolley structure portfolios where reflective parts are not commonly present.

This statement is consistent with the findings of longitudinal studies that explored the development and improvement of reflective writing and critical thinking across the curriculum (Bouanani, 2015).

In general, several studies have demonstrated the bidirectional relationship between critical thinking skills and reflective writing through measurement tools whether standardized such as the CCTST (Ahmady & Shahbazi, 2020) or self-developed such as 'Carter Assessment of Critical Thinking in Midwifery' CACTiM (Carter & al., 2017).

In the context of this study, there is the potential to enhance portfolio structure by assessing critical thinking skills through the CCTST, allowing the formative and summative assessment and even helping teachers in their teaching-learning process.

## 5. Limitation of Study

Firstly, the price of the CCTST, complex procedure to obtain the test, and the commitment of the institutions to respect the copyright of the CCTST delivered by "California insight assessment 2019".

This limited the number of respondents who participated in the study and therefore had an impact on the generalizability of the results.

Consequently, a bigger number of participants could have been more representative of the wider Moroccan midwifery students.

The difficulty of the CCTST, and the time assigned to the task “45 mn”, may have an impact on the participants' ability to answer the test questions more specifically.

Furthermore, the qualitative process of categorizing the portfolios was not without challenges; both internal and external reviewers spent significant time to come to results.

## 6. Conclusion

The results of this study revealed that the CCTST is sufficiently reliable as a research tool, and all subscales measure a single construct (Critical Thinking) and is able to distinguish individuals with different levels of Critical Thinking skills, and to determine whether and to what extent students are engaging in reflective writing in their portfolios.

The results show also, that the overall critical thinking score was moderate. Nevertheless, its subskills of analysis and evaluation were low among the midwifery students participating in the study. Consequently, teachers and mentors need to adopt teaching and learning strategies to reinforce these skills.

This study indicated the reliability of the CCTST to assess midwifery students' critical thinking in portfolio structure. Validation with large, diverse samples is justified.

Thus, the predominance of shopping trolley structure portfolios among third semester students and predominance of toast rack portfolio among sixth semester students, may serve instructors better in improving the reflective writing structure among midwifery students' portfolios. Therefore, special attention will be deployed to strengthening analytical and evaluative skills that can enhance reflective writing among Moroccan midwifery students, as well as in evidence-based practice.

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