Portfolio Development: Addressing Deep Information Processing Skills of Medical Students

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ABSTRACT

Objective: Portfolio development has an established role in deep learning and continuous professional development. Deep Information Processing (DIP) skills are essential for professional success. This study was undertaken to assess and compare DIP skills of undergraduate medical students who have developed and used learning portfolios to ones who have not, which would act as a baseline for future work.
Study Design: A Quantitative, Ex-Post Facto Causal Comparative research was conducted at Fatima Memorial College of Medicine & Dentistry, Lahore, for 2 months.
Materials & Methods:
A total of 150 undergraduate students of 2nd Year MBBS were selected using convenience sampling and sorted into two groups (who have developed portfolio and those who have not). After ethical approval & informed consent of participants, data was collected using pre-validated Deep Information Processing skills questionnaire. Data was summarized using descriptive statistics in SPSS V.23. Median and IQR for each group were calculated. Comparison between groups & three domains of DIP skills was done using cross tabulation & Mann-Whitney U test.
Result:
A total of 126/150 doctors with 62.7% females and 37.3% males participated in the study (Response-rate=84.6%). The median score of students who developed portfolio ranged between 3-4, 4 & 4 for critical reading, context & content understanding, & finding structure in content domains of DIP skills, as compared to median score between 2-3 for students who did not develop portfolio. There was a statistically significant difference in the DIP skills of the students who developed portfolio (64.6%) as compared to students who did not develop portfolio (34.1%).
Conclusion: Portfolio development is an effective way of inculcating DIP skills in students. DIP skills are more developed in students who had developed portfolio. Critical reading skills are improved more than content understanding & finding structure in content skills.
Key Words: DIP skills, Medical undergraduates, Portfolio development

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INTRODUCTION

With the advancement in science and technology, medical science has evolved to advanced, complex, radical & multifaceted medical teaching and learning. Learning and its enhancement is prime focus of students and educators. Learning refers to the recollection of prior knowledge and development of interconnections between existing and newly acquired knowledge.[1] Different people have different learning approaches and styles and adopt different approaches to acquire and retain knowledge. Surface, deep and strategic learning approaches are the most commonly recognized approaches.[2] Deep learning actively engages learner and promotes understanding, retention of knowledge and encourage development of reasoning, problem solving & information processing skills.[3,4] The Information Processing theory is a framework used by cognitive psychologists to explain and describe mental processes describing the stages that occur when we interact with and take in various kinds of information from our daily environment.[5] The stages are attending, encoding, storing, and retrieving.[6] There are three stages of receiving information into the memory. These include sensory memory, short-term memory, and long-term memory.[7]

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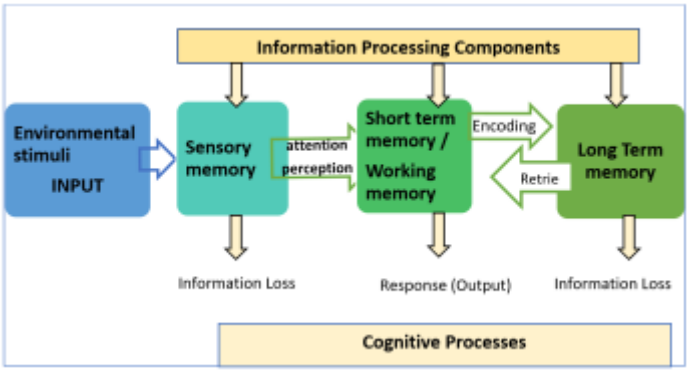

Figure 1: Information Processing Model[5]

Reflections promote deep learning and it is one of the strengths of portfolio development.[8,9] Adults are independent, self-directed and self-motivated learners and take upon responsibility for their own professional development.[10] Portfolio development is best suited to track the performance of an individual. It provides evidence of insight and experiences that the students have passed through during his educational tenure.[11] Other benefits of the portfolio include improvement in knowledge and understanding, enhancement of self-awareness, engagement in reflection and an improved student-mentor relationship.[12] Therefore, portfolio development has an established role in deep learning and continuous professional development.[13]

Portfolio development has wide application and has numerous strengths if used correctly. Portfolios have different constructs and layouts and are modified and tailored to meet specific needs.[14,15] DIP Skills are very critical for medical students and doctor's success. Lifelong learning can only be beneficial if the students are capable of processing the acquired information deeply in a manner that yields the required learning.[16,9] A doctor cannot grow professionally if he does not have DIP skills. Thus, it is very important to see the effect of portfolio development on DIP skills.

Some studies have established a link between portfolio development and deep information processing skills for pharmacy students. The effect of portfolio development on DIP skills of doctors is yet to be explored. This will help us establish the link between portfolio and DIP skills. DIP skills have a drastic effect on students' overall performance as a doctor and as an individual. This study would assess and compare DIP skills of undergraduate medical students who have developed and used learning portfolios as compared to ones who have not developed portfolios.

METHODOLOGY

A Quantitative, Ex-Post Facto Causal Comparative research was done at Fatima Memorial College of Medicine & Dentistry, Lahore (FMH, CM&D Lahore) for two months. Using convenience sampling, 150 students of 2nd year MBBS were included in the study.

Inclusion criteria:

· Both males and females of 2nd years MBBS

· Students who had received formal portfolio development training from medical education department were included in the study.

Exclusion criteria:

· Students of other MBBS years

· Students of Dental section

· Students from other medical colleges

Students had received preliminary formal portfolio development training via lectures & workshops by DME department of FMH, CMD in last 1 year. Portfolio development was reinforced using formal mentoring program in adjunct to lectures and workshops. All these students were expected to develop portfolios. Eighty-nine out of 150 students successfully completed & submitted their portfolio, whereas sixty-one did not developed portfolios. They were classified into, Group A with students who had developed portfolios & Group B who did not develop portfolios. After ethical approval from Institutional Review board and informed consent of the participants, data was collected using a self-administered, pre-validated and reliable DIP questionnaire.''10 The questionnaire was distributed to the students in groups. No incentive or reward was given. The participants recorded their responses on a five-point Likert scale. The DIP questionnaire assesses scores in three domains; critical reading skills, content and context understanding skills and finding structure in the content skills.

The data collected was entered in SPSS V.23, cleaned and prepared for analysis. The descriptive and inferential statistics were calculated to derive the results from the data. The data was non-parametric so median scores and Interquartile range was calculated for the two groups. The median scores of group A and B were then cross tabulated to the three domains of deep information processing skills. The test used for analysis of statistical significance was Mann-Whitney U test and $P \leq 0.05$ was taken as significant.

RESULTS

A total of 126 out of 150 students completed the questionnaire with a response rate of 84.6%. Out of 126 students, 47 (37.3%) were males and 79 (62.7%) were female (Figure-1). A total of 82 (65.1%) students developed portfolio while 44 (34.9%) did not (Figure-2). Thirty out of 47 males (63.8%) and 52 out of 79 (75.8%) females developed portfolio whereas the rest did not (Figure-2). The Cronbach alpha for the DIP scale was 0.928.

In domain of critical reading skills, majority of the students who developed portfolio had a median score in between 3 to 4 (skill developed sometimes to most of the times), while majority of students who did not developed portfolio had a median score of 2 to 2.5 (skill developed rarely) (P-value=0.001).

In the domain of content and context understanding skills majority of the students who developed portfolio had a median score of 4 (skill developed most of the times) as compared to majority of students having median score of 2 to 3 (skills developed rarely to sometimes) in the group who did not develop portfolio (P-value=0.001).

In the domain of finding structure in content skills majority of students who developed portfolio had a median score of 4 (skill developed most of the times), whereas majority of the students who did not develop portfolio had a median score of 2 to 3 (skill developed rarely to sometimes) (P-value= 0.004).

There was a statistically significant difference in the DIP skills of the students who developed portfolio (64.6%) as compared to students who did not develop portfolio (34.1%) (P-value= 0.002).

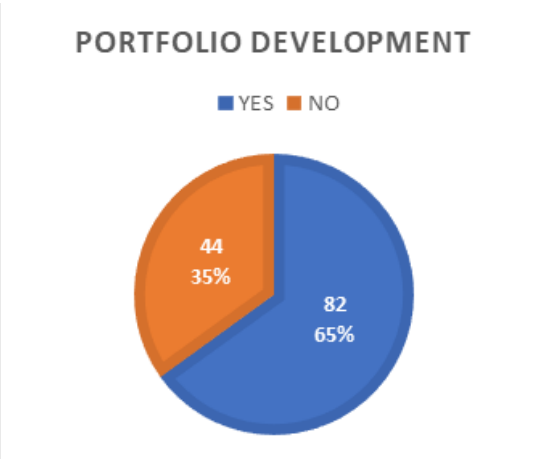

Figure : portfolio development percentage

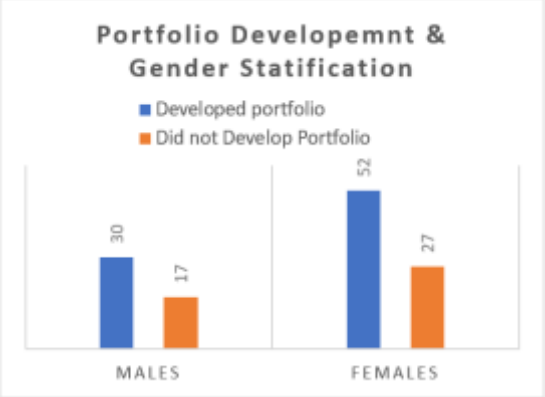

Figure 2: portfolio development & gender stratification

Dip Scale Domain	Portfolio Development	N	Mean Rank	Median score	Mann-Whitney U test "*U*" value	P-value
Domain 1 (Critical reading)	Yes	82	79.95	3-4	1193	0.001
	No	44	29.61	2-2.5		
Domain 2 (Content & context understanding)	Yes	82	74.46	4	1151	0.001
	No	44	41.66	2-3		
Domain 3 (Finding structure in content)	Yes	82	71.91	4	1114	0.004
	No	44	47.82	2-3		
Full Scale	Yes	82	71.38	4	1157	0.002
	No	44	48.81	2.5		

Table : Cross tabulation of domain scores to portfolio development categories

Figure-3: Median scores of DIP scale between groups

**CR-Critical Reading skills, C&C-Content & Context understanding skills, FS- Finding structure in content skills*

DISCUSSION

The main finding of this study is that those students who developed reflective portfolio demonstrated more advanced deep thinking and information processing skills as compared to those who did not develop portfolio. All the domains of DIP were more developed in portfolio developers, but enhancement in Critical Reading skills was enriched the most. Literature also supports that Portfolio development, which refers to the collection of evidence in the form of pictures, research activities, self-assessment cards, reflective writing, progress reports and various other proofs of teaching and learning; improves deep learning in individuals. Reflective practice is the most important realm addressed in portfolio development.[17,18] Reflection is one of the best methods to provide evidence of learning.[19]

Multiple evidences in literature support that portfolio development promotes DIP skills in students but the development of DIP skills is strongly correlated with the students' perception of the use of the portfolio.[20] This study reports improvement in all domains of DIP by the use of reflective portfolio. Similarly Meng Er reported that reflection on one's action can promote deep information-processing skills among the students, especially in critical reading and broadening their context domains.[10] The engagement of students in the learning process in order to embed experiential learning into practice and their subsequent reflection on and in actions based on their learning activities, collectively encourage learners to adopt a deep, rather than a surface learning approach.[11] This promotes processing of information in a manner which promotes interlinking of newly acquired information to the already developed schemas.[5] This in-turn supports the findings of our study of improvement in critical reading skills domain the most. These findings are similar to the results reported by Ashcroft and Fida in their studies as portfolio development improving critical reading skills the most.[12,13]

In our study both the domains of critical reading & context and content understanding were significantly improved in students who developed portfolio as compared to students who didn't. This is supported in literature as portfolio development drives formative and summative assessment as well as promotes deep learning.[21] The focus on writing and documenting the learned knowledge and skill not only improves the written expression of the students but also improve understanding and integration of the learned domain.[17] This ultimately improves the context understanding as well as critical thinking and reading skills which are two important dimensions of DIP skills.

Portfolio development improves reflective thinking and other metacognitive skills and helps solve real-life problems that demand higher order thinking.[22] These metacognitive skills help students find structure in the context and analyze and integrate the real meaning of the learned knowledge. This is an important domain of DIP skills and the results of my study support this notion in literature. Portfolios development gives a significant sense of validation i.e. an increase in the sense of worth of prior learning, skills, and work in relation to portfolio development.[23] This ultimately promotes deeper understanding of the context and content hence promoting DIP skills. Mcmullan & Jimenez also reported similar findings in their studies that DIP skills are improved by portfolio development, especially the content & context understanding skills.

Hence, Portfolio is an effective teaching and assessment tool but the essence of tool lies in its user. A well designed, relevant, clear and user-friendly portfolio will yield better outcomes.[24] Secondly DIP skills are promoted by portfolio development which is a desirable trait in doctors. So, Portfolio development enhances DIP skills but well-tailored portfolio guidelines are needed for achievement of required outcomes.

This study is uni-centric study as only one institute is involved. A large population is needed to generalize its results to larger community the sample size is small so some observations may be context specific however the findings of my study are parallel with the other international studies. This study is unique in establishing a link between portfolio development and DIP skills but as it is a cross- sectional study, so a more rigorous approach would be to conduct this study in a longitudinal design. The DIP skills questionnaire used in the study is based on a 5-point Likert scale so it is difficult to know the real impact of the small differences in the scores. This study can be done with a larger sample size, involving multiple institutes. This study paves a foundation for future research on exploring how portfolio development influences DIP skills. Furthermore, formal portfolio assessment scores can be linked to DIP skills score for quantifying how much is the effect on various dimensions of DIP.

CONCLUSION

DIP skills were developed more in students who had developed portfolio as compared to students who didn't. Critical reading skills & content understanding are improved more than finding structure in content skills by portfolio development. So, portfolio development is an effective way of inculcating DIP skills in students.

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