

Development, Implementation, and Evaluation of Medical Students' Portfolio at a Newly Developed Competency-Based Medical Education Curriculum/School

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Abstract

Background: The Faculty of Medicine, Suez University (FOM/SU) is a newly developed competency-based medical education curriculum/school that was established in 2017 then started working in 2018. One of the main requirements at FOM/SU is to adopt and incorporate a portfolio in the undergraduate learning and assessment process. **Aim:** This study aims to develop, implement, and evaluate a medical student's portfolio with the ultimate goal of ensuring quality learning performance. **Subjects and Methods:** A quasi-experimental single-group post-test only designed composed of 90 participants (65 undergraduate medical students and 25 mentors) as a comprehensive sample. The intervention was a newly developed students' portfolio model. **Results:** After implementing the newly developed students' portfolio model, all participant students agreed that the portfolio included enough entries in each area to make valid judgments, the portfolio included the students' self-evaluations and their reflections on what was learned, the portfolio provided clear evidence of learning to users of the portfolio, and the portfolio providing for student participation and responsibility. **Conclusions:** This study concluded that most of the studied undergraduate medical students and their mentors agreed that the newly developed students' portfolio was well organized, properly arranged, its purpose clearly stated, and included assessment based on clearly stated criteria of successful performance.

Keywords: Students' Portfolio, Development, Learning, Assessment, Evaluation.

Introduction

A student portfolio is a systematic collection of student work that represents student activities, accomplishments, and achievements over a specific period of time in one or more areas of the curriculum. It can be used as a form of student voice and choice in assessment, allowing learners to demonstrate their understanding, skills, and interests in various ways.

The use of portfolios for learning and assessment in the health care professions has developed as an integral part of moving away from "snapshot" examinations, towards broader methods of assessment⁽¹⁾. Portfolio learning requires reflection by learners and investment in coaching by teachers. The quality of portfolio assessment depends on investing in the interpretation of and discussion of qualitative data. Not only does it require a new

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perspective on education from mentors and learners, many of whom are still used to instructor-directed learning with a strong emphasis on the acquisition of knowledge, but it also asks instructors and learners for a significant investment of time and energy, so that learning process becomes student-centered and self-directed, with a focus on the application of knowledge⁽²⁾. FOM/SU is a newly developed competency-based medical education curriculum/school that was established in 2017 then started working in 2018. One of the main requirements at FOM/SU is to adopt and incorporate a portfolio in the undergraduate learning and assessment process. This study aims to develop, implement, and evaluate a medical student's portfolio at FOM/SU to fulfill its by-law main requirements and accordingly NARS-2017 requirements with the ultimate goal of ensuring quality learning performance and accordingly quality of the provided health care in the future.

Subject and Methods

Study setting and Study population

The current study was carried out in the Faculty of Medicine, Suez Canal University, Egypt, involving 90 participants (65 2nd year medical students and 25 mentors) chosen as a comprehensive sampling. A mixed-method approach of both qualitative and quantitative data collection methods was used. In this study, the instruments were designed especially for the evaluation of the newly developed undergraduate medical students' portfolios. To assess the needs of the stakeholders, a focus group was used to collect data from the stakeholders due to it explores a topic in depth through group discussion, there was the absence of students due to academic year vacation at that time, so it was

quickly and reliably to get a common impression, it is efficient to get much range and depth of information in a short time, and it is a convey key information about the program. Steps of focus group preparation: Purpose: recognizing the needs and concerns of stakeholders, to assist us in concentrating our decision-making around the implementation of portfolios in our educational setting and in clarifying the aim of the portfolios. Target audience: faculty staff members, administrators, students, and their parents. Venue: at FOM/SU. Activity 1: Form 2 groups of three faculty members. Faculty Member A Interviews Faculty Member B, while Faculty Member C records the response (by writing) to these questions: Why is it vital for students to have portfolios, and what are your expectations for them? What are some things you hope your students will do for their portfolios this year? Faculty members rotate roles after each interview until each faculty member has been interviewed. (Allow 3–5 minutes for each interview). Activity 2: Form one group of three participants, including faculty members, students, and parents, and communicate with them. Spend around three minutes coming up with ideas and writing them down. Regarding portfolio design, assessment, evaluation, and grading, the concepts should be centered on the requirements and issues of each audience. The recorder might query the group with the following examples: What requirements and apprehensions do you have for portfolio implementation? Facilitate a group discussion to identify essential concepts connected to each stakeholder at the conclusion of the group process. The conversation may be aided by the following queries: What are the shared worries and demands of all parties involved? How do the requirements and concerns of the various stakeholders

differ? What potential inputs might each stakeholder have on the portfolio-processing workflow? To assess the perception of students and their mentors/assessors (Short-term outcome) towards a newly developed undergraduate medical student's portfolio's strengths and weaknesses as feedback for continuous quality improvement, A paper-based questionnaire⁽⁶⁾ (Appendix) was used after applying the newly developed portfolio model at FOM/SU to measure medical students' and mentors' perceptions towards the portfolio as a learning and assessment tool. This questionnaire included the following questions: Is the purpose of the portfolio clearly stated? Is the portfolio providing evidence of various types of student learning? Does the portfolio include evidence of complex learning in realistic settings? Does the portfolio include enough entries in each area to make valid judgments? Does the portfolio include the students' self-evaluations and their reflections on what was learned? Does the portfolio enable one to determine learning progress and current level of learning? Is the portfolio providing clear evidence of learning to users of the portfolio? Is the portfolio providing for student participation and responsibility? Is the portfolio providing present entries in a well-organized and useful manner? Is the portfolio including assessment based on clearly stated criteria of successful performance? Is the portfolio providing guidelines for student participation? Is the portfolio providing for greater interaction between instructions?

Study design

A quasi-experimental single group post-test only design composed of 90 participants. The intervention was a newly developed students' portfolio model designed for undergraduate medical students at

FOM/SU, which was designed around themes based on needs assessment and benchmarking of some other well-recognized systems either in Egypt or abroad.

Table 1: Study design

Quasi-experimental /post-test-only design	Exposure to Portfolio	Measurement after
Intervention group (2 nd year medical students and their mentors)	X	01

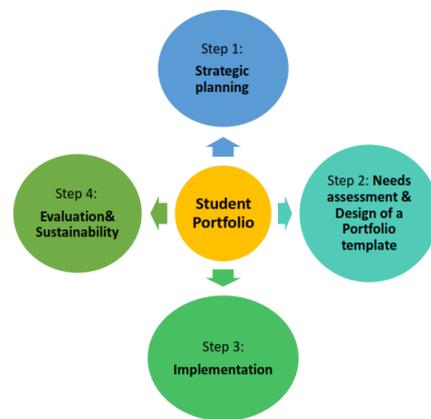


Figure 1: Conceptual framework of the task

An action research work was followed through a stepwise approach of the following four steps: Step 1: strategic planning. Step 2: a portfolio model was designed based on the needs assessment. Step 3: implementation of a newly developed portfolio model on a pilot basis. Step 4: Evaluation and sustainability (Figure 1)

Phase 1: Strategic planning

Performing GANTT CHART

Identification of Interested Faculty: building the core team and creating a shared vision (developing an undergraduate students' portfolio for FOM/SU).

Identification of Stakeholders: all students, faculty staff, Faculty Dean, Faculty Vic dean of Education, members of the Curriculum

Committee, the first phase coordinator, and the 2nd educational year coordinator.

Analysis of the current situation (Analyzing the realities of the portfolio situation).

Strengths: There is an educational need for a student portfolio in the faculty bylaw to assess student's cumulative work and identify strengths and weaknesses in all outcomes especially professional and personal development. Implement the recommendations of the medical sector committee visit. Implementing the decision of the Education Committee at the faculty in designing a student portfolio. There is support from the Faculty Dean and the Faculty Vice dean of Education and Student affairs. *Weakness:* Lack of qualified human resources in medical education. There are no faculty members in medical education. Lack of adequate training for faculty members to use student portfolios. Lack of resources in the newly established medical school. Assigned faculty with diverse and non-academic backgrounds. Newly assembled administrative team. Ordinary red tape and routines.

Opportunities: Seeking the accreditation of the National Authority for Quality Assurance and Accreditation of Education (NAQAEE). Getting scientific support from the Department of Medical Education, Faculty of Medicine, Suez Canal University in designing portfolio. Request for scientific, technical, and professional support from the Egyptian Society for Medical Education in faculty building capacity, student orientation program, and training of examiners.

Threats: Increased national and international competition in medical education.

Assessment of needs by using focus groups to collect data from stakeholders.

Planning for Implementation phase^(4,5)

1- Type and Time Frame of the portfolio

Purpose of the portfolio: shows learning progress over time, provides greater motivation for the students and faculty, increases self-assessment skills due to the student selection of the best samples of work, encourages reflective learning as students are asked to comment on each portfolio entry, increases tutor-student collaboration in the teaching-learning and assessment process, achieves broader and comprehensive assessment of different domains (knowledge, skills, and attitude), explain professional competence by increases understanding of student's professional growth and encourages a holistic & integrative approach to medical practice.

Portfolio type: summative, quantitative, authentic, standardized, and personalized assessment portfolio. A student's progress and growth over time are displayed in a growth portfolio. The focus of development can be on intellectual or thinking abilities, subject-matter expertise, self-knowledge, or any other area that is crucial in our environment.

Targeted population: the 2nd year students.

Targeted module: the 1st module (Blood and Lymph) in the 2nd academic year.

Duration of the module: four weeks.

Portfolio follow-up and Mentoring: The student should be informed about the name of his/her portfolio Mentor immediately after the beginning of the module. The student should be ready for a follow-up meeting with his/her mentor every two weeks. The student brings with him/her all portfolio partitions and is ready for discussion and any kind of evaluation and feedback from his mentor. The student must deliver his/her portfolio to the first phase secretary before the last week of the module. The student portfolio represents 20% of the total score of the module.

2- Determining competencies to be assessed: At the level of (Does), however, personal

development is only assessed by portfolio. A portfolio, through the student's cumulative work, identifies strengths and weaknesses in all outcomes.

3- *Selection of portfolio material*: Identification of competencies to be measured. Identify key performance behaviors relevant to the competence measured.

4- *Develop a marking system*: specific to each competency.

5- *Selection and training of examiners*: Pairing of new examiners with more senior colleagues with experience in portfolio assessment. Training of faculty examiners in cooperation with the Egyptian Association of Medical Education and maintaining them in the examiners' pool.

6- *Planning the examination process*: The Portfolio has introduced the concept of individualized student assessment together with the time needed, administration issues, faculty manpower, logistics, and availability of support staff.

7- *Student orientation*: Students must be informed at the beginning of the module about the following: portfolio examination. A special orientation booklet for students is issued to inform them of the purpose and content of portfolio building, portfolio assessment process, examination day, marking system, and use of the result.

8- *Developing guidelines for decisions*

9- *Establishing reliability and validity evidence*: Different settings, different rates, and different cases.

10- *Design evaluation procedures*: Student's and mentor/assessor's opinions on the portfolio's strengths and weaknesses as feedback for changes and improvement.

Planning for the Evaluation phase

Measuring the impact (Short-term outcome) of the portfolio (First level of Kirkpatrick Model) by using a paper-based questionnaire⁽⁶⁾ (Appendix¹) to measure

students' and mentors' initial reactions to gain an understanding of the portfolio's strengths and weaknesses as a feedback for continuous improvement.

Phase 2: Implementation

1. *Needs assessment of target stakeholders*: Focus groups are used to collect data from the stakeholders.
2. *Staff orientation and training* (through performing two workshops)

The 1st workshop

Titled: Students' Portfolio in Medical Education.

Targeted Audience: All faculty staff members/mentors.

Objectives: By the end of this workshop, all audiences will be able to: Define a student's portfolio. List types of portfolios. Identify the contents of the portfolio. Characteristics of Portfolio Assessments. Explain the importance of a portfolio. Differentiate between the portfolios' main assessment features. Validity and Reliability of Portfolio Assessments. Advantages and Limitations of Portfolio Assessments.

The 2nd workshop

Titled: Student Portfolio at FOM/SU.

Targeted Audience: 25 mentors.

Its objectives are: By the end of this workshop, all audiences will be able to: Identify components of the portfolio. Identify portfolio follow-up and Mentoring. Handle the students' portfolios effectively.

3. *Obtaining the approval of the Curriculum Committee*
4. *Obtaining the approval of the Faculty Council*
5. *Students' orientation* (through performing one interactive lecture)

An interactive lecture

Title: Student Portfolio in Medical Education.

Targeted Audience: all 2nd year students.

Its objectives are: By the end of this lecture, all students will be able to: Define a portfolio. List types of portfolios. Explain the importance of a portfolio. Identify components of our portfolio. Identify our Portfolio follow-up, Mentoring, and assessment.

6. **Pilot study:** The portfolio was initially piloted with a group of five-year students (for one month before the written reset exam in the summer). Accordingly, the modifications were carried out.
7. **Assign the portfolio to students:** The approved and validated newly developed medical students' portfolio was introduced to 2nd-year medical students at FOM/SU.

Phase 3: Evaluation phase

Measuring the impact (Short-term outcome) of the portfolio (First level of Kirkpatrick Model) by using a paper-based questionnaire⁽⁶⁾ (Appendix¹) to measure 2nd-year students' and mentors' initial reactions to gain an understanding of the portfolio's strengths and weaknesses as feedback for continuous improvement.

Sustainability⁽³⁾

Making new behavior stick in organizational systems and culture

Institutionalizing new approaches: Obtain the approval of the Curriculum Committee and the Faculty Council. The student portfolio is one of the basic requirements in our faculty bylaw and represents 20% of the score of each module. Appointment of a general coordinator for the student portfolio and appointment of a group of co-coordinators for the student portfolio (co-coordinator for each module). Maintain support for facing ongoing challenges. Maintenance portfolio team for monitoring and updating. Stakeholders are aware of evaluation procedures and findings.

Findings consideration in decisions or actions that affect new behavior.

Ensuring that everyone understands that the new behaviors lead to corporate success: Continuous training for faculty and assisting staff through faculty development programs. Continuous training for students on how to accomplish the tasks required in their portfolios through the allocation of weekly time (one hour) in their study schedule to practice the activities of the portfolio. Honoring the highest score students in the portfolio every semester, while demonstrating the work they have done in presentation in front of the audience.

Anchoring new behaviors into the organization: Revisiting urgency and reviewing the opportunities again and again. Recruiting more volunteers. Removing the knocking barriers for those volunteers. Creating new leaders at many levels and making the success not impersonalized. Developing social relationships and close the gaps between high and low achievers.

Data analysis

The quantitative data were stored and analyzed using SPSS Statistics for Windows. The variables were described using number (%).

Ethical considerations

During the study, the following ethical considerations were considered: The study was approved by the ethical committee of the Faculty of Medicine, Suez University. Reporting findings to all relevant stakeholders and refraining from keeping secrets or selectively communicating findings. Participants of the study were informed about the aims of the study and were kept updated with any changes in the

research through informed consent. Participants had the right to withdraw from the study at any time. No influence was used on the study participants to compel them to participate in the research. Confidentiality regarding the responses of the participants was guaranteed by the anonymity of questionnaires and interviews. Conflict of interest was avoided. The findings and the practical significance of the study were communicated in clear, straightforward, and appropriate language to relevant research populations, institutional representatives, and other stakeholders. Intellectual ownership was respected during quoting from the literature.

The results are described in terms of:

- Needs assessment of stakeholders.
- Frequency distribution of the mentors/assessors according to their perception of the specific characteristics of students' portfolios.
- Frequency distribution of the 2nd year students according to their perception of the specific characteristics of their portfolio.

Needs' assessment of target stakeholders Responses of Focus Group Activity 1

By using portfolios, we need our students to: Begin to take responsibility for their own learning. Assist them in recognizing the significance of their own thoughts, feelings, and inquiries, as well as the relevance of what they are learning. Begin to draw connections between what they are learning in college and their personal identities. Give them opportunities to reflect on what they are learning. Offer them experiences that speak to them, thrill them, and consider their needs and interests. Be self-directed learners. Self-evaluate more effectively.

Responses of Focus Group Activity 2

The participants' needs and concerns are Staff orientation about the portfolio. Training of mentors and examiners. Student orientation about portfolio. One hour weekly in students' schedule to practice activities of the portfolio. To add extra extracurricular activities for the students to motivate and encourage them to participate and practice other activities. And give value for their participation in their portfolio. We need instructors to get to know who students are as individuals. All participants agreed that the distribution of the marks allocated for each Portfolio component is based on Table 2:

Table 2: The distribution of the marks allocated for each Portfolio component	
Component	Score
	First phase Student
Registration Form	-
Mind map ^(7,11)	10%
PBL Concept map ⁽⁸⁻¹¹⁾	15%
Student Scientific Presentation	10%
Literature Review Report	10%
SOAP note	10%
Student reflections ^(1,2,10-12)	15%
PBL Health Education Poster	10%
Practical Logbook	20%

Regarding the perception of the mentors towards the portfolio, the majority (96%) agreed that the portfolio included the students' self-evaluations and their reflections on what was learned. Eighty-eight percent agreed that the purpose of the portfolio was clearly stated as shown in Table (2). Seventy-six percent of the mentors agreed that the portfolio provides for student participation and responsibility and the portfolio provides guidelines for student participation as shown in Table (2). More than sixty percent of the mentors agreed that the portfolio presents entries

in a well-organized and useful manner, the portfolio enables one to determine learning progress and current level of learning, the portfolio providing evidence of various types of student learning, and the portfolio including assessment based on clearly stated criteria of successful performance (Table 2). Regarding the perception of the mentors towards the portfolio, >50% of

mentors agreed that the portfolio includes enough entries in each area to make valid judgments, the portfolio provides clear evidence of learning to users of the portfolio, the portfolio provides greater interaction between tutor and student, and the portfolio includes evidence of complex learning in realistic settings (Table 2).

Table 3: Frequency distribution of the mentors/assessors according to their perception of the specific characteristics of students' portfolio				
The specific characteristics of students' portfolio	Mentors/Assessors (= 25)			
	Yes		No	
	No.	%	No.	%
Is the purpose of the portfolio clearly, stated?	22	88%	3	12%
Is the portfolio providing evidence of various types of student learning?	15	60%	10	40%
Does the portfolio include evidence of complex learning in realistic settings?	13	52%	12	48%
Does the portfolio include enough entries in each area to make valid judgments?	14	56%	11	44%
Does the portfolio include the students' self-evaluations and their reflections on what was learned?	24	96%	1	4%
Does the portfolio enable one to determine learning progress and current level of learning?	16	64%	9	36%
Is the portfolio providing clear evidence of learning to users of the portfolio?	14	56%	11	44%
Is the portfolio providing for student participation and responsibility?	19	76%	6	24%
Is the portfolio providing present entries in a well-organized and useful manner?	17	68%	8	32%
Is the portfolio including assessment based on clearly stated criteria of successful performance?	15	60%	10	40%
Is the portfolio providing guidelines for student participation?	19	76%	6	24%
Is the portfolio providing for greater interaction between the tutor and the student?	14	56%	11	44%

Regarding the perception of the students

towards the portfolio, all participant students agreed that the portfolio included

enough entries in each area to make valid judgments, the portfolio included the students' self-evaluations and their reflections on what was learned, the portfolio provided clear evidence of learning to users of the portfolio, and the portfolio providing for student participation and responsibility (table 3). Regarding the students' opinion towards the portfolio organization and management, the majority (< 90%) agreed that the portfolio was well organized and properly arranged. Eighty-nine percent agreed that the portfolio includes an assessment based on clearly stated criteria of successful performance. More than 87% agreed that the purpose of the portfolio

was clearly stated as shown in Table (3). Regarding the perception of the students towards their portfolio, most of the students agreed that the portfolio provides evidence of various types of student learning (77%), and about 72% agreed that the portfolio includes evidence of complex learning in realistic settings. A high percentage of the students (<60%) mentioned that the portfolio enables one to determine learning progress and current level of learning, the portfolio providing guidelines for student participation, and the portfolio providing for greater interaction between tutor and student (Table 3).

Table 3: Frequency distribution of the 2nd year students according to their perception of the specific characteristics of their portfolio				
The specific characteristics of students' portfolio	Students (=65)			
	Yes		No	
	No.	%	No.	%
Is the purpose of the portfolio clearly stated?	57	87.7%	8	12.3%
Is the portfolio providing evidence of various types of student learning?	50	77%	15	23%
Does the portfolio include evidence of complex learning in realistic settings?	47	72%	18	28%
Does the portfolio include enough entries in each area to make valid judgments?	65	100%	0	0%
Does the portfolio include the students' self-evaluations and their reflections on what was learned?	65	100%	0	0%
Does the portfolio enable one to determine learning progress and current level of learning?	44	67.7%	21	32.3%
Is the portfolio providing clear evidence of learning to users of the portfolio?	65	100%	0	0%
Is the portfolio providing for student participation and responsibility?	65	100%	0	0%
Is the portfolio providing present entries in a well-organized and useful manner?	59	90.7%	6	9.3%
Is the portfolio including assessment based on clearly stated criteria of successful performance?	58	89%	7	11%
Is the portfolio providing guidelines for student participation?	43	66%	22	34%
Is the portfolio providing for greater interaction between the tutor and the student?	41	63%	24	37%

Discussion

Regarding the perception of the mentors towards the portfolio, the majority of them

agreed that the portfolio includes the students' self-evaluations and their reflections on what was learned, the purpose of the portfolio is clearly stated, the portfolio provides for student participation and responsibility, and the portfolio providing guidelines for student participation, the portfolio providing present entries in well organized and useful manner, the portfolio enables one to determine learning progress and current level of learning, the portfolio providing evidence of various types of student learning, and the portfolio including assessment based on clearly stated criteria of successful performance. On the opposite side, more than 44% of mentors disagreed that the portfolio included enough entries in each area to make valid judgments, the portfolio provided clear evidence of learning to users of the portfolio, the portfolio provided greater interaction between tutor and student, and portfolio including evidence of complex learning in realistic settings. Regarding the perception of the students towards the portfolio, all participant students agreed that the portfolio included enough entries in each area to make valid judgments, the portfolio included the students' self-evaluations and their reflections on what was learned, the portfolio provided clear evidence of learning to users of the portfolio, and the portfolio providing for student participation and responsibility, the portfolio was well organized and properly arranged, the portfolio including assessment based on clearly stated criteria of successful performance, the purpose of portfolio clearly stated, the portfolio providing evidence of various types of student learning, and the portfolio including evidence of complex learning in realistic settings. On the opposite side, around 40% of the students disagreed that the portfolio enables one to determine learning progress and current level of

learning, the portfolio provides guidelines for student participation, and the portfolio provides for greater interaction between tutor and student. In the past, most students rarely met with their assigned mentor before the portfolio assignment, unless they were having academic difficulties. However, based on the chance to collaborate on the portfolios, the relationship between the advisor and advisee is now very strong, and some of the results show perceived value in this relationship. According to the findings of a significant meta-analysis, the mentor's contribution to the perceived value of the portfolio process was significant⁽¹³⁾. Numerous authors from various research concluded that the portfolio's potential benefits were constrained by the absence of mentor support^(14,15). According to a different study, the mentor ought to take part in a discussion of the student's shortcomings and a strategy for improvement⁽¹⁴⁾. The study's findings seem to partially confirm these conclusions, albeit there may have been less variation in positive evaluations due to poor portfolio mentoring quality. The purpose of the mentor is to support students as they begin and develop this self-reflection. Although many students find it difficult to complete portfolios, researchers at the University of Toronto found that faculty members frequently presume that medical students are familiar with the procedure and don't need their mentors to explain it to them⁽¹⁶⁾.

Strengths of the study

Good topic of the study (students' portfolio). The learning and assessment nature of the student's portfolio. Action research methodology. Good organization. Evaluate multiple outcomes.

Limitations of the study

Some limitations had diminished the generalization power of the study as the study was conducted in the first basic clerkship (basic sciences educational phase). The study was conducted with only 65 undergraduate medical students and 25 mentors, which also diminished the generalization power of the study. Too many tasks for the allotted time.

Conclusion

Now after developing and establishing the newly developed students' portfolio model, FOM/SU has a students' portfolio which has become a real tool for the learning and assessment process. Students' portfolio assessment at FOM/SU became a systematic and organized collection of evidence used by the instructor and student to monitor the growth of student's competency in a specific area of an integrated competency-based medical education curriculum. The portfolio process is designed to be a tool that teaches students how to evaluate the growth of their knowledge and skill competencies so they can keep improving in areas where they may have gaps once they start working as physicians. We anticipate that through upgrading the portfolio procedure, students will acquire these abilities that they can use in the workplace. The majority of the students and their mentors agreed that the portfolio was well organized, properly arranged, its purpose clearly stated, and included assessment based on clearly stated criteria of successful performance. All participant students agreed that the portfolio includes enough entries in each area to make valid judgments, the portfolio includes the students' self-evaluations and their reflections on what was learned, the portfolio provides clear evidence of learning to users of the portfolio, and the portfolio pro-

vides for student participation and responsibility. Also, more than fifty percent of mentors agreed that the portfolio includes enough entries in each area to make valid judgments, the portfolio providing clear evidence of learning to users of portfolio, the portfolio provides greater interaction between tutor and student, and the portfolio including evidence of complex learning in realistic settings.

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