

Helping Learners in Difficulty – The Incidence and Effectiveness of Remedial Programmes of the Medical Radiation Sciences Programme at University of Toronto and the Michener Institute for Applied Sciences, Toronto, Ontario, Canada[†]

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Abstract

Introduction: Academic difficulty can often be a significant problem for students in health professional programmes. Students in difficulty are often identified late in their training and run the risk of dismissal if remediation is not successful. Since the inception of the Medical Radiation Sciences Program (MRSP) at the University of Toronto, Faculty of Medicine, and the Michener Institute (MI) in 1999, a number of students have required remediation due to problems in the didactic or clinical component of their training. Not all remediation was successful, and a number of students have been dismissed. There is relatively sparse evidence in the educational literature regarding the nature of academic difficulties that health professional students encounter, and what constitutes appropriate remedial education. The purpose of this research was to evaluate the incidence and prevalence of remediation in the MRSP and the nature of the academic problems. In addition, this study looked at the type of remedial instruction that the Radiation Sciences Board of Examiners (BOE) recommended for these students as well as the effectiveness of these recommendations. **Materials and Methods:** This study consisted of a review of the academic records of students who failed one or more courses and underwent pre-clinical or clinical remediation, and who were presented at the Medical Radiation Sciences Board of Examiners at the University of Toronto between September 1999 and December 2004. Data extraction forms were developed to obtain demographic information, the nature of the academic problems, the remedial recommendation, and their outcomes. **Results:** This study identified 69 students who were presented to the BOE 95 times. Forty-four students (44/69, 64%) were from the Radiation Therapy stream, 16 students (16/69, 23%) were from the Nuclear Medicine stream and 9 students (9/69, 13%) were from the Radiographic Technology stream. Most of the remediation occurred due to pre-clinical 50 (50/69, 72%), clinical 15 (15/69, 22%) and both pre-clinical and clinical problems 4 students (4/69, 6%). Out of 54 students who required pre-clinical remediation, 40 (74%) were promoted. Out of 19 students who required clinical remediation, 10 (10/19, 53%) passed their remediation. Six students (6/69, 9%) were dismissed from the programme due to unsuccessful remediation; 2 due to pre-clinical and 4 due to clinical problems. Based on these results, the remediation process at the MRSP was successful; however, 6 students (6/69, 9%) were dismissed from the programme during the last 4 years despite lengthy unsuccessful remediation. **Conclusion:** Our study provided an important perspective about the remediation process at the MRSP at the Michener Institute for Applied Health Sciences. Despite its retrospective methodology, it attempted to identify the magnitude of learning problems that lead to remediation, and identified the efficacy of the remedial programmes.

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Introduction

Since its founding in 1958, The Michener Institute (MI) for Applied Health Sciences has distinguished itself as one of Canada's top post-secondary educational institutions in the field of applied health sciences. The MI undertook a joint venture with the Faculty of Medicine in 1998 to establish the first diploma programme in Medical Radiation Science in Canada. In fact, the Medical Radiation Sciences Program (MRSP) started in 1999 and subsequently underwent a curricular renewal in 2001, to be a part of the Department of Radiation Oncology at the University of Toronto (U of T). Of all the University-based programmes in Canada, the joint U of T/MI programme is the only one to offer all 3 specialties: Nuclear Medicine Technology, Radiation Therapy and Radiological Technology.¹

The MRSP is a 3 year second-entry undergraduate BSc diploma programme that annually admits 130 students into 3 separate streams: Radiation Therapy (60), Nuclear Medicine Technology (40) and Radiological Technology (30). The pre-clinical curriculum includes courses in basic, clinical and social sciences that are common to all 3 streams, as well as those specific to each discipline. In addition, students in each of the 3 specialties undertake a set of courses that focused on discipline-specific material and skills development in dedicated laboratory facilities, and in the clinical environment. The clinical courses have typically taken place in healthcare settings across Ontario and take place after 2 years of pre-clinical classroom teaching. The curriculum of the MRSP emphasises critical thinking, evidence-based practice and problem solving related to each specialty.² In 1999, the MRSP agreed to adopt the appeals process of the University of Toronto's Faculty of Medicine and a separate Board of Examiners (BOE) was established. Membership of the Medical Radiation Sciences Board is the Chair (elected by Council), the Vice-Chair (elected by the members from among the members), the Associate Dean Inter-Faculty & Graduate Affairs (ex officio), the Vice-President of the MI or delegate (ex officio), 7 faculty members (elected by Council) and 2 students from the Programme.³ The BOE determines whether a student identified by the MRSP is in academic difficulty. The BOE approves the programme recommendations regarding remediation, probation or dismissal and determines if the recommended remedial programme is optimal. A distinction is made between remediation undertaken in the normal course of training and remediation needed to correct academic difficulties. Programmes addressing the latter may include probation. The most significant consequence of failing the probationary period is dismissal. Students cannot be dismissed unless efforts at remediation fail. The policies and procedures of the Medical Radiation Sciences, BOE are largely based on those of

the Faculty of Medicine Postgraduate Program, developed in 1992 and updated in 1996.⁴

The MRSP has established a number of monitoring committees to oversee the progress of students and identify those in academic difficulty. If difficulties occur, the course supervisors implement in-course remediation and notify the Oversight Committee, which monitors student progress. Students who fail courses are discussed at the stream-specific Program Review to determine if the student indeed had failed and what remediation is warranted. These recommendations are made to the Oversight Committee, and then to the BOE. The programme maintains a database of students in academic difficulty.

The data from the literature indicate that remedial programmes have been shown to be successful. Morrison et al⁵ describe improved National Council Licensure Examination-Registered Nurse (NCLEX-RN) test (NCLEX-RN) pass rates from 9% to 41% within 2 years by implementing a progression policy, based on the Health Education Systems, Inc. (HESI) Exit Exam (E²).

Many additional examples from the nursing literature provide evidence that disadvantaged nursing students, when given the appropriate assistance or remediation, can succeed academically and can graduate from the nursing schools.⁵⁻⁹ In addition, if a student presents with unprofessional behaviour, counselling services and mentoring by faculty may be successful and should be provided to such students.¹⁰⁻¹⁶

Catton et al¹⁷ examined the academic difficulty in postgraduate medical education across training programmes at the U of T between July 1994 and June 2000. They reported in their study that during these 6 years less than 1% of trainees (65/7134) developed academic difficulties and required remedial programmes to overcome problems. They had identified several types of academic difficulties: cognitive, affective, psychomotor, structural, interpersonal and professional. Most of the literature related to remediation concentrates on undergraduate medical education; however, there is relatively sparse evidence about remediation in health-allied education, particularly remediation in radiation technologist education. Our review tries to fill this gap by presenting remediation in MRSP at the MI.

Materials and Methods

This study consists of a review of the academic records of students who failed 1 or more courses and underwent pre-clinical or clinical remediation, and who were presented at the Medical Radiation Sciences BOE at the U of T between September 1999 and December 2004. Data extraction forms were developed to obtain demographic information, the nature of the academic problems, the remedial recommendation and their outcomes.

Sources of the Data

The students with academic problems who were presented at the Medical Radiation Sciences BOE between September 1999 and December 2004 were identified by reviewing the BOE minutes. However, if the students' information was not available in the BOE minutes, additional student academic records were accessed through the MRSP Student Office. These records consisted of:

1. Descriptive student evaluations from the clinical rotations, including evaluations of competencies as well as Professional Behavioral Evaluations,
2. Student grades from the pre-clinical courses,
3. Descriptive summaries of the students learning problems that were presented to the Program Advisory Committee for remediation,
4. Student performance summaries and programme recommendations prepared by the programme academic coordinators and presented to the BOE for remediation,
5. Student progress reports presented at special meetings and
6. External assessor reports.

To define the type of student academic difficulties, Catton's classification was used¹⁷ (Table 1).

Data Collection and Data Analysis

The study's principal investigator (ES) collected the data. In order to avoid bias or misunderstanding of the information provided, the clinical coordinators in the MRSP were contacted, if necessary, to confirm the validity of the information collected. The data from the students' academic records were incorporated into the Data Extraction Forms that were designed specifically for this study. Descriptive statistics were used to describe the characteristics of the sample. The frequency data were examined. The analysis was done using SPSS statistical software.

Data Extraction Forms

Two data extraction forms were developed to capture the study variables, which helped the researcher to understand the following issues:

1. The incidence of remediation in the MRSP over the last 4 years.
2. The nature of the academic problems seen in the MRSP in the last 4 years.
3. The remedial recommendations of the MRSP BOE.
4. The effectiveness of the remedial recommendation of the MRSP BOE.

Form 1 was developed for the clinical remediation; Form 2 was developed for the pre-clinical remediation.

Privacy and Confidentiality: Ethical considerations were deliberated. No known harm came upon the students whose data were reviewed. No student names were disclosed at any time during the study period. The study was approved by the MI Research Ethics Board. Approval was also given to publish the results of the study.

Results

Incidence and Prevalence of Remediation in the MRSP

From 490 students (351 female; 139 male) enrolled in the MRSP between September 1999 and December 2004, the cases of 69 students (32 female; 37 male) were presented to the BOE 95 times. The average annual incidence of remediation in the MRSP was 14% (range, 10 to 21) and the annual prevalence was 19.5% (range, 11 to 28), given an average annual enrolment of 123 students between September 1999 and December 2004. For the purpose of the data analysis, the students were divided into 3 groups.

- a. Group One: Students (50/69, 72%) who were presented to the BOE only due to pre-clinical problems

Table 1. Classification of Academic Difficulties¹⁷

Type	Description
Affective	Problem with adjustment (e.g., illness, death, marital problems, poor grades resulting in failure to perform, memory loss, withdrawal, low aspirations, low self-esteem, being overwhelmed, depression).
Cognitive	<p>Written: inability to complete assignments, slow or poor reading.</p> <p>Spatial: perceptual problems</p> <p>Oral communications: how to ask questions (difficulty interviewing patients)</p> <p>Integration: difficulty with conceptual or abstract thinking</p> <p>Knowledge deficit: gap in knowledge base</p>
Structural	Unable to structure experience in environment (e.g., poor time management, lack of organizational skills, poor study habits)
Interpersonal	Difficulty interacting with patients or staff (e.g., shy, non-assertive, manipulative, overeager)
Psychomotor	Deficits in technical skills
Professional	Deficits in behaviours (e.g., honesty, integrity, reliability)

- b. Group Two: Students (15/69, 22%) who were presented to the BOE only due to clinical problems.
- c. Group Three: Students (4/69, 6%) who were presented to the BOE due to both pre-clinical and clinical problems.

Demographics (Group One): Fifty out of 69 students presented to the BOE required only pre-clinical remediation in the first 2 years of their programme. Twenty-eight students (28/50, 56%) were female and 22 students (22/50, 44%) were male. The average number of female and male students enrolled in the MRSP annually was 88 (72%) and 35 (28%) respectively. Twenty-nine students (29/50, 58%) were from the Radiation Therapy stream, 13 (26%) were from the Nuclear Medicine stream and 8 (16%) from the Radiographic Technology stream. Thirty-one students (31/50, 62%) failed one pre-clinical course, 15 (30%) failed 2 pre-clinical courses and 4 (8%) failed 3 pre-clinical courses. Thirty-seven from this group (37/50, 74%) were presented to the BOE once, 9 (18%) were presented twice, 2 were presented (4%) 3 times and 2 (4%) were presented 4 times (Table 2).

Demographics (Group Two): Fifteen out of 69 students presented to the BOE required remediation due to clinical problems only. Eight students (8/15, 50%) were female and 7 (47%) were male. Twelve students were from the Radiation Therapy stream (12/15, 80%) and 3 (20%) were from the Nuclear Medicine stream. Thirteen students (13/15, 87%) failed 1 course and 1 (7%) failed 2 courses. One student's problems were not related to a failed course. Of the 15

students who required remediation, 14 were presented to the BOE once (14/15, 93%) and 1 (7%) was presented twice (Table 2).

Demographics (Group Three): Four students developed problems requiring both pre-clinical and clinical remediation. All 4 students were male. Three students were from the Radiation Therapy stream and 1 was from the Nuclear Medicine stream. All 4 students failed one pre-clinical and one clinical course. Two students were presented to the MRSP, BOE once for pre-clinical and once for clinical problems, and 2 students were presented once for pre-clinical and twice for clinical problems. All 4 students were promoted after successful remediation. However, 1 student passed pre-clinical but failed clinical remediation and withdrew from the programme after extensive remediation and extension of this programme by 24 weeks.

Nature of Academic Problem

Academic difficulties judged by the MRSP, BOE as warranting remediation were present in 69 out of 490 students. These 69 students were presented at the MRSP, BOE 95 times in the last 4 years, with an average annual prevalence of 19.5 (range, 11 to 28). However, in this study, the nature of academic problems was investigated only in 19 (19/69, 28%) students who developed clinical problems (Group Two and Three). These 19 students cases were presented 22 times to the BOE, and consisted of 22 (22/95, 23%) of all remedial cases presented to the BOE. Fifty-four (54/69, 78%) students who required pre-clinical remediation (Group One and Three) were not assessed regarding the nature of their academic difficulties because the measurement of successful remediation in this group was a Pass (60% grade on the supplemental exam). These students were presented 73 times (733/96, 76%) to the BOE.

Nineteen students who required clinical remediation (Group Two and Three) were assessed regarding the nature of their academic difficulties. The following academic difficulties were reported in these 19 students: affective (6), cognitive (13), structural (3), interpersonal (9), psychomotor (3) and professional (5). It is important to stress that students could have more than 1 academic difficulty (Table 3). The mean number of problems identified per student was 39/19 or 2.1 (range, 1 to 3).

Remedial Recommendations of the MRSP BOE (All 3 Groups)

Several different strategies were used in the remediation process. The nature of the remedial programmes that were used for all 69 students is reported (Table 4).

Nature of the remedial programme (Group One and Three): Fifty-four (54/69, 78%) students required

Table 2. Student Characteristics for Those who Underwent Clinical or Pre-clinical Remediation (Group One and Two)

Characteristics No. of subjects	Clinical n = 15	Pre-clinical n = 50
Gender – n (%)		
Female	8 (50)	28 (56)
Male	7 (47)	22 (44)
Discipline – n (%)		
Radiation therapy	12 (80)	29 (58)
Nuclear medicine	3 (20)	13 (26)
Radiographic technology	0 (0)	8 (16)
Number of courses failed – n (%)		
1	13 (87)	31 (62)
2	1 (6)	15 (30)
3	0 (0)	4 (8)
Presented to BOE – n (%)		
1	14 (93)	37 (74)
2	1 (6)	9 (18)
3	0 (0)	2 (4)
4	0 (0)	2 (4)

BOE: Board of Examiners

Table 3. Classification and Frequency of Academic Difficulties for Those Who Underwent Clinical Remediation (Group Two and Three)

Classification of academic difficulties*	No. of students
Affective	6
Cognitive	13
Structural	3
Interpersonal	9
Psychomotor	3
Professional	5

* Students may have more than one difficulty

remediation due to pre-clinical problems. There were 50 students (50/69, 72%) from Group One and 4 (4/69, 6%) from Group Three. The following 7 remedial recommendations were used 88 times with these students: supplemental exam (47), counselling (17), professional assessment (5), personal leave of absence (5), repeat of course (2), financial help (1) and others (11). The other category consisted of remedial strategies such as: English as a Second Language (ESL) support, academic leave of absence, modified course load, tutorials and mentors. The mean number of strategies used per student was 1.6 (range, 1 to 5).

Nature of the remedial programme (Group Two and Three): Nineteen students (19/69, 28%) required clinical remediation. There were 15 students (15/69, 22%) from Group Two and 4 (4/69, 6%) from Group Three. The following 13 remedial programmes were used 118 times with these students: counselling (16), extra time (14), one-on-one discussion (12), increased observation and feedback (11), role modelling (11), special rotation (10), professional assessment (10), mentors (9), extra rotation (8), academic leave of absence (7), special course/training (4), personal leave of absence (3) and objective structured clinical examination (OSCE) scenarios (3). The mean number of strategies used per student was 6.2 (range, 2 to 13).

The Effectiveness of Remedial Recommendations of the MRSP BOE

The effectiveness of remediation was assessed according to variables that were identified on the data extraction form. For pre-clinical remediation, the following variables were captured under the results section: promotion, dismissal, transfer to another programme and withdrawal from the programme. In clinical remediation, the results were defined as pass, dismissal and programme extension due to remediation process. The promotion category in the pre-clinical remediation and pass category in the clinical remediation was defined in this study as the successful completion of student’s remediation. Unfortunately, using

Table 4. Nature of Remedial Programme (All 3 Groups)

Nature of remedial programme*	No. of students
Clinical remediation n = 15 (Group Two)	
Clinical remediation n = 15 (Group Three)	
Extra rotation	
Time	8
Leave of absence (personal)	14
Leave of absence (academic)	3
Special rotation	7
One-on-one discussion	10
Mentors	9
Special courses/training	4
Increased observation/feedback	11
Role modelling	11
Professional assessment	11
Counselling	16
OSCE scenarios	3
Pre-clinical remediation n = 50 (Group One)	
Pre-clinical remediation n = 4 (Group Three)	
Professional assessment	5
Counselling	17
Repeat course	2
Financial help	1
Leave of absence (personal)	5
Other	11
Supplemental examination	47

OSCE: objective structured clinical examination

* Students may have more than one remedial programme

a total assessment of remediation results per student did not enable us to determine the results of each particular remedial period in students who had several remediation intervals. However, due to the retrospective nature of this study as well as often missing information from the student files, the determination of the results of each particular remedial time was difficult to assess, and therefore an overall pass or promotion of remediation was used instead. In order to analyse the results as comprehensively as possible, students who were presented to the BOE several times are presented separately in the results section (Table 5).

The effectiveness of remedial recommendations (Group One and Three): The retrospective review of students’ academic reports showed that of the 54 students (54/69, 78%) who required remediation due to pre-clinical problems (Group One and Three), 40 (40/54, 74%) were promoted after they successfully completed the supplemental exams. However, 10 (10/54, 19%) students withdrew, 2 (2/54, 4%) were dismissed and 2 (2/54, 4%) transferred to another programme within the same institution. One student (1/54,

Table 5. Remediation Results for All 3 Groups

Remediation results and frequency	No. of students
Clinical remediation (n = 19)	
Pass	10/19 (53%)
Dismissal	4/19 (21%)
Transfer	1/19 (5%)
Still in process	4/19 (21%)
Programme extension	12/19 (63%)
Pre-clinical remediation (n = 54)	
Promote	40/54 (74%)
Dismissal	2/54 (4%)
Transfer	2/54 (4%)
Withdrawal	10/54 (19%)

2%) in the pre-clinical remediation group repeated the year.

Thirteen students (13/54, 24%) who required pre-clinical remediation were presented to the BOE more than twice. Nine students (9/54, 17%) were presented twice, 2 (2/54, 4%) were presented 3 times and 2 (2/54, 4%) were presented 4 times. Out of 9 students who were presented twice to the BOE, 8 (8/9, 89%) were promoted after successful remediation and 1 (1/9, 11%) withdrew from the programme. Out of 2 students who were presented 3 times to the BOE, 1 was dismissed from the programme and the other withdrew. The 2 students who were presented to the BOE 4 times passed their remediation and were successfully promoted. The analysis of these 13 students who were presented to the BOE multiple times is provided in Table 6.

The effectiveness of remedial recommendations (Groups Two and Three): Out of the 19 students who required remedial modification due to clinical problems (Group Two and Three), 10 students (10/19, 53%) passed their remediation and were promoted in their programmes. One student (1/19, 21%) transferred to another programme. Four (4/19, 21%) students from this group were dismissed due to unsuccessful remediation. The remaining 4 students (4/19, 21%) are still in remediation. All of the dismissed students (4) appealed the decision of dismissal to the Faculty of Medicine Appeal Committee. However, these students were unsuccessful in their appeals. The course of the study for students requiring clinical remediation was extended for 12 students (12/19, 63%) by 274 weeks in total with a mean of 23 weeks per student (range, 4 to 68) (Table 5).

Students dismissed from the MRSP: Six students (6/69, 9%) were dismissed from the MRSP after unsuccessful remediation. Three of these students were female and 3

Table 6. Remediation Results of Students with Pre-clinical Remediation Presented More Than Twice to the BOE*

Pre-clinical remediation n = 13/54	BOE x2	BOE x3	BOE x4
	9 students	2 students	2 students
Promote	8	0	2
Dismissal	0	1	0
Transfer	0	0	0
Withdrawal	1	1	0
Repeat year	0	0	0

BOE: Board of Examiners

Table 7. Dismissed Students (Pre-clinical Remediation)

Student	Gender	Programme	No. of courses failed	No. of remedial recommendations
1	Female	Radiation therapy	2	1
1	Male	Radiographic technology	2	3
Total 2			4	4

were male. Two students (2/6, 30%) were dismissed due to academic problems in the pre-clinical part of their studies (1 female, 1 male). One student was from the Radiation Therapy stream and the other was from the Radiological Technology stream. Both students failed 2 pre-clinical courses and subsequent supplemental exams (Table 7).

Four students (4/6, 70%) were dismissed after failure of clinical remediation (2 female, 2 male). The profile of these students is presented in Table 8. Three students were from the Radiation Therapy stream and 1 was from the Nuclear Medicine stream. Eight academic difficulties were identified in these 4 students, median 2.0 per student (range, 1 to 3). The most common types of academic difficulties were: professional (3), interpersonal (2), cognitive (2) and affective (1). In addition, the MRSP used 32 strategies to remediate these 4 students, median 8.0 per student (range, 5 to 13). All 4 students in this group had their study period extended to accommodate extensive remediation. The total length of programme extension for all 4 students was 116 weeks. The median length of time extension was 29 weeks per student (range, 16 to 52).

Discussion

A joint BSc and Diploma programme in MRS that is offered to the students by the Faculty of Medicine of the U of T and the Michener Institute for Applied Health Sciences provides several excellent opportunities to their students. The integrated 3-year curriculum aims to provide students with a broad-based theoretical and analytical foundation for their discipline-specific professional responsibilities. Graduates receive a BSc in MRS from the

Table 8. Dismissed Students (Clinical Remediation)

Student	Gender	Programme	No. of academic difficulties	Type of academic difficulties	No. of remedial programmes per student	Programme extension
1	M	Nuclear medicine	1	P	5	16 weeks
1	M	Radiation therapy	3	A, C, I	8	52 weeks
1	F	Radiation therapy	2	P, I	8	32 weeks
1	F	Radiation therapy	2	C, P	6	16 weeks

Type of Academic Difficulties – A: Affective; C: Cognitive; I: Interpersonal; P: Professional

Table 9. Successful Remedial Strategies

1.	Early identification of students with difficulty
2.	Open and ongoing dialogue with students
3.	Systematic review and monitoring of the remedial process
4.	Student-centeredness
5.	Individualisation according to student's needs
6.	Use of appropriate resources with full faculty support

U of T and a Diploma of Health Sciences in Nuclear Medicine Technology, Radiation Therapy or Radiological Technology from the MI. Students receive instruction at both institutions. Teaching faculties are drawn from both the U of T and the MI. The programme is designed to accommodate 130 students per year. The 3-year curriculum provides students in each of the 3 disciplines with a core curriculum of broad-based content along with discipline-specific courses and clinical practice activities. The programme proves breadth and depth of knowledge and develops analytical, critical and evaluative skills. Professional value, responsibility, accountability, sensitivity and ethical attitudes towards both the consumer and healthcare community are emphasised. Students learn to evaluate and consider the implications of their professional actions. The clinical practicum components integrate and apply the material taught in lectures and laboratories, leading to the development of clinical competence.

In dealing with students in difficulty, the MRSP adheres to the principles of open discussion with students regarding strategies for improvement, and tries to identify early the students who experience academic difficulty. During this process the MRSP staff maintains ongoing communication with students to provide support, solidify expectations and monitor the remediation process. In addition, the MRSP directs the student to the appropriate resources as required.

The purpose of this study was to evaluate the incidence and effectiveness of remedial programmes of the MRSP, and to identify the nature of academic difficulties that students in the programme have developed. In addition, this study was designed to obtain a better understanding of the remediation process since the beginning of the MRSP in 1999.

The results of this study confirmed that 69 students (69/490, 14%) at the MRSP have required remedial modification of their programme from 1999 to 2004. The majority of students who required remediation (44/69, 64%) were from the Radiation Therapy stream, followed by 16 (23%) from the Nuclear Medicine stream and finally 9 (13%) from the Radiographic Technology stream. Most of the remediation occurred due to pre-clinical problems that students developed in the first 2 years of their study period (54/69, 78%). However, 19 students (19/69, 28%) required clinical remediation. Out of the 54 students who required didactic remediation (Group One 50/69 and Group Three 4/69), 40 students [36/50 (74%) Group One and 4 Group Three] passed their supplemental exams and were promoted. Only 2 students (2/54, 4%) were dismissed due to unsuccessful remediation in the pre-clinical group.

Out of the 19 students who required clinical remediation (15/69 in Group Two and 4/69 in Group Three), 10 students (10/19, 53%) successfully completed their remediation. However, 4 (Group Two and Three) (4/19, 21%) were dismissed due to unsuccessful clinical remediation.

As the literature suggests the most common causes of academic difficulties are cognitive problems.¹⁶ Thirteen students from 19 who developed clinical problems were classified into this group. The interpersonal class of problem learners, consisting of learners who have difficulty interacting with others, was the second most common category among these 20 students. Nine of them were diagnosed with interpersonal problems. The other classes of academic problems seen in these students were affective (6), professional (5), psychomotor (3) and structural (3). Unfortunately, students who presented with pre-clinical problems were not assessed regarding the nature of their academic problems. The reason for this was that the outcome of successful remediation in these groups of students was passing a supplemental examination from the failed subject. In future studies, it would be interesting to investigate the nature of academic problems in these students as well, because they consisted of the majority of students who were presented to the BOE. They were presented 73 times (73/96, 76%).

Unfortunately, the results confirmed that 6 students from

the total of 69 students who required remediation (6/69, 9%) were dismissed from the programme due to unsuccessful remediation. Two students failed their supplemental exams. The other 4 students developed academic problems in their clinical courses, and were dismissed from the programme after an unsuccessful lengthy remediation process. Despite that this study is a single institution study, it provides other allied-health professional educators with framework of how to approach remedial problems. Many different remedial interventions were listed for pre-clinical and clinical remediation, but due to the retrospective design of this study and often multifactorial nature of students' problems we will not be able to determine what strategy is the most effective one to correct specific students' difficulties. Often more than one strategy is necessary to successfully remediate these learning problems (Table 9). The literature suggests that in order to be successful, the remediation need to be student-centred and based on the individual needs of the trainee. Perin¹⁸ suggests that the optimal remediation should be "learner-centered" and requires an understanding of the students needs. Students who participated in the remedial programme enjoyed it. These students reported improved motivation both for study and for their chosen careers, and demonstrated a greatly improved pass rate in subsequent examinations. In addition, students can benefit from an individually-tailored remedial programme and go on to be successful in subsequent parts of the curriculum. However, the provision of individually-tailored remedial teaching is labour intensive and requires full faculty support.¹⁹ Another study by Mitchell et al²⁰ concluded that "*attempting to understand resident performance without understanding factors that influence performance is analogous to examining patient adherence to medication regimens without understanding the individual patient and his/her environment.*"

In designing an intervention, teachers should carefully define the goal and time frame of the intervention, determine how the problem will be addressed, and decide how the intervention will be documented and evaluated. Although students' difficulties are often seen as residing within the resident or student alone, teacher and systems factors must be considered, and the resident should be involved in every step of the process.²¹

Eventhough the role of this article was to present the scope of the remedial education within the MRSP, it also provided the readers with important information about successful remedial strategies that this institution used to correct their students' problem.

Conclusion

Our study provided an important perspective on the remediation process used by the MRSP of the Michener

Institute for Applied Health Sciences. Despite its retrospective methodology, it attempted to identify the magnitude of learning problems that lead to remediation and identified the efficacy of the remedial programmes. This study can help to improve the remediation programmes in this institute by quantifying its magnitude. The suggestion from this research is that the MRSP develop a prospective database of students who require remedial modification of their programmes because the documentation could be incomplete after many years and the real nature of students problems may be difficult to understand. It is also important for the future studies to concentrate on cost-effectiveness of the remediation, as this aspect will be important in the planning of the students' remedial strategies.

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FORM 1

1	File #					
2	Initials					
3	BOE (Date)	1	2	3		
4	Gender	1 Female	2 Male			
5	Discipline	1 RT	2 NM	3 RGT		
6	Grade point average					
7	Year of training	1	2	3		
8	Nature of the problem					
8a	Affective	1 Yes	2 No			
8b	Cognitive	1 Yes	2 No			
8c	Structural	1 Yes	2 No			
8d	Interpersonal	1 Yes	2 No			
8e	Psychomotor	1 Yes	2 No			
8f	Professional	1 Yes	2 No			
9	Didactic	1 Yes	2 No			
9a	Clinical	1 Yes	2 No			
10	Course failed	1/310	2/410	3/510	4/520	
11	Programme recommendations (PR) 1 st time	1/Nil	2/R	3/R&P	4/P	5/D
	PR1/ repeat full course	1 Yes	2 No			
11a	PR2/ repeat part of the course	1 Yes	2 No			
12	Programme recommendations (PR) 2 nd time	1/Nil	2/R	3/R&P	4/P	5/D
12a	PR1/ repeat full course	1 Yes	2 No			
12b	PR2/ repeat part of the course	1 Yes	2 No			
13	Board recommendations (BR) 1 st time	1/Nil	2/R	3/R&P	4/P	5/D
13a	Repeat full course (BR 16)	1 Yes	2 No			
13b	Repeat part of the course (BR 26)	1/Nil	2/R	3/R&P	4/P	5/D
14	Board recommendations (BR) 2 nd time	1/Nil	2/R	3/R&P	4/P	5/D
14a	Repeat full course (BR 2)	1 Yes	2 No			
14b	Repeat part of course (BR 26)	1 Yes	2 No			
15	BOE agrees with the programme 1 st time	1 Yes	2 No			
15a	BOE agrees with the programme 2 nd time	1 Yes	2 No			
16	Nature of remedial programme					
16a	Time	1 Yes	2 No			
16aa	Extra rotation	1 Yes	2 No			
16ab	LOA personal	1 Yes	2 No			
16ac	LOA academic	1 Yes	2 No			
16b	Special rotation	1 Yes	2 No			
16c	One-on-one discussion	1 Yes	2 No			
16d	Mentors	1 Yes	2 No			
16e	Special courses/training	1 Yes	2 No			
16f	Increased observation and feedback	1 Yes	2 No			
16g	Role modelling	1 Yes	2 No			
16h	Professional assessment	1 Yes	2 No			
16i	Counselling	1 Yes	2 No			
16j	OSCE					
17	Resources	1 Yes	2 No			
17a	Within programme	1 Yes	2 No			
17b	Within U of T	1 Yes	2 No			
18	Results	1 Yes	2 No			
18a	Remediation	1 Yes	2 No			
18b	Remediation and probation	1 Yes	2 No			
18d	Probation	1 Yes	2 No			
18e	Dismissal	1 Yes	2 No			
19	Programme expanded	1 Yes	2 No			
19a	How long (weeks)					

FORM 2

1	File #	_____			
2	Initials	_____			
3	BOE (Date)	1	2	3	
4	Gender	1 Female	2 Male		
5	Discipline (Radiation therapy)	1 RT	2 NM	3 RGT	
6	Grade point average	_____			
7	Year of training	1/Y1S1	2/Y1S2	3/2S1	4/Y2S2
8	Number of courses failed	1	2	3	4
9	Nature of courses	_____			
9a	Core	1/ Yes	2/ No		
9b	Stream specific	1/ Yes	2/ No		
10	Results	1/ Yes	2/ No		
10b	Repeat year	1/ Yes	2/ No		
10c	Transfer	1/ Yes	2/ No		
10d	Personal LOA	1/ Yes	2/ No		
10e	Withdrawal	1/ Yes	2/ No		
10 f	Promote	1/ Yes	2/ No		
11	Nature of remediation	_____			
11a	Professional assessment	1/ Yes	2/ No		
11b	Counselling	1/ Yes	2/ No		
11c	Repeat course	1/ Yes	2/ No		
11d	Financial help	1/ Yes	2/ No		
11e	Other	1/ Yes	2/ No		
11f	Supplement examination	1/ Yes	2/ No		
11fa	Supplement examination passed	1/ Yes	2/ No		