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Student Perspectives and Academic Achievement in a Traditional versus an Integrated Curriculum: Evidence from a Medical School

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ORIGINAL RESEARCH REPORTS

Student Perspectives and Academic Achievement in a Traditional Versus an Integrated Curriculum: Evidence From a Medical School

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Abstract

Purpose: The adoption of the integrated curriculum in medical schools has gained popularity over the last two decades entailing radical changes in methods of curriculum delivery. Limited cohort studies have attempted to compare students' perspectives and academic achievement in both curricula. The purpose of this study was to compare students' perceptions and academic achievement among medical students enrolled in an integrated curriculum and those enrolled in a traditional curriculum.

Methods: A retrospective cohort study design was used. A structured questionnaire was administered to assess students' perceptions of learning experiences among third-year medical students belonging to two successive cohorts: one enrolled in the Traditional Curriculum and the other enrolled in the Integrated Curriculum. Assessment of academic achievement was conducted at the end of each cohort's final year in a quantitative manner using assessment plans and the program matrix. Independent sample t-test was used to identify the differences between the two groups.

Results: Students enrolled in the integrated curriculum reported higher satisfaction scores with their learning experience. There were significant differences in favor of the integrated curriculum as regards students' perceived curiosity to investigate new ideas, perceived self-confidence, problem-solving skills, communication skills, interest in learning, perception of the value of their skills for their future career, and perceived teamwork skills. There was a significantly lower academic achievement in the knowledge domain in the traditional curriculum cohort while skills and attitudes domains were comparable.

Discussion: Students enrolled in the integrated curriculum had an overall more positive perception towards their learning experiences than their counterparts in the traditional curriculum. The results also showed that students' acquisition of knowledge was enhanced by the adoption of an integrated curriculum as shown by students' academic achievement results.

Keywords: Integrated curriculum, Traditional curriculum, Cohort study, Student perspectives, Academic achievement

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1. Introduction

The medical education landscape is constantly evolving in an effort to graduate physicians capable of providing contextually appropriate services, a responsibility entrusted to medical schools and depending largely on the curriculum taught. Since the Flexner report, medical curricula have largely remained traditional or discipline-based, which is reported to cause a disconnection between theory and practice and may result in demotivation of students [1]. The inability of traditional models to meet current inter-disciplinary inquiry needs requires a solution which may be the integrated curriculum. The shift to integrated curricula has been attempted repeatedly in recent decades without meaningful research to show for its advantages which necessitates further exploration.

Curriculum implementation creates an educational context that should encourage a student who is self-directed, self-motivated, and capable of working independently to solve challenges [2]. There has been an international trend since the early 1990s to integrate the teaching of basic and psychological sciences into the medical curriculum. The basic idea is to design blocks of a multidisciplinary system that integrate threads from different disciplines [3]. Knowledge retention and the improvement of clinical skills may be improved by integrated curricula because they remove boundaries between the clinical and basic sciences [4–6]. The problem-based curriculum (PBL) is one of the most investigated types of integrated curricula confined to the socio-constructivist theory. The concept of PBL involves the framework of the case-study educational approach [7]. This method permits for handling realistic cases and allows students to apply their knowledge in a practical approach [8]. Compared to the traditional teaching model, the integrated approach is largely student-centered [9]. It is also believed that constructivist educational environments enhance students' understanding of their learning context and encourage in-depth knowledge acquisition [10].

Since its inception, the integrated curriculum approach has spread throughout the world of medical education, and the available literature has become filled with developments, descriptions, and implementations of these types of curricula. The approach has been endorsed by the Association of Medical Colleges and the World Federation of Medical Education [11]. Empirical results on the educational outcomes of this education technique

are limited, however, several positive effects have been detected on students' motivation and practical relevance [12,13]. Currently, integrated curricula are increasingly used within health professions disciplines [11,14,15]. Studies have demonstrated that an integrated curriculum may be more effective at improving students' clinical competencies, but its ability to develop their theoretical knowledge base has been doubted [11]. Thus, despite its extensive global adoption, the benefits of the integrated curriculum over the traditional curriculum have not been conclusively confirmed.

In recent decades, recommendations on medical education have been published that have strongly affected undergraduate curriculum development worldwide [16–18]. Some medical schools have adopted hybrid-PBL curricula in response to increasing concerns regarding the conventional medical education methods [19]. Students who studied a hybrid-PBL curriculum had higher perceptions of academic self-perception and learning than students with the traditional lecturing method [19]. There are numerous unresolved or partially answered concerns about the advantages of integrated curricula over traditional curricula with few epidemiological studies carried out to evaluate medical students' preference, highlighting the need for such research.

Our hypothesis was that the change in the methods of teaching and learning that had accompanied the introduction of the Integrated Curriculum in our undergraduate program would affect students' perceptions of their skills in problem-solving, communication, teamwork, and lifelong learning, and that with the gain of these skills there would be a higher level of academic achievement. Therefore, the aim of this study was to compare students' perceptions and academic achievement among medical students enrolled in an integrated curriculum and those enrolled in a traditional curriculum.

2. Methods

2.1. Study cohorts

Approval to conduct this study was obtained from the Institutional Review Board at Imam Abdulrahman bin Faisal University (IAU), Dammam, Saudi Arabia (IRB-2022-01-201). A retrospective cohort study design was used to compare between students' perceptions of their learning experiences and academic achievement as measured by the achievement of PLOs among medical students enrolled in the traditional curriculum (TC Cohort)

and those enrolled in the integrated curriculum (IC Cohort). The data from two successive cohorts of undergraduate students enrolled in the Bachelor of Medicine and Surgery Program (MBBS) were retrospectively evaluated for inclusion in the study.

For each cohort, the collection of data took place at two points during their program: The Student Experience Survey (SES) was administered at the midpoint of the program (toward the end of students' 3rd year) and the assessment of academic achievement took place just before graduation (toward the end of the 6th year of the program). For the Traditional Curriculum cohort (TC), which included 275 students (135 males and 140 females), the SES was administered in May 2014 and the academic assessment was conducted in May 2017, while for the Integrated curriculum cohort (IC), which included 200 students (89 males and 111 females), the SES took place in May 2015 while the academic assessment was conducted in May 2018. Both cohorts responded to the same Student Experience Survey Questionnaire and the same methodology was utilized to assess the academic achievement for both cohorts. Both cohorts had been admitted to the MBBS program from the common foundation year, thus ensuring identical entry requirements among students and the groups were similar as regards age and sex distribution. Fig. 1 shows the study flow-chart and the data collection points.

2.2. Traditional and integrated curricula

The MBBS program is a six-year undergraduate degree consisting of one foundation year (considered as year one of the program) followed by five academic years and a twelve-month internship supervised training subdivided into eight rotations. Students are admitted to the program upon successful completion of the foundation year and achievement of the admission requirements. The traditional curriculum includes two parts; the pre-clinical part (year 2 and 3 of the medical program) in which the students study basic-science courses such as physiology, anatomy, biochemistry, histology, among others. The teaching in these courses is mostly didactic depending on large group lectures, laboratory sessions, and tutorials. Students have virtually no clinical exposure during pre-clinical years, however, starting from the fourth year; students begin their clinical rotations including courses such as pediatrics, obstetrics and gynecology, internal medicine, surgery, anesthesia, dermatology, emergency medicine, etc These rotations take place mostly in the teaching hospital affiliated to the University.

The integrated curriculum, on the other hand, is an interdisciplinary curriculum integrating basic science and clinical knowledge and skills training. It is designed as a thematic integrated program comprising 4 themes, within which a range of semester-long units from different disciplines are integrated across the program. The courses emphasize clinical skills, with clinical sessions conducted in clinics, hospitals, and community health facilities starting as early as the first year of the program. The integrated curriculum follows a thematic structure where learning and teaching is incorporated within a matrix of four themes across the curriculum's 5 years: Theme (I): "Personal and Professional Development," Theme (II): "Population, Society, Health and Illness," Theme (III): "The Scientific Basis of Clinical Practice," and Theme (IV): "Clinical Skills."

Across the 5 years of the integrated curriculum, the balance between the curriculum themes varies with students' progress through the program. The curriculum is integrated with respect to both teaching and assessment to mirror changes in skill and knowledge development at the program's different levels with complexity increasing as students move along in the program. The themes have an essential role in outlining the learning outcomes of the curriculum, while the students' learning experiences are rooted in the delivery of an integrated curriculum with integrated assessment characterized by horizontal and vertical integration. As such, horizontal integration ensures that the content for each theme complements other materials delivered each week while vertical integration allows courses to build on content presented in previous levels of the program.

Problem-Based Learning (PBL) is one of the integrating methods employed in the Integrated Curriculum and is undertaken using an array of different modalities such as instructor-facilitated sessions, small-group learning, and student presentations which is also supported by concomitant clinical exposure. The delivery of courses largely provides learning experiences in both community-based and hospital-based settings. The culture promoted by the curriculum is one that largely recognizes teamwork, service, scientific enquiry, and commitment to life-long learning as crucial factors in effective medical practice. Basic biomedical and behavioral sciences including anatomy, physiology, biochemistry, microbiology, immunology, genetics, pharmacology, pathology, sociology, and psychology are introduced in the early years of the curriculum within inter-disciplinary units which emphasize clinical issues using case

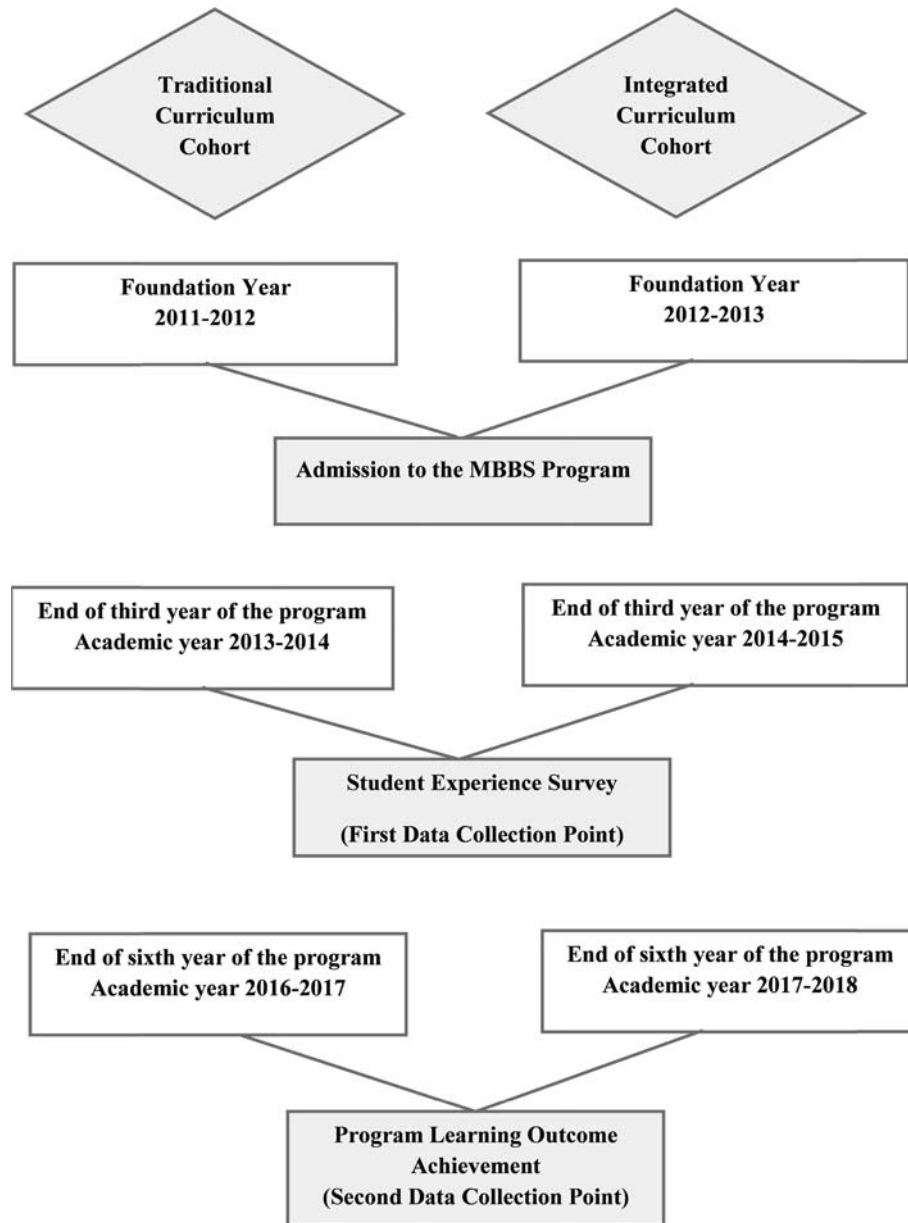


Fig. 1. Flowchart of the study.

studies and PBL. The 3rd year of the curriculum also provides opportunities for students to participate in community program placements where they have the chance to work in different community-based settings under guided supervision. The students' 4th year course focuses on integrating medicine and surgery in one interdisciplinary course while exposing students to a variety of case-based learning and PBL sessions in teaching hospitals. The 5th year is where students start their clinical rotations in family medicine, child health, mental health, and women health. Finally, the 6th year is structured as a series of clerkships in internal medicine, surgery, geriatric medicine, emergency

medicine, in addition to one selective rotation where students can select to train in a discipline of their choice. The 6th year is also when students are provided the opportunity to undertake a year-long research project under supervision of the college faculty. Upon successful completion of all the courses of the program, students are required to take part in a 12-month internship training which is an essential part of their degree.

2.3. Student experience survey

At the first data collection point (the end of each cohort's third year), the participants were asked to

complete the Student Experience Survey (SES). The survey is conducted at this precise timing in order to evaluate the perception of students of their learning experience at the midpoint of their studies when they have had enough time in the program to adapt and form an objective opinion about their studies and there is still time remaining for them in the program to allow for application of corrective measures based on students' feedback and also to evaluate the effect of these corrective measures. The survey questionnaire was developed by the "National Center for Academic Accreditation and Evaluation", the official accrediting body for higher education programs in Saudi Arabia. The SES tool was validated in a previous study [6]. The questionnaire consists of 20 items dealing with the students' experience in the program. It includes major elements of the program and a number of general items relating to services and facilities. The final question is intended as a summary question that might be used as a general quality indicator. Questionnaire items are scored on a 5-point Likert scale ranging from 1 to 5 indicating; "Strongly Disagree", "Disagree", "Neutral", "Agree", or "Strongly Agree" respectively. For the purpose of this study, the questionnaire items were grouped into 8 categories: curiosity to investigate new ideas, self-confidence, problem-solving skills, communication skills, interest in learning, value of skills for future career, teamwork skills, and enjoyment of university life. Informed consent to utilize the survey data was provided by all participants.

2.4. Academic achievement

The second data collection point comprised the assessment of academic achievement and took place towards the end of each cohort's sixth and final year of the program. The MBBS Program at IAU has clear procedures to assess students' academic achievement by assessing their achievement of Program

Learning Outcomes (PLOs). The assessment process is designed in such a way that the students' achievement of each PLO is measured in a quantitative manner for each student cohort by adopting a multi-step process. The process starts at the course level by assessing the achievement of the Course Learning Outcomes (CLOs); appropriate course blueprints and assessment plans are devised for each offered course and accordingly students' achievement is measured in each respective course. The CLOs are aligned with appropriate PLOs within the program matrix; thus, the CLOs achievement results can be aggregated with regard to those courses contributing to each PLO using the program planning matrix. The students' academic achievement was calculated in terms of the percentage of students achieving a grade of C or above. Grades were categorized into four categories using a pre-defined grading scale: "A" \geq 90%, "B" \geq 80%, "C" \geq 70%, and "D" \geq 60%.

2.5. Data analysis

Statistical Package for Social Sciences (SPSS version21) was used for data entry and data analysis (IBM Corporation, Armonk, NY, USA). Descriptive statistics and independent sample t-tests were used to determine the differences between the two studied cohorts. A P value of less than 0.05 was considered as significant at a Confidence Interval (CI) of 95%.

3. Results

3.1. Student experience survey results

The survey questionnaire was administered electronically to 529 medical students. Four hundred and seventy-five students responded to the questionnaire, of which 275 (135 males and 140 females) belonged to the traditional curriculum cohort and

Table 1. Comparison of students' perceptions of their learning experience among students belonging to the traditional and the integrated curriculum cohorts.

Students' Perception areas	TC Cohort Mean (SD)	IC Cohort Mean (SD)	Standard Error	t value	p value
Curiosity to investigate new ideas	3.12 (0.98)	3.40 (1.10)	0.10	-2.81	0.01**‡
Self-confidence	3.46 (1.00)	3.79 (1.08)	0.10	-3.45	0.001***‡
Problem- solving skills	3.46 (1.00)	3.79 (1.08)	0.10	-3.45	0.001***‡
Communication skills	3.51 (1.00)	3.80 (1.05)	0.09	-3.03	0.001***‡
Interest in learning	3.44 (1.02)	3.82 (1.11)	0.10	-3.87	0.001***‡
Value of skills for future career	3.82 (0.95)	4.11 (1.00)	0.09	-3.24	0.001***‡
Teamwork skills	3.60 (1.10)	4.12 (1.05)	0.10	-5.24	0.001***‡
Enjoyment of university life	3.75 (0.97)	3.47 (1.20)	0.10	2.72	0.01**‡

TC: Traditional Curriculum, IC: Integrated Curriculum, *: Significant at $p < 0.05$, **: Significant at $p < 0.01$, ***: Significant at $p < 0.001$, ‡: Significant for IC cohort, ±: Significant for TC cohort.

200 (89 males and 111 females) belonged to the integrated curriculum cohort. Multivariate assumptions were explored; data was normal, linear, and free of issues of heteroscedasticity or multicollinearity. Cronbach's Alpha results showed a high level of internal consistency of the survey items with a value of 0.939.

Table 1 shows the comparison between the mean values of the Students' Experience Survey results among students belonging to the Traditional Curriculum Cohort (TC) and those belonging to the Integrated Curriculum (IC). Independent sample t-test revealed differences that were statistically significant as regards the perception of the learning experience between the two cohorts. Students enrolled in the integrated curriculum expressed significantly higher perceived curiosity to investigate new ideas ($P = 0.01$), perceived self-confidence ($P = 0.001$), problem-solving skills ($P = 0.001$), communication skills ($P = 0.001$), and interest in learning ($P = 0.001$). They also expressed a higher perception of the value of their skills for their future career, and higher perceived teamwork skills ($P = 0.001$). On the other hand, the overall enjoyment of university life was higher among students of the TC cohort ($P = 0.01$).

3.2. Academic achievement

The Assessment of academic achievement was conducted at the end of the 6th year of the program for the two study cohorts. For the Traditional Curriculum cohort, out of the 275 students who responded to the Student Experience Survey in 2014, 261 (130 males and 131 females) completed the program in 2017 and were subjected to the assessment. The traditional curriculum had 19 PLOs subdivided according to the domains of learning into 3 domains: knowledge, skills, and attitudes. The percentage of students who scored a grade of C or above in each learning outcome of the knowledge domain ranged between a minimum of 53.3% and a maximum of 83.21%. The percentage of students who scored a grade of C or above in each learning outcome of the skills domain ranged between a minimum of 78.34% and a maximum of 92.35%. Finally, the percentage of students who scored a grade of C or above in each learning outcome of the attitudes domain ranged between a minimum of 86.35% and a maximum of 96.5%.

For the integrated curriculum cohort, out of the 200 students who responded to the Student Experience Survey in 2015, 198 (88 males and 110 females) completed the program in 2018 and were subjected to assessment of PLO achievement. The

integrated curriculum had 15 PLOs subdivided according to the domains of learning into 3 domains: knowledge, skills, and attitudes. The percentage of students who scored a grade of C or above in each learning outcome of the knowledge domain ranged between a minimum of 74.2% and a maximum of 80.4%. The percentage of students who scored a grade of C or above in each learning outcome of the skills domain ranged between a minimum of 87.8% and a maximum of 89.6%. Finally, the percentage of students who scored a grade of C or above in each learning outcome of the attitudes domain ranged between a minimum of 89.9% and a maximum of 90.79%.

Fig. 2 compares the academic achievement as measured by program learning outcome assessment in each learning domain among students in the traditional curriculum cohort and students in the integrated curriculum cohort. The results show a significantly lower achievement in the knowledge domain among the TC student cohort compared to the IC student cohort ($P = 0.03$), while the results in the skills and attitudes domains were comparable in the two cohorts.

4. Discussion

Medical schools have traditionally adopted discipline-based curricula containing large bodies of knowledge related to pre-clinical and clinical disciplines. Lack of integration of course material; poor coordination between the basic science departments and clinical specialties; and use of traditional didactic pedagogic methods of teaching deter it from achieving its main goal [20]. In today's scenario, there is a strong need for medical knowledge to be delivered to students in a more integrated way [21]. The present study was undertaken with the aim of comparing perception of learning experiences and academic achievement among students enrolled in a traditional discipline-based medical curriculum and those enrolled in an integrated curriculum.

4.1. Students' perception of their learning experience

In this study, students belonging to the integrated curriculum cohort (IC) reported overall more positive perceptions of their learning experience than those belonging to the traditional curriculum (TC) cohort. Our results revealed that students in the IC cohort expressed significantly higher perceived curiosity to investigate new ideas and had higher perceived self-confidence, problem solving skills, teamwork skills, and communication skills. They

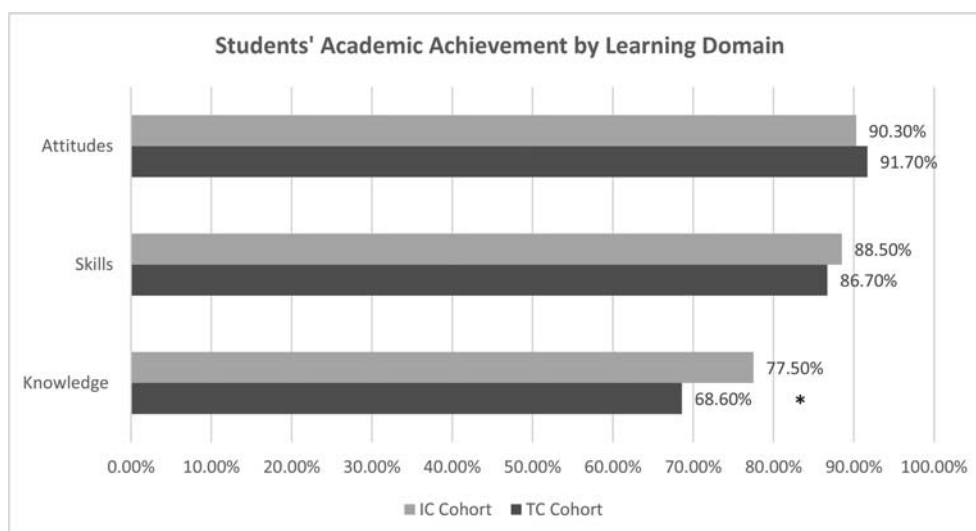


Fig. 2. Comparison of academic achievement by domain of learning among students of the traditional curriculum cohort and students of the integrated curriculum cohort. * statistically significant difference ($p < 0.05$). IC: Integrated curriculum Cohort, TC: Traditional curriculum cohort.

also expressed a higher interest in learning and a higher perception of the value of their skills for their future career. On the other hand, the overall enjoyment of university life was higher among students of the traditional curriculum cohort.

These overall more favorable ratings for the integrated curriculum may be accounted for by the considerable change in the methods of teaching and learning that took place with the adoption of the integrated curriculum. For instance, differences in favor of the IC cohort for perceived communication skills, teamwork skills, self-confidence, problem-solving skills, and curiosity to investigate new ideas may be linked to the introduction of PBL in the IC. Indeed, the most prominent feature of PBL is the use of real-life clinical problems to encourage and systematize student learning thus transforming the curriculum into a more student-centric approach that emphasizes the construction of knowledge as opposed to the passive transmission of knowledge [22]. While traditional methods of teaching rely on the administration of lectures covering vast areas of content, PBL emphasizes the utilization of a problem as a medium to guide the learner towards important information [21]. This strategy of learning challenges the established assumption that problem solving is not possible unless an information base is previously acquired, and that learning should progress sequentially from basic-science to clinical teaching [23].

Additionally, the IC cohort had a higher perception that their studies stimulated their interest in learning and a higher perception of the value of their skills for their future career. This may be

attributed to the horizontal and vertical integration in the new curriculum. In 1993, Ginzberg cited vertical integration as a significant curricular reform method that better prepares future medical practitioners for the practicing in the twenty first century [24]. In fact, it can be argued that teaching different disciplines in isolation is an artificial concept in medical education since, in real life, the practice of medicine is largely transdisciplinary. In other words, medical students need to fit things together to learn the relationship between the parts and how to synthesize and be able to see the big picture.

Several studies have investigated medical students' perceptions towards their learning experience in integrated curricula. For example, in a study that attempted to measure and compare medical graduates' perceptions of their preparedness for their role as house officer among graduates of a traditional versus an integrated medical curriculum, Jones et al. reported that the graduates of the integrated curriculum perceived a higher ability to work in groups and to communicate effectively and felt that their program prepared them better for providing medical care for individuals of cultures and groups. The same study found that faculty and staff ratings favored integrated curriculum graduates regarding communication skills [25]. Similarly, another study found integrated curriculum graduates to be significantly superior to traditional curriculum graduates with respect to relationship with patients and their families and relationship with the members of the health team [26]. These results are in accordance with our findings that emphasized that students enrolled in the integrated curriculum

perceived a higher ability to communicate effectively, work in groups, and solve problems which can be explained by the heavy reliance of the integrated curriculum on PBL, especially in the early years of the program, which has been shown to enhance students ability not just to assimilate knowledge but also to apply communication skills, critical thinking, problem-solving, teamwork, and independent learning [2].

Comparable findings were also reported by Shehnaz who conducted a longitudinal study to compare the educational environment among cohorts of medical students receiving a traditional curriculum or hybrid, student-centered, integrated curriculum in Ajman, UAE. The results showed that the curricular reform had produced a significant positive effect on the educational environment, however, curricular overload and higher stress levels among students emerged as areas that warranted remedial attention [11]. Again, in an early study exploring attitudes among teachers and students regarding a medical curriculum that employed horizontal integration and vertical integration, Brynhildsen et al. reported that both students and teachers were confident that both vertical and horizontal integration were essential features of an undergraduate medical curriculum concluding that when basic scientific concepts were vertically integrated with clinical application, this was likely to result in deep rather than superficial learning which can lead to better understanding of biomedical scientific principles and stimulate a higher knowledge retention [27].

Our study results also indicated that students belonging to the Integrated Curriculum Cohort were stimulated by their studies to further their learning and perceived that the knowledge and skills that they were learning were valuable for their future career. These results can be explained by the breaking-down of barriers between basic sciences and clinical application that occurs in the integrated curriculum which helps promote in students a sense of the relevance of their studies as well as an early development of their clinical skills. Kate et al. reported similar findings in a study comparing an integrated medical program using case-based learning and a traditional discipline-based program; the integrated program was perceived to be more beneficial by most faculty and students with respect to performance in courses as well as during clinical training. The students expressed that their greater participation in the integrated learning program helped them to become active learners [26].

Although the integrated approach to medical education has been shown to provide medical students

with a motivating and challenging approach to their learning experience promoting lifelong habits of self-directed learning [27,28], however, the present study found a higher perceived overall enjoyment of university life among students belonging to the TC cohort compared to those belonging to the IC cohort. This may be due to the fact that the lack of course structure in integrated curricula may create some degree of uncertainty and anxiety in students compared to discipline-based curricula using didactic teaching and learning methods where the pressure is mostly on the teacher as the source of knowledge. Students enrolled in integrated and problem-based curricula may also feel more stress related to the pressure to participate and provide input in PBL sessions which may contribute to their lack of enjoyment of university life [11,29]. Contrastingly, in a study by Gustin et al. comparing perceptions of educational context among medical students receiving an integrated curriculum and those receiving a traditional lecture-based curriculum using the “Dundee Ready Educational Environment Measure” (DREEM) [30]. The authors found that the integrated curriculum improved students’ perceptions of the educational context notably their perceptions of their general educational atmosphere which included perceiving that their enjoyment outweighs stress. The authors explained this by the fact that the severe process employed in a lecture-based traditional curriculum induced in students a fear of failure which impacted their enjoyment of university life [2]. We hypothesize that these variations may be explained by a potentially different social climate among institutions. In fact, it is more than likely that an integrated curriculum will help optimize students’ educational atmosphere eventually favoring a better enjoyment of university life provided that its objectives are clear, its assessment criteria are well defined, and its teaching content is relevant.

4.2. Students’ academic achievement

Our study used a Program Learning Outcome achievement assessment approach to objectively compare the academic achievement of the Traditional Curriculum and the Integrated Curriculum cohorts of students. Assessment of academic achievement is often a challenge for program leadership due to the difficulty of its methodology. However, it is well recognized that outcome-based assessment modes which evaluate “mastery of learning by students through their demonstration of knowledge, attitude, values, skills, and behaviors required for the degree sought” [31] are better

equipped to graduate physicians who have the particular competencies required of their profession. To the best of our knowledge, few studies have used a mixed model using both subjective criteria (students' self-perceived learning benefits) and objective criteria (achievement of PLOs) to evaluate the impact of an integrated curriculum on undergraduate medical education [32]. Our results showed that the overall PLO achievement was significantly lower among the TC student cohort compared to the IC student cohorts ($P = 0.03$) as regards the learning outcomes of the knowledge domain, while the results in the skills and attitudes domain were comparable. Similar findings were reported in a study of dental students where the authors sought to objectively determine the effect of an integrated PBL curriculum on dental students' first-time pass rate. The results showed that the first-time pass rate for the integrated problem-based learning students was significantly higher than the traditional curriculum group in both oral and written OSCEs (91.7% vs. 81.0%, $p = 0.02$) [33]. Again, comparable results were obtained by Faisal et al. who designed a study that compared the effectiveness of Problem Based Learning and traditional lecture-based learning (LBL) on medical students' cognitive skills as measured by their achievement in Multiple Choice Question tests. The results showed significantly higher academic performance among students who attended PBL sessions compared to those who attended the LBL ($P = 0.001$). [34].

The higher achievement that was observed among students enrolled in integrated curricula may be explained by the fact that these students have a tendency to place focus on using learning resources including online sources and library resources early in their studies. By contrast, those who receive a traditional curriculum tend to depend mostly on resources supplied to them by faculty such as lecture notes and summaries. Moreover, students who are trained on PBL strategies, which are often featured in integrated curricula, are more likely to utilize their acquired skills spontaneously to solve new problems to which they are exposed during assessments [35]. On the other hand, another study conducted on undergraduate medical students showed similar achievement in knowledge retention and understanding among students who were taught using a PBL approach and those taught using a lecture-based approach as measured by achievement in a multiple-choice question test [36].

Despite the overall favorable attitude towards curriculum integration and problem-based learning in the literature, several studies have reflected

concerns regarding challenges in execution as well as in outcomes. For instance, some studies have found PBL to be more costly than traditional curricula, demanding more manpower, logistics, and time [36,37]. Additionally, some early studies have found that PBL graduates rated their basic science knowledge as weaker than their traditional curriculum counterparts which may suggest that integrated curricula may not help in developing in students a solid knowledge foundation [38,39]. These findings are also supported by a more recent study that was carried out by McManus et al. in the UK among 29 medical schools. The study showed that students enrolled in schools that applied a problem-based learning curriculum generally showed lower performance in postgraduate assessments than those enrolled in traditional subject-based curricula, which according to the authors may have been influenced by the early attainment of an "academic backbone" in students enrolled in traditional curricula [40]. However, it is the opinion of the authors of the current study that findings based on examinations alone do not reflect the many behaviors and roles of physicians such as running wards and clinics, consulting and prescribing, communicating with patients as well as leadership and advocacy.

In the current study, the integrated curriculum that was offered to students was not a problem-based curriculum per se; however, it did rely on PBL sessions in the early years and on case-based learning sessions in the more advanced courses. Several studies reported that while many students may prefer integrated and PBL curricula, still they communicate a certain degree of dissatisfaction regarding a perceived lack of structure or direction of the curriculum [41]. A study examining PBL in several medical colleges in Asia reported that difficulties facing students in a PBL curriculum included the fact that sometimes students were unable to participate actively in discussions and that they reportedly perceived that subject-based tutorials would be more efficient for obtaining information [42]. Another study found that over 50% of students reported that they had gained better communication skills and problem-solving abilities but were however dissatisfied with their fellow students' poor participation. They also expressed that PBL could be time-consuming [43]. It is also the opinion of the authors of the current study that conducting PBL sessions needs to involve considerable attention to problem design in order to ensure that problems are presented in a relevant and interesting method; and that training of facilitators should be enhanced to meet the demands of such curricula.

5. Limitations and future directions

This study was a retrospective cohort study in one institution; its findings might not be generalizable; further studies across several institutions are required. Additionally, only third year students were involved in the student experience survey; a study exploring students' confidence and abilities across their years of study to graduation may be beneficial. Furthermore, the use of self-administered questionnaires has been claimed inaccurate and potentially limiting the interpretation of the results, yet students' self-perception may still provide useful insights to guide the continuous improvement of teaching and learning modalities and the quantitative assessment of learning outcome achievement among cohorts has added objectivity to the results of this work. Future prospective studies could evaluate the impact of the Integrated Curriculum on graduates' achievements in Medical Licensing Exams.

6. Conclusion

If one of the goals of a medical college is for its students to take responsibility for their own learning and graduate with the ability to integrate and apply knowledge, then a traditional discipline-based curriculum may not be ideal for meeting these objectives. The current study showed that the cohort of students enrolled in the Integrated Curriculum had an overall more positive perception towards their learning experiences than their counterparts in the Traditional Curriculum Cohort. We also quantitatively assessed the academic achievement among students belonging to the two cohorts and found a higher achievement in the knowledge domain among students of the Integrated Curriculum cohort. Solid evidence that demonstrates that an integrated curriculum is better than a traditional curriculum is hard to come across, however, the motivation towards such a strategy is evident; the theories behind it are strong, and students show an inclination toward it. Successful implementation of the integrated curriculum still faces some difficulties; however, we believe that this will be the way to educate and train the kind of physicians needed to meet the demands of the future.

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Conflict of interest

The authors have no conflict of interest to declare.

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