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Research Article

Capabilities of Implementing Flipped Classroom Teaching in Kermanshah University of Medical Sciences

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Abstract

Background: The flipped classroom teaching method can lead to frustration and dissipation if the necessary conditions are not met.

Objectives: The present study aimed to evaluate the feasibility of implementing the flipped classroom teaching method at Kermanshah University of Medical Sciences.

Methods: The study was conducted using a descriptive cross-sectional survey method. A sample of 120 professors with theoretical teaching experience was selected. The data collection tool was a researcher-made questionnaire, validated for construct and face validity. Data analysis was performed using SPSS version 18 software, employing mean, standard deviation, independent parametric *t*-tests, one-way analysis of variance (ANOVA), and Tukey's post hoc test.

Results: Factors related to the curriculum, with an average score of 18.09 ± 3.01, were at the desired level. Regarding the abilities of faculty members in implementing the flipped classroom, the conditions were within the average range, with an average score of 14.79 ± 3.2. Scores for other variables were significantly lower than average. Analysis of variance revealed a statistically significant difference in scores related to internet access (P = 0.02).

Conclusions: "Curriculum-related factors" is the only factor with suitable conditions for the flipped classroom; implementation of this method is not feasible for other factors. It is recommended to address these deficiencies to optimize conditions for the flipped classroom.

Keywords: Flipped Classroom, Medical Education, Teaching-Learning, Teaching Method

1. Background

With advancements in teaching technology, medical education has increasingly adopted digital media to enhance learning. One prominent approach is the flipped classroom model, where traditional teaching structures are inverted: Students acquire foundational knowledge through pre-class materials, typically delivered digitally, and use classroom time to deepen understanding through discussion and application (1). This model has gained widespread popularity in medical education due to its reported benefits, including improved self-directed learning, enhanced teacher-student interactions, increased student motivation, and better academic performance (2-4). By shifting initial learning outside the classroom, the flipped approach fosters cooperative learning, encourages active participation in class discussions, and allows instructors to monitor and advance students' progress more effectively (5-7). Both students and professors report satisfaction with this method, as it enables practical application of knowledge and aligns with student-centered learning principles (8-10).

Despite these advantages, implementing the flipped classroom model requires careful consideration of institutional resources, faculty preparedness, and student readiness. Research suggests that learners must take an active role in their education for this method to

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succeed, rather than relying on traditional, professor-led instruction (11). While studies have demonstrated the effectiveness of flipped classrooms in various contexts (2, 3, 12), there remains a notable gap in understanding the feasibility of applying this method, particularly in resource-constrained or developing educational settings. For instance, some South Asian universities, including those in developing countries, face challenges such as limited technological infrastructure and inadequate training, which hinder the adoption of flipped classroom strategies (13). This suggests that the success of the model cannot be assumed universally and must be tested in specific contexts.

In Iran, where medical education is evolving to meet global standards, little is known about whether the flipped classroom can be effectively implemented in universities with varying levels of technological and pedagogical support. Kermanshah University of Medical Sciences, located in a region with unique socioeconomic and infrastructural characteristics, exemplifies this uncertainty. Although the flipped classroom holds promise for enhancing medical education, its feasibility in this setting — considering factors such as access to digital tools, student preparedness, and faculty expertise — remains underexplored. Therefore, this study was designed to investigate the feasibility of implementing the flipped classroom teaching method at Kermanshah University of Medical Sciences, addressing a critical need to evaluate whether this innovative approach can be adapted to local conditions and contribute to improving medical education in similar contexts.

2. Objectives

Given the importance of the flipped classroom teaching method in improving the quality of learning and the lack of optimal conditions for its implementation, this study aimed to evaluate the feasibility of implementing the flipped classroom teaching method at Kermanshah University of Medical Sciences.

3. Methods

This study employed a descriptive cross-sectional survey design to assess the feasibility of implementing the flipped classroom teaching method at Kermanshah University of Medical Sciences. The statistical population consisted of 230 faculty members with experience teaching theoretical courses in medical education. From this population, a sample of 120 participants was selected using a convenience sampling method due to logistical constraints and the availability of faculty during the study period.

Data were collected using a researcher-developed questionnaire titled "Feasibility of Implementing the Flipped Classroom", designed to evaluate key factors influencing the adoption of this teaching method. The questionnaire comprised 30 items divided into six components: Curriculum factors (questions 1 - 5), educational equipment and tools (questions 6 - 10), faculty member capabilities (questions 11 - 15), student-related factors (questions 16 - 20), educational rules and regulations (questions 21 - 25), and access to electronic resources (questions 26 - 30). Each item was scored on a 5-point Likert scale (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree).

The questionnaire's validity was established through face validity, assessed by a panel of five experts in medical education and survey design, and construct validity, confirmed via exploratory factor analysis to ensure items aligned with their intended components. Reliability was evaluated using Cronbach's alpha, yielding an overall coefficient of 0.91, indicating high internal consistency. Component-specific reliability coefficients were as follows: Curriculum factors (0.74), educational equipment and tools (0.81), faculty capabilities (0.81), student-related factors (0.87), educational rules and regulations (0.76), and access to electronic resources (0.80).

Data collection occurred over a one-month period, during which faculty members completed the questionnaire either in person or online, depending on their availability. Descriptive statistics, including means and standard deviations, were calculated to summarize responses. For inferential analysis, the normality of quantitative variables was tested using the Shapiro-Wilk test. Although some variables in certain subgroups did not meet normality assumptions, the sample size (n = 120) was deemed sufficient, and variances across groups were homogeneous (confirmed via Levene's test), justifying the use of parametric tests due to their greater statistical power. Consequently, independent *t*-tests were used to compare findings across binary variables (e.g., gender), one-way analysis of variance (ANOVA) was applied to assess differences across multi-level variables (e.g., years of teaching experience), and Tukey's post hoc test was conducted to identify specific group differences where ANOVA results were significant. All analyses were performed using SPSS version 18.

4. Results

The study included 120 faculty members, of whom 28.3% (n = 34) were women and 71.7% (n = 86) were men.

Participants' academic ranks were distributed as follows: 24.4% (n = 29) were instructors, 42.9% (n = 51) were assistant professors, 23.5% (n = 28) were associate professors, and 9.2% (n = 11) were professors. Teaching experience varied: 30.2% (n = 36) had less than 5 years, 22.7% (n = 27) had 5 - 9 years, 16.0% (n = 19) had 10 - 14 years, 5.5% (n = 7) had 15 - 19 years, and 25.2% (n = 30) had 20 or more years. Educational groups and fields of study are detailed in Table 1, with notable representation from paramedicine (28.6%, n = 34), basic medical sciences (15.1%, n = 18), and nursing and midwifery (14.4%, n = 17).

Questionnaire responses were analyzed for six components, with means, standard deviations, and ranges calculated (Table 2). The "curriculum factors" component (n = 119) had a mean of 18.09 (SD = 3.01, range = 11 - 25), indicating above-average availability. Other components scored below the midpoint of 15: "Educational equipment and tools" (n = 120, M = 14.12, SD = 4.30, range = 5 - 25), "faculty capabilities" (n = 120, M = 14.79, SD = 3.20, range = 5 - 24), "student activity" (n = 120, M = 13.37, SD = 3.62, range = 5 - 22), "educational rules and regulations" (n = 120, M = 13.72, SD = 3.40, range = 5 - 21), and "Internet access" (n = 120, M = 13.37, SD = 3.73, range = 5 - 21).

Normality was assessed using the Shapiro-Wilk test; although some variables deviated from normality, the sample size (n = 120) and homogeneous variances (via Levene's test) supported the use of parametric tests. One-sample *t*-tests compared component means to a test value of 15 (the scale midpoint). Curriculum factors (M = 18.09, $P < 0.0001$) significantly exceeded 15, while educational equipment (M = 14.12, $P < 0.05$), student activity (M = 13.37, $P < 0.001$), rules and regulations (M = 13.72, $P < 0.001$), and internet access (M = 13.37, $P < 0.001$) were significantly below 15. Faculty capabilities (M = 14.79, $P > 0.05$) did not differ significantly from 15 (Table 2). Therefore, curriculum factors were rated as highly feasible, faculty capabilities as average, and other components as below average for implementing the flipped classroom.

Independent *t*-tests showed no significant gender differences in component scores ($P > 0.05$ for all, Table 3). One-way ANOVA examined differences by teaching experience. No significant differences emerged for curriculum, equipment, faculty capabilities, student activity, or rules and regulations ($P > 0.05$), but internet access scores varied significantly ($P = 0.02$, Table 4). Tukey's post hoc test revealed that professors with 10 - 14 years of experience (M = 15.42) rated internet access higher than those with 20+ years (M = 11.97, $P = 0.013$), as shown in Table 5 and Figure 1 (95% CI).

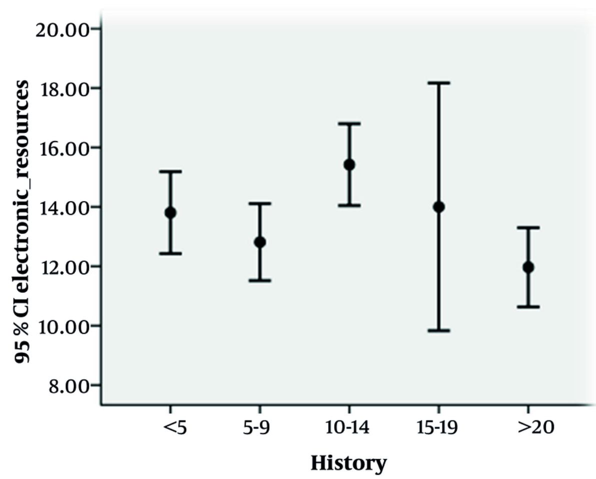

Figure 1. Scores related to internet access based on teaching experience based on the Confidence Interval Index

5. Discussion

The findings of this study provide insight into the feasibility of implementing the flipped classroom teaching method at Kermanshah University of Medical Sciences. The results indicate that conditions are favorable for implementation only in terms of curriculum-related factors, while other components — educational equipment, faculty capabilities, student activity, rules and regulations, and internet access — present significant barriers.

Curriculum factors achieved a mean score of 18.09 (SD = 3.01), significantly above the scale midpoint of 15 ($P < 0.001$) (Table 2), suggesting optimal readiness for flipped classroom adoption. This aligns with prior research by Chen Hsieh et al., who found that flipped teaching enhances motivation and knowledge acquisition due to its alignment with familiar pedagogical structures, merely shifting the location of content delivery and practice (14). The high curriculum readiness may reflect its flexibility, requiring minimal infrastructural change compared to other components, making it a practical starting point for implementation.

In contrast, faculty capabilities scored a mean of 14.79 (SD = 3.20), below the midpoint but not significantly so ($P > 0.05$) (Table 2), indicating an average level of preparedness. This could be attributed to the relative inexperience of the faculty, with 30.2% having less than 5 years of teaching experience (Table 5). Younger professors, while potentially adaptable, may lack the pedagogical expertise needed for flipped classroom

Table 1. The Frequency and Percentage of Professors' Educational Group and Field of Study

Variables	No. (%)
Curriculum factors	
Nursing	7 (5.9)
Midwifery	5 (4.2)
Paramedicine	34 (28.6)
Statistics and epidemiology	8 (6.7)
Health	12 (10.1)
Nutrition	8 (6.7)
Dentistry	8 (6.7)
Pharmacy	12 (10.1)
Basic medical sciences	18 (15.1)
Islamic teachings	3 (2.5)
Other	4 (3.4)
Fields of study	
Paramedicine	10 (8.5)
Nursing and midwifery	17 (14.4)
Humanities	6 (5.1)
Health	14 (11.9)
Rehabilitation	3 (2.5)
Basic medical sciences	19 (16.1)
Statistics and epidemiology	8 (6.8)
Pharmacy	12 (10.2)
Dentistry	8 (6.8)
Nutrition	8 (6.8)
Medical physics	5 (4.2)
Information technology	1 (0.8)
Laboratory science	2 (1.7)
Clinical psychology	3 (2.5)
Other	2 (1.7)

Table 2. Estimating the Availability of the Component Factors for the Implementation of the Flipped Classroom Using the *t*-Test

Components	Mean ± SD	Mean Difference Confidence Interval (95%)	*t*	P-Value
Curriculum	18.09 ± 3.01	3.09 (2.54 to 3.63)	11.27	> 0.0001
Educational equipment and supplies	14.12 ± 4.30	-0.88 (-0.10 to -1.66)	-2.25	0.026
Abilities of professors	14.79 ± 3.20	-0.21 (0.37 to -0.79)	-0.712	0.478
Student activity	13.37 ± 3.62	-1.63 (-0.98 to -2.28)	-4.94	> 0.001
Educational rules and regulations	13.72 ± 3.40	-1.28 (-0.67 to -1.89)	-4.13	> 0.001
Internet access	13.37 ± 3.73	-1.62 (-0.95 to -2.29)	-4.78	> 0.001

facilitation, which demands skills in guiding active learning rather than traditional lecturing. This finding underscores the need for targeted training, especially given the faculty's long-term influence on medical education.

Other components — educational equipment (M = 14.12, SD = 4.30), student activity (M = 13.37, SD = 3.62), rules and regulations (M = 13.72, SD = 3.40), and internet access (M = 13.37, SD = 3.73) — scored significantly below 15 (P < 0.05) (Table 2), indicating inadequate availability. This suggests that infrastructural and systemic barriers hinder flipped classroom adoption. The novelty of the method, as noted by Aboutaleb et al., may explain this unpreparedness; their study highlighted students perceiving flipped teaching as innovative yet unfamiliar, requiring significant adjustment (15). Similarly, research in developing contexts, such as South Asian universities,

Table 3. Comparison of the Average Scores of the Professors from the Components for the Implementation of the Flipped Classroom Teaching Method Using the *t*-Test

Components and Gender	Mean ± SD	*t*	P-Value
Curriculum		0.057	0.954
Female	18.12 ± 3.51		
Male	18.08 ± 2.82		
Educational equipment and supplies		0.048	0.961
Female	14.15 ± 3.89		
Male	14.1 ± 4.47		
Abilities of professors		0.005	0.996
Female	14.79 ± 3.28		
Male	14.79 ± 3.19		
Student activity		-1.032	0.304
Female	12.82 ± 4.06		
Male	13.58 ± 3.44		
Educational rules and regulations		0.811	0.419
Female	14.12 ± 3.01		
Male	13.56 ± 3.55		
Internet access		0.447	0.656
Female	13.62 ± 3.14		
Male	13.28 ± 3.95		

Table 4. Comparison of the Groups Regarding the Components for the Implementation of the Flipped Classroom According to History Using the Analysis of Variance Test

Components and Sources Change	Sum of Squares	Mean Squares	F	P-Value
Curriculum			1.126	0.348
Between groups	40.81	10.2		
Within a group	1033.17	9.06		
Total	1073.98			
Educational equipment and supplies			1.07	0.377
Between groups	79.3	19.82		
Within a group	2119.49	18.59		
Total	2198.79			
Abilities of professors			1.541	0.195
Between groups	62.61	15.65		
Within a group	1157.7	10.15		
Total	1220.32			
Student activity			1.422	0.231
Between groups	74.22	18.55		
Within a group	1487.77	13.05		
Total	1561.98			
Educational rules and regulations			2.06	0.090
Between groups	90.24	22.56		
Within a group	1246.32	10.93		
Total	1336.55			
Internet access			2.99	0.02
Between groups	156.91	39.23		
Within a group	1495.31	13.12		
Total	1652.22			

shows that limited equipment and training impede adoption (13), a challenge mirrored at Kermanshah.

Internet access, in particular, revealed disparities by teaching experience, with professors having 10 - 14 years

Table 5. Descriptive Report of Internet Access Score and Comparison of Groups According to Teaching Experience in Terms of Internet Access

Teaching Experience (y) and Groups	P-Value	Percent	Mean ± SD	Range
Less than 5		30.2	13.8 ± 4.07	5 - 21
5 - 9	0.82			
10 - 14	0.52			
15 - 19	1			
More than 20	0.25			
5 - 9		22.7	12.81 ± 3.27	6 - 20
Less than 5	0.82			
10 - 14	0.12			
15 - 19	0.94			
More than 20	0.9			
10 - 14		16	15.42 ± 2.85	12 - 21
Less than 5	0.52			
5 - 9	0.12			
15 - 19	0.9			
More than 20	0.013			
15 - 19		5.9	14 ± 4.51	8 - 21
Less than 5	1			
5 - 9	0.94			
10 - 14	0.9			
More than 20	0.67			
More than 20		25.2	11.97 ± 3.57	5 - 20
Less than 5	0.25			
5 - 9	0.9			
10 - 14	0.013			
15 - 19	0.67			
Total	-	100	13.39 ± 3.74	5 - 21

of experience rating it higher than those with 20+ years (P = 0.013) (Table 5). This aligns with Macdonald and Poniatowska, who emphasized that younger educators, more familiar with technology, are better equipped for virtual teaching (16). In Iran, the lack of systematic virtual training programs for faculty exacerbates this gap, leaving older professors less prepared for flipped classroom demands. This finding highlights a generational divide in technological readiness, critical for a method reliant on digital pre-class materials.

Despite the flipped classroom's proven benefits — such as enhanced engagement and learning outcomes (14, 15) — these results suggest that Kermanshah University is not yet fully equipped for its implementation beyond the curriculum. This echoes challenges in other developing regions (13), emphasizing the need for context-specific preparation. To address these barriers, we recommend: (1) Engaging educational technologists to develop digital content; (2) creating accessible video databases for faculty; and (3) implementing in-service training to build flipped classroom skills. Further research should explore these obstacles in depth and evaluate pilot implementations to refine this approach for local medical education.

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Footnotes

Authors' Contribution: Study concept and design: Y. S.; Acquisition of data: M. F.; Drafting of the manuscript: M. F.; Critical revision of the manuscript for important intellectual content: Y. S.; Administrative, technical, and material support: KUMS; Study supervision: Y. S.

Conflict of Interests Statement: The authors declare no conflict of interests.

Data Availability: The dataset presented in the study is available on request from the corresponding author

Ethical Approval: The present study was approved under the ethical approval code of IR.KUMS.REC.1399.343
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Informed Consent: Informed consent was obtained from all participants.

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