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A Pilot Study on Assessing the Role of Various Learning Methods Among the Optometry Students: A Futuristic Scenario in Optometry Education

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Abstract

Purpose- This study aims to assess the role of various learning methods among optometry students, identifying preferred methods, effectiveness, and challenges.

Method-A cross-sectional survey was administered to the optometry students to assess their preferences for traditional lectures, online modules, and practical workshops in clinical optometry education through self-structured questionnaires. We enrolled 100 participants (male=40 and female=60) from different years of optometry.

Result- A significant majority of respondents rated their academic performance positively, with 42.5% considering themselves "Good" and 36.3% rating "Excellent", Only a small fraction (2.5%) needed improvement. Online resources-16%, Hands-on clinical training-21%, Traditional classroom lectures-25%, Self-study-18%, Group discussions-12%, AI-based learning tools (simulations, virtual tools)-8%. These findings suggest that while traditional and practical approaches remain valuable, digital resources play an increasingly central role in modern optometry education, 31.3% of participants cited lack of clinical exposure as their biggest challenge, 27.5% had difficulty understanding theoretical concepts, 25% struggled with poor time management, 16.2% experienced limited access to digital learning tools. 67.5% of the respondents reported utilizing mobile apps or software to study optometry, 32.5% did not use any such tools. A majority of students reported scoring in the excellent range, suggesting effective study habits or learning methods i.e. students scored Outstanding- 27% (Over one-fourth of students achieved top-tier academic success), Average– 56%, A smaller but significant portion scored within the average range-16%, Below Average– 1% (Very few students reported poor outcomes).

All factors mentioned were found to be statistically significant ($p<0.05$) with the Pearson Chi-square in SPSS version 21.0.

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Conclusion- Assessing the role of various learning methods among optometry students can help identify effective strategies, improve academic performance, and enhance clinical competence. By understanding student preferences and learning outcomes, educators can optimize instructional approaches and better support in student success.

Keywords- Optometry, Learning methods, Academic performance, Learning process, AI based tools.

1. Introduction

Education quality in optometry holds the central position of constructing effective eye care practitioners equipped to address the increasing demands of clinical practice. With changing learning paradigms on a global platform, institutions are making more concerted efforts to investigate and adopt various types of learning methodologies to ensure maximum student performance and professional competence. Traditional didactic lectures, though still popular, are increasingly being supplemented by or even substituted with more interactive and student-focused methods like problem-based learning (PBL), blended learning, flipped classrooms, and simulation-based education etc. [1].

This research will determine the preference and effectiveness of different learning modalities among students in optometry within an educational institution. Its results will provide worthwhile information for academic policymakers and instructors who aim to improve the quality of instruction in optometry and match learning methodologies with current student needs.

How effective are different learning method in promoting students engagement and understanding?

The effectiveness of different learning methods in promoting student engagement and understanding can vary depending on the individual student, subject matter, and context.

1. Active Learning:

Active learning techniques, such as group discussions, problem-solving tasks, and peer teaching, engage students more effectively than passive listening. Research shows that active learning promotes critical thinking, problem-solving skills, and knowledge retention [2]. Incorporating activities that require students to apply concepts can improve engagement by making the material more relevant and interactive.

2. Formative Assessment and Feedback:

Frequent formative assessments, such as quizzes, reflections, or low-stakes tests, provide opportunities for students to monitor their progress. Timely and specific feedback helps students stay engaged and motivated by giving them a clear understanding of their performance and areas for improvement [3]. Feedback should focus on both effort and achievement to maintain student motivation.

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3. Collaborative Learning:

Strategies such as group work, peer assessments, and cooperative projects foster engagement by promoting interaction among students. Group activities help students feel connected to their peers and the material, improving engagement through social support and collective problem-solving [4].

4. Culturally Responsive Teaching

Integrating elements of gamification, such as point systems, badges, and leaderboards, can increase engagement by making learning more interactive and enjoyable. Research indicates that gamified learning environments can boost motivation and participation, particularly among students who are motivated by competition and achievement [5]. We will explore student engagement platforms in more detail later; in the meantime, you may find it helpful to watch this video to learn more about incorporating games in your classroom.

5. Personalized Learning

Tailoring instruction to individual students' needs, interests, and learning styles can increase engagement by making lessons more relevant and accessible. Research suggests that personalized instruction often leads to greater academic performance and motivation [6]. One effective way to implement this strategy is to utilize technology to offer adaptive learning paths.

6. Clear and High Expectations

Setting high expectations and communicating them clearly can encourage students to engage by giving them a clear sense of purpose. Research indicates that students are more motivated and perform better when challenged with high expectations, provided that adequate support is in place to facilitate their success [7].

7. Active Teacher Presence

An active and supportive teacher presence in both face-to-face and online classrooms helps maintain student engagement. Teachers who actively participate in discussions, provide feedback, and demonstrate enthusiasm for the subject matter tend to foster higher levels of engagement among their students [8].

The functions which teaching-learning methods carry out are:

- ❖ The cognitive function, representing the way of access to knowledge, and information, necessary for its plenary development;
- ❖ The formative-educational function through exercising skills, certain motor and psychic functions at the same time as discovering scientific facts;
- ❖ The motivational function inspiring the student, transforming the learning activity into an attractive, stimulating activity;

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- ❖ The instrumental function allows the method to be positioned between the objectives and the results of the didactic activity, being a working tool, a means to efficiently achieve the plan and achieve the intended purpose; and
- ❖ The normative function of optimizing action is highlighted by the prescriptions, rules and phases that the method brings in achieving the objective.

2. Methodology-

Study design-

A research cross-sectional comparative study was carried out to assess the role of learning methods among Optometry students of Era Institute of Allied Health Sciences And Research. Students are usually between the ages of 18 and 25.

It was administered to the optometry students to assess their preferences for traditional lectures, online modules, and practical workshops in clinical optometry education.

Sampling size-

It was included 100 participants who agreed to participate in this study.

Time frame-

It was conducted between (Feb. to May 2025).

Inclusion criteria-

1. Students presently enrolled in an optometry program are known as optometry students.
2. Age: Students are usually between the ages of 18 and 25.
3. Academic level: Students pursuing pre-clinical or clinical education.
4. Willingness to participate: Students who agree to take part in the study after giving their informed consent.

Exclusion criteria-

1. Students not in an optometry program: these are known as non-optometry students.
2. Low English proficiency: Students who could find it difficult to comprehend or take part in the study because of linguistic obstacles.
3. Students with considerable prior expertise with the learning methods under study or those who have had prior exposure to similar learning approaches.
4. Students who refuse to take part in the study or who do not give their informed consent are considered unwilling participants.

3. Data Collection-

Online survey:

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A verified survey to collect information on the demographics, learning styles, and experiences of students with different learning approaches (e.g., Active learning, traditional lectures, online learning, simulation-based learning, case-based learning).
Likert scale used to measure students attitudes, knowledge and perception towards different learning method.

Sampling technique-

Systemic random-sampling method was used to collect the data via google form method with modified structured questionnaire.

The form was distributed via professional email networks and social media platforms in order to obtain a wide audience and a range of answers. 100 correctly completed replies in all were obtained. The poll asked both open ended and close ended questions about the various learning methods among the optometry students.

Data analysis-

The Statistical Program of Social Sciences (SPSS) version 21 was used to collect and analyze the data. To analyze metrics like frequencies, mean, standard deviation, cross tabulation, and percentage of the data obtained, descriptive statistics were employed. The connection between pertinent variables was examined using the Pearson chi-square test. P-values less than 0.05 were regarded as statistically significant.

4. Results-

A significant majority of respondents rated their academic performance positively, with 42.5% considering themselves "Good" and 36.3% rating "Excellent", Only a small fraction (2.5%) needed improvement.

Online resources-16%, Hands-on clinical training-21%, Traditional classroom lectures-25%, Self-study-18%, Group discussions-12%, AI-based learning tools (simulations, virtual tools)-8%. These findings suggest that while traditional and practical approaches remain valuable, digital resources play an increasingly central role in modern optometry education, 31.3% of participants cited lack of clinical exposure as their biggest challenge, 27.5% had difficulty understanding theoretical concepts, 25% struggled with poor time management, 16.2% experienced limited access to digital learning tools. 67.5% of the respondents reported utilizing mobile apps or software to study optometry, 32.5% did not use any such tools.

A majority of students reported scoring in the excellent range, suggesting effective study habits or learning methods i.e. students scored Outstanding- 27% (Over one-fourth of students achieved top-tier academic success), Average– 56%, A smaller but significant portion scored within the average range-16%, Below Average– 1% (Very few students reported poor outcomes).

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Table 1: It shows the biggest challenges and importance of learning methods						
Variable	Characteristics	The biggest challenges in your learning process				P-value
Which learning method do you most effective	AI-based learning techniques	Difficulty understanding theoretical concepts.	Limited access to digital learning tools.	Lack of clinical exposure.	Poor time management.	P<0.05
		2%	1%	0%	3%	
	Group discussion	3%	1%	4%	2%	
	Hands-on clinical training	5%	2%	8%	2%	
	Online resources	3%	3%	1%	6%	
	Self-study	5%	2%	2%	5%	
	Traditional classroom lectures	4%	4%	10%	2%	

The table presents a comparison of various learning methods and the biggest challenges faced during the learning process, along with their respective P-values indicating statistical significance.

1. Most commonly reported challenge across all methods was “Lack of clinical exposure”, particularly in Traditional classroom lectures (10%) and Hands-on clinical training (8%).
2. Self-study was most associated with poor time management (6%).
3. Online resources users reported the highest for limited access to digital learning tools (3%).
4. Hands-on clinical training had the highest number (5%) reporting difficulty understanding theoretical concepts.
5. AI-based learning techniques showed fewer overall challenges, with lower numbers in each category.

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Table 2: It shows preference of the learning methods

Variable	Characteristics	How often do you participate in group study session				P-value
		Never	Occasionally	Rarely	Regularly	
Do you prefer learning through	Case studies and patient interactions	0%	5%	3%	8%	P<0.05
	Practical demonstrations	1%	9%	2%	7%	
	Reading textbooks	1%	8%	2%	10%	
	Watching video lectures	0%	7%	9%	7%	

This table explores the relationship between students' preferred learning methods and how often they participate in group study sessions. The P-value is given as $P < 0.05$, indicating statistical significance in the association.

1. **Case studies and patient interactions:** Majority (8%) who regularly participate in group study sessions prefer this method. Very few (1%) who never participate in group studies prefer this method.
2. **Practical demonstrations:** Most students who prefer this method either participate occasionally (9%) or regularly (7%) in group study sessions. Very few (1%) never participate.
3. **Reading textbooks:** Shows the highest preference (10%) among those who regularly participate in group sessions. A total of 1 respondent in the never category prefers this method. $P < 0.05$ suggests a statistically significant relationship between textbook reading and group study participation.
4. **Watching video lectures:** Most common among those who rarely (9%) or occasionally (7%) participate in group study. Fewer students (7%) who regularly participate in group study prefer this method.—

Therefore, there is a significant association ($P < 0.05$) between preferred learning methods and frequency of participation in group study sessions. Students who prefer reading textbooks and case-based learning tend to participate more regularly in group sessions. Those who prefer video lectures are more likely to study independently or rarely participate in groups. These insights can help in tailoring educational strategies to suit different learning preferences effectively.

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- *Self-Rated Academic Performance*

A significant majority of respondents rated their academic performance positively, with 42.5% considering themselves "Good" and 36.3% rating "Excellent". Only a small fraction (2.5%) felt they needed improvement, indicating that most students are confident in their academic abilities. This positive self-assessment aligns with the earlier finding that many participants are in their 6th semester, suggesting that experience and familiarity with learning methods contribute to greater academic confidence.

- *Most Effective Learning Method in Optometry*

Online resources (e.g., YouTube, Coursera): 16%, Hands-on clinical training: 21%, Traditional classroom lectures: 25%, Self-study (textbooks, notes): 18%, Group discussions: 12%, AI-based learning tools (simulations, virtual tools): 8%. These findings suggest that while traditional and practical approaches remain valuable, digital resources play an increasingly central role in modern optometry education.

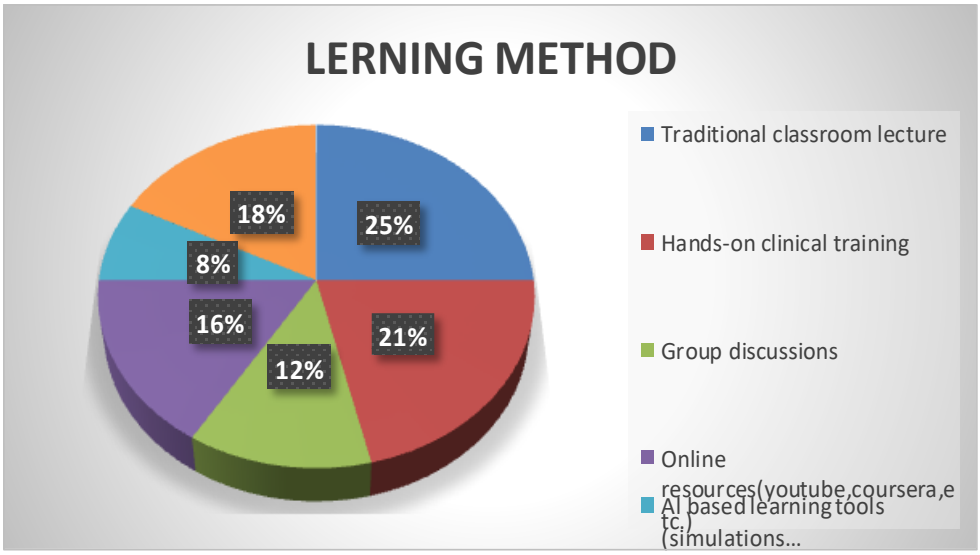

Fig 1. Most Effective Learning Method in Optometry

- *Preferred Learning Medium Among Optometry Students*

The majority of students (30%) preferred watching video lectures, indicating a trend toward digital and visual modes of instruction. This aligns with findings from Question 3, where online resources were rated the most effective. Reading textbooks came in second at 26.3%, showing that traditional methods are still widely valued, especially for foundational knowledge. Practical demonstrations and case-based learning (23.8% and 20%, respectively) were also popular, emphasizing the importance of applying theoretical knowledge in real-world or simulated contexts. These insights highlight a preference for multimodal and interactive learning experiences, blending visual, practical, and textual inputs to enhance understanding and engagement.

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- Participation in Group Study Sessions Among Optometry Students

The data shows that group study is a common practice, with 76.2% of students participating either regularly or occasionally. This highlights the value students place on collaborative learning, likely due to the benefits of peer discussion and shared understanding of complex concepts. Only 21.3% reported rarely participating, and a very small minority (2.5%) never engage in group study, indicating a general acceptance of this method among the majority. These results suggest that institutions might consider facilitating structured group study opportunities, as they align with the learning preferences and habits of students.

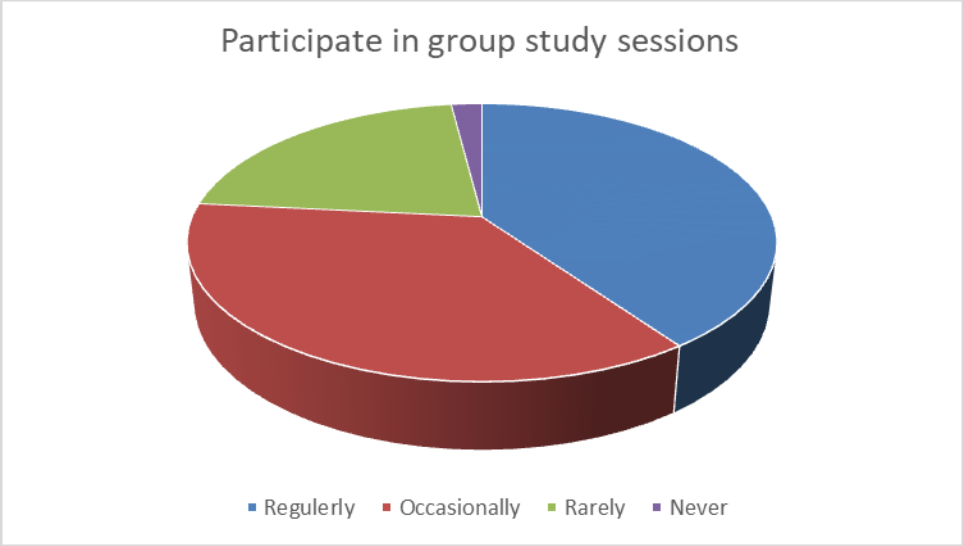

Fig 2. Participate in group study sessions.

- *What are the biggest challenges in your learning process?*

Lack of clinical exposure – 31.3% (25 respondents). This was identified as the most significant challenge, indicating a strong need for more hands-on and clinical experience in the curriculum. Difficulty understanding theoretical concepts – 28% (22 respondents). A considerable number of students struggle with grasping theoretical content, suggesting the need for improved teaching strategies and conceptual clarity. Poor time management – 25% (20 respondents). Time management appears to be a major barrier to effective learning, highlighting the importance of skill development in planning and organizing study schedules. Limited access to digital learning tools – 16% (13 respondents). A smaller yet important portion of respondents face challenges due to inadequate access to modern educational tools and platforms

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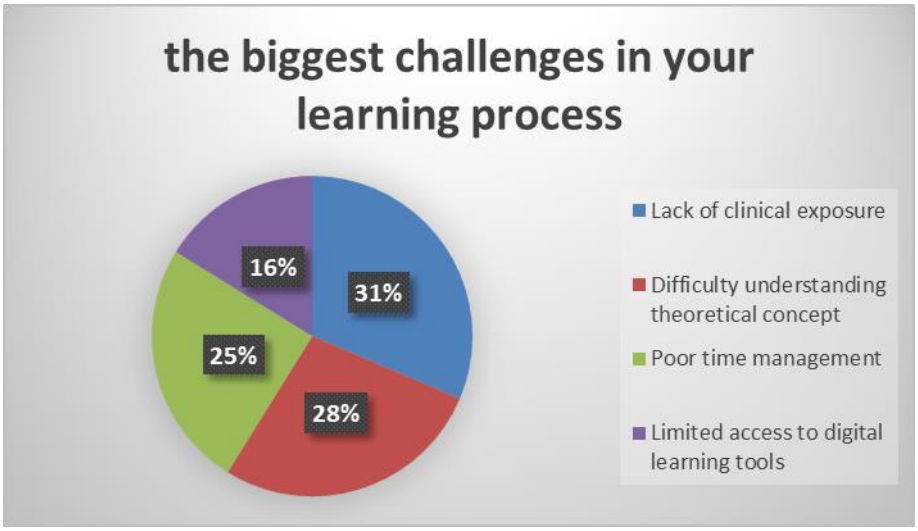

Fig 3. The biggest challenges in your learning process.

- *Do you use any mobile apps or software for studying optometry?*

The finding that 67% of respondents use mobile apps or software for studying optometry suggests a significant inclination towards leveraging technology for educational purposes. This insight can inform further investigation into the types of digital resources being used, their effectiveness, and how they impact learning outcomes. Additionally, the 33% who do not use such tools may indicate a need to explore barriers to adoption or alternative learning preferences. Overall, this data provides a valuable starting point for delving deeper into the role of technology in optometry education.

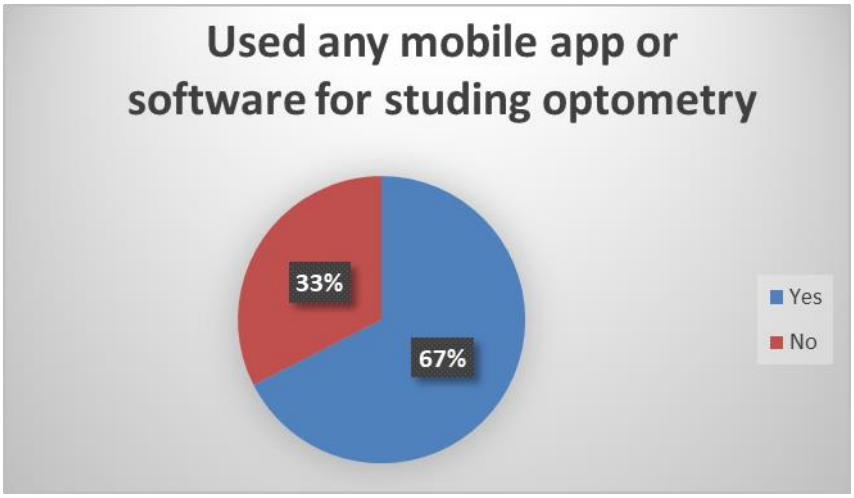

Fig 4. Used any mobile app or software for studying optometry.

- *Belief in AI-Based Tools Enhancing Learning in Optometry*

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62.5% believe that AI-based tools such as virtual reality and simulations can improve learning in optometry. 29% responded with "Maybe", indicating potential openness or uncertainty toward the integration of AI tools. Only 9% do not believe these tools would be beneficial. However, nearly one-third remain uncertain, suggesting that further exposure, training, or demonstrations may be needed to increase acceptance and understanding.

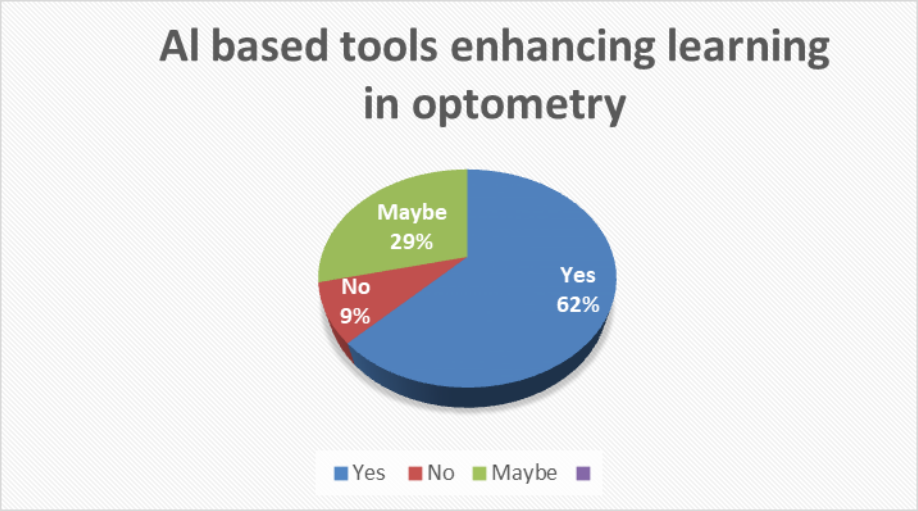

Fig 5. Al based tools enhancing learning in optometry.

- *What changes would you like to see in the optometry field to improve learning?*

More practical training – 65% (52 respondents). This was the most common response, indicating a strong student preference for hands-on, experiential learning to enhance their understanding and skills. More case-based discussion – 16% (13 respondents). Many students expressed the need for real-world application through discussion of clinical cases, which could help bridge theory and practice. More interactive online content – 10% (8 respondents). A moderate portion of students favored improvements in online educational tools and engagement. Better access to AI-based learning tools – 8% (6 respondents)

A smaller group suggested the use of advanced technologies like AI to modernize and personalize learning. No idea – 1% (1 respondent). Very few respondents did not have any suggestions.

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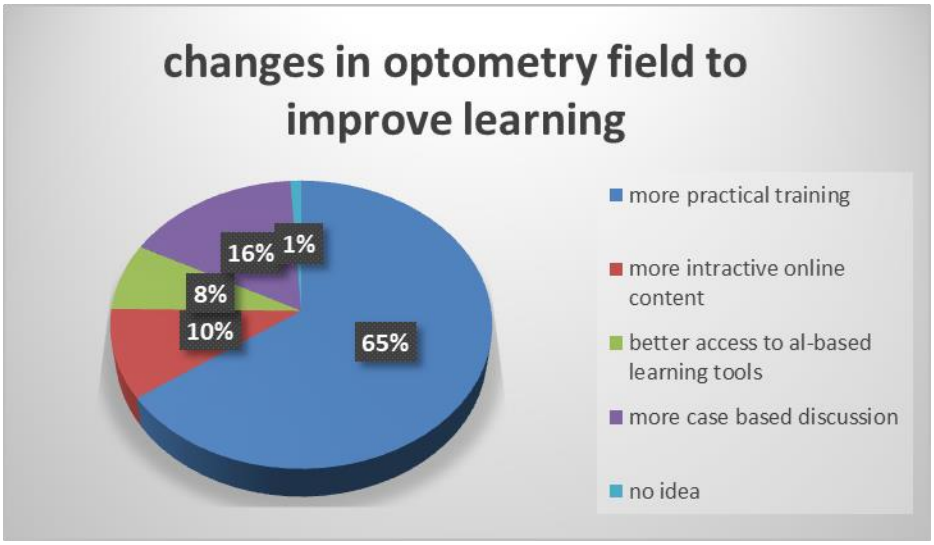

Fig 6. Changes in optometry field to improve learning.

- *Duration of study?*

4 hours: 36.3% (29 respondents) – The most common study duration, indicating a moderate, sustained effort by most students. 6 hours: 25% (20 respondents) – A significant number of students dedicate extended time to studying, possibly reflecting academic demands. 2 hours: 20% (16 respondents) – A smaller yet notable portion of students prefer shorter study sessions. More than 6 hours: 19% (15 respondents) – A dedicated group spends intensive hours in study, possibly correlating with exam periods or rigorous coursework.

Table 3: It shows the perception of the students towards different learning methods

Variable	Characteristics	Duration of study				P-value
Which learning method do you most effective	AI-based learning techniques	2 hours	4 hours	6 hours	More than 6 hours	P<0.05
		2%	1%	2%	1%	
	Group discussion	1%	5%	2%	2%	
	Hands-on clinical training	4%	5%	6%	2%	
	Online resources	5%	2%	4%	2%	
	Self-study	1%	6%	3%	4%	
	Traditional classroom lectures	3%	10%	3%	4%	

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- *What is your sitting posture while studying?*

Sitting on a chair – 80% (64 respondents). The vast majority of students prefer a traditional and ergonomically recommended posture—sitting on a chair—while studying. Lying down on bed – 13.8% (11 respondents). A smaller group studies while lying in bed, which may be less effective due to comfort-induced distractions.

While walking – 4% (approximately 3 respondents). A few students practice walking while studying, possibly to aid memory retention or combat fatigue. All of the above – 2.5% (approximately 2 respondents). A very small number use all three postures depending on the situation.

- *Study Outcome after End Term Exams?*

Excellent (65%–75%) – 56% (44 students): A majority of students reported scoring in the excellent range, suggesting effective study habits or learning methods. Outstanding (more than 75%) – 27% (21 students): Over one-fourth of students achieved top-tier academic success. Average (50%–65%) – 16% (13 students): A smaller but significant portion scored within the average range. Below Average (less than 50%) – 1% (1 student): Very few students reported poor outcomes. This appears to be a visual or labeling inconsistency, likely referencing a different metric on the chart legend. It may be ignored unless clarified.

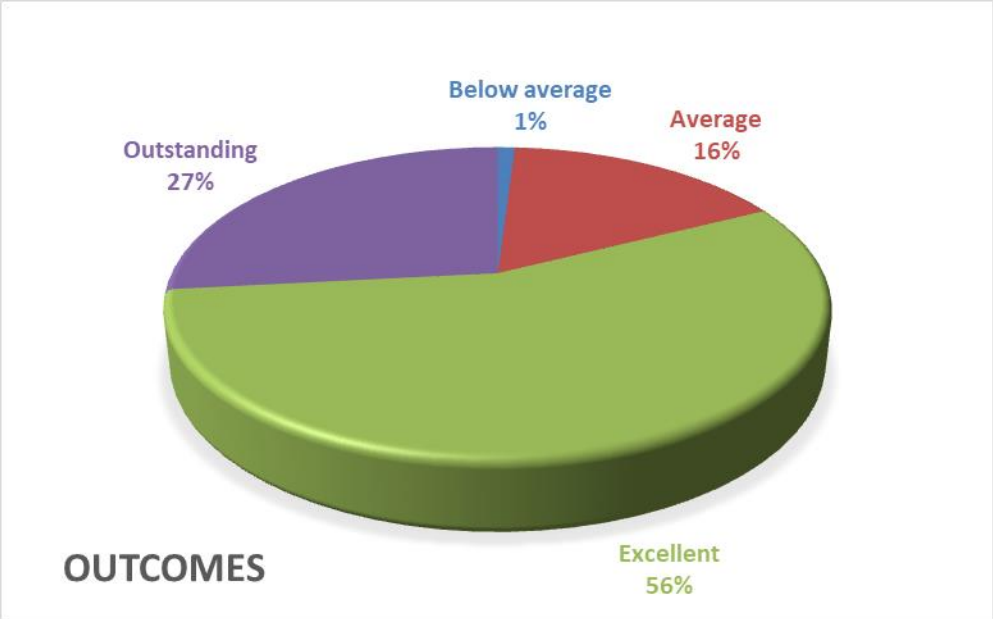

Fig 7. Outcome after End Term Exams.

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5. Discussion-

The findings of this research project align with previous studies in emphasizing the significant impact of learning methods on academic performance, student engagement, and overall learning outcomes among optometry students. The comparison of various studies reveals that learning preferences are not only diverse but also closely associated with students' participation patterns, perceived challenges, and academic success [9].

According to other study [10], a consistent observation across the studies is the predominance of kinesthetic and uni-modal learning styles among optometry students. This suggests that many students benefit from hands-on, practical approaches, which aligns well with the clinical nature of optometry education. However, challenges related to clinical exposure limitations were also noted among those relying on traditional lectures and hands-on training, indicating a gap between learning style preference and real-world learning opportunities.

According to these studies demonstrate a significant association ($P < 0.05$) between preferred learning methods and group participation. Students who preferred reading and case-based learning were more engaged in group discussions, whereas students who favored video-based or independent learning methods participated less in collaborative settings. These insights are valuable in designing group-based learning activities that align with student preferences to maximize participation [11].

Another important finding is the link between learning methods and the type of challenges faced. While self-study methods were hindered by time management issues, Al-based learning and group discussions emerged as more adaptive and less problematic. These results highlight the potential of integrating modern technologies and collaborative learning environments to support a more resilient learning process [12-14].

Effective teaching also requires structural changes that can only be brought about by academic leaders. These changes include hiring practices reward structures that recognize the importance of teaching expertise, quality assurance approaches that measure learning processes, outcomes in a much more sophisticated way than routine methods, and changing the way of attaining university accreditation [15].

In summary, the comparative analysis across studies reinforces the need for flexible, diverse, and student-centered curricula in optometry education. By recognizing individual learning preferences and addressing specific learning challenges, educators can design more effective teaching strategies. Incorporating a mix of traditional lectures, clinical training, modern technological tools, and collaborative activities can enhance learning outcomes, improve retention, and better prepare students for clinical practice.

6. Conclusion-

This study highlights the importance of diverse learning methods in optometry education. The findings suggest that optometry students benefit from a combination of traditional lectures,

hands-on clinical training, and modern technological approaches etc. These learning methods having different learning styles, enhance student engagement, and improve knowledge retention. The study also underscores the need for optometry programs to incorporate flexible and adaptive learning strategies to meet the evolving needs of students and the profession. By understanding the effectiveness of various learning methods, educators can design more effective curricula, ultimately enhancing the quality of optometric education their interest in field and preparing students for successful careers in the field.

The current world's rapid changes have presented the higher education system with a wide range of difficulties. Thus, it is necessary to develop more motivated, considerate people in interdisciplinary domains. Therefore, one of the most crucial requirements of educational systems is study and exploration to identify practical and efficient teaching and learning strategies.

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