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THE IMPACT OF APPLYING HYFLEX LEARNING MODEL ON THE STUDENTS' ACHIEVEMENT AND THEIR ATTITUDES AT SOHAR UNIVERSITY

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ABSTRACT

The current study falls in line with global and local mobility that directs efforts toward applying instructional technology in the digital transformation era. The study aims specifically to investigate the students' attitudes toward applying the HyFlex Learning Model and inquire about the impact of this model on the students' achievement. To implement the study, a quasi-experimental method with a one-group pre/post-test design and a questionnaire of 16 items to collect data about the students' attitude was used. After verifying the psychometric characteristics of the two tools, they were applied to the sample of 21 students at the Faculty of Computing and IT at Sohar University who were enrolled in the course entitled "Wireless Sensor and Actuator Networks" during the first semester of the academic year 2023/2024. The findings showed positive and strongly positive attitudes toward applying the HyFlex learning model and a statistically significant difference between pre-test and post-test averages, which means more interest and more procedures to integrate the HyFlex learning model in teaching-learning processes.

KEYWORDS: HyFlex Learning Model, Hybrid Learning, Information Technology, Education.

1. INTRODUCTION

HyFlex, an abbreviation for Hybrid-Flexible, is an educational framework that integrates both online and offline formats, as well as synchronous and asynchronous learning methods. HyFlex is already called the future of higher education and is used in large international universities. This model is based on the following principles: choice of work mode by students (the ability for students to choose a work mode daily, weekly or thematically); equivalence of operating modes (synchronous face-to-face, synchronous online, asynchronous online); reuse of learning resources (all learning materials, such as paper and electronic resources, tutorial recordings can be used in all modes of operation) and accessibility (all participants receive equal access to course materials) (Beatty, 2019). According to experts, HyFlex is about connecting online and offline with the most seamless experience possible. The model has another significant advantage - it removes physical borders between countries for students. It has the potential to initiate a fresh wave of collaboration among universities, which will require significant effort and restructuring. Universities must undergo a "technical revolution" to fulfil the requirements of diverse students and educators. In addition, it is also necessary to rearrange the space, arrange the teachers' work area differently, and consider how students are seated. Through monitors, you can see remote participants and interact with students who come in person. The teacher's mission is to manage all processes related to the technical organization of the learning process and the organization of work and interaction of full-time and distance students in various modes.

Implementing a blended learning approach, which combines offline and online modes, necessitates modifications in both classroom infrastructure and teaching methods. To perform optimally, a teacher needs support and the opportunity to learn and gradually master new tools. At the same time, it is optimal to select tools that comply with the principle of simplicity and ease of use to make the transition from physical (Rosen, 2021).

Formats like HyFlex enhance the potential for organizing training but also present challenges like a remote learner necessitating increased attention, motivation, and engagement. It is recommended to arrange work in small groups, engage students in conversations and provide them with collaborative projects, and closely manage the scheduling of sessions. However, a question arises with students who study asynchronously. Scholars contend that uniformity in the student experience is not necessary, emphasizing instead the paramount importance of educational worth. These two crucial elements of such learning are interaction and fostering a sense of community within the classroom. In other words, you need to develop a sense of community, a sense of integration, even in an asynchronous course, so that when students interact with each other, they feel like they are part of something instead of just looking at a screen. To achieve this, one must understand how to make the learning content more interactive and engaging. The education content problem requires regular updating and a special approach to its selection, especially in a hybrid environment (Keiper et al., 2021). A certain difficulty arises when teachers need more technical tools, such as hybrid classrooms, or more time to learn new tools. However, one might escape from the difficult situation by using creative techniques and engaging students in the process of making decisions (Chen & Lai, 2024).

Nowadays, educational systems all over the world start changing their rules and policies to prepare students in the digital transformation era. The Sultanate of Oman is a country that tries hard to develop educational procedures and environment. The initial national priority in Oman vision 2040 focuses on Inclusive Education, Lifelong Learning, and Scientific Research that Led to a Knowledge-based Society and Competitive National Talents (Elayyan, 2021). So, there is continuous monitoring of academic staff at schools and higher education institutions to develop their skills and attributes to provide Hybrid Learning that is sustainable, interactive and attractive to students.

1.2. Statement of the Problem

Higher education institutions worldwide, including those in Oman, are rapidly moving toward digital and flexible learning environments (Elayyan, 2026). Despite the widespread adoption of technology-enhanced models, the effective integration of the HyFlex Learning Model remains under-investigated, especially in local contexts like Sohar University. The problem addressed in this study arises from the lack of empirical evidence on how students perceive HyFlex learning and whether this model has a measurable impact on learning outcomes. While HyFlex promises flexibility, accessibility, and enhanced engagement through multimodal participation, students may also face challenges in adapting to new learning modes and managing the associated technological and self-regulation demands. Therefore, the current

study falls in line with these efforts to re-direct educational processes toward applying instructional technology.

Specifically, the study tries to investigate the impact of HyFlex learning model on teaching-learning processes by answering a principal question and testing a null hypothesis:

RQ: What are the students' attitudes towards applying Hyflex Learning Model at Sohar University?

H_0: There are no significant differences at $\alpha \leq 0.05$ in arithmetic means of the students' achievement in pre/post-tests.

1.3. Significance of the Study

Theoretically, findings of the current study are expected to provide empirical evidence about the HyFlex model within a local context where such evidence remains scarce. Although HyFlex is widely discussed in global literature, its effectiveness and learner perceptions in higher education settings are still underexplored. By examining both attitudes and achievement, the study helps fill a theoretical gap concerning how multimodal learning environments influence student engagement, motivation, and performance. Practically, the study tries to provide valuable insights for educators, teachers, and educational policymakers who are seeking to enhance teaching–learning processes in line with Oman Vision 2040, which emphasizes technology integration, lifelong learning, and high-quality educational environments. Understanding students' attitudes maybe support teachers in designing more engaging and responsive instructional practices. The results can also inform training programs that prepare instructors to manage diverse learning modes effectively. The study's findings can inform policy decisions on classroom infrastructure, digital platforms, professional development, and scaling HyFlex, aligning with national goals for inclusive and future-ready education.

2. LITERATURE REVIEW

The HyFlex Learning Model, combining the terms "hybrid" and "flexible," offers students the choice to attend classes in person, online synchronously (live), or online asynchronously (on their own time). This model is designed to accommodate different learning preferences and needs, providing maximum flexibility and accessibility. While there is an increasing amount of literature on technology-enhanced course delivery models, such as blended, flipped, and online learning, there is a notable lack of research on the implementation and impact of HyFlex models in higher education. The many benefits of attending class, such as student-faculty and student-student interaction, a sense of community, and increased academic motivation, are essential for students' success in college.

Education experts have widely adopted the conventional face-to-face approach as the norm for instructors and learners to convene in a single real location for the lesson. In (Wiesenberg & Stacey, 2008), the researchers attributed the development of teaching attitudes and standard methods throughout the whole educational field to the conventional face-to-face paradigm. Analyzing the distinctions and parallels in the face-to-face and online teaching ideas of Australian and Canadian teachers. According to their study, the participants successfully adjusted to an online delivery format. This format was really a modified version of the same sort of course that was previously presented in person. Online learning relies on a traditional face-to-face model to exist. The criteria used to assess the effectiveness of an online course are largely derived from those used to assess traditional face-to-face courses. These criteria include, but are not limited to, the level of interaction between teachers and students, the level of interaction among learners, and the level of engagement with course content (Xu & Jaggars, 2014). These fundamental roles have laid the groundwork for the subsequent significant advancement in online education.

Distance education, often known as online learning, has gained popularity, and is now widely used in the academic world, from K-12 to university level, in the USA. In (Yukselturk & Safure, 2007), the authors contended that the scrutiny of the concept, development, and implementation was dubious. Similarly, in (Bowers & Kumar, 2015), as well as in (Harasim, 2000) contend that while online education and technology have become more prevalent in traditional face-to-face higher education courses, this does not imply that online courses are inherently superior to old-style face-to-face courses in all academic fields. Until recently, there has been no established and validated model that identifies improved learning outcomes in blended, hybrid, and fully online course delivery. Expanding on this concept, the researchers in (McGee & Reis, 2012) argue that the differentiation between a 'hybrid' and 'blended' course remains ambiguous, posing difficulties for teachers, course coordinators, and institutes who are interested in implementing or providing these models. Due to this, courses are frequently implemented in various ways, leading to conflicting perceptions among students, teachers,

decision makers, and institutions regarding the efficiency of the course and student participation.

Hybrid learning, commonly referred to as blended learning, integrates in-person lectures and tutorials with an online learning management system (LMS) like Moodle or Desire to Learn (D2L) (Farley et al., 2011). Again, the researchers in (McGee & Reis, 2012) state that converting a traditional face-to-face course into a blended or hybrid online format necessitates significant adjustments to the course content to make it compatible with the chosen Learning Management System (LMS). Furthermore, the instructor determines whether students can attend class via any of these two methods, leaving them with no choice but to choose the attendance choice that best meets their requirements. The literature explores many circumstances in which these two models are employed in a university setting, offering differing perspectives on their efficacy when implemented.

Typically, quantitative fields often rely on better faculty-student interaction, which may not be as effective in enhancing student-learning results compared to non-traditional instructional formats when using a combination of online and in-person teaching methods. Nevertheless, the writer in (Scherrer, 2011), indicates that non-traditional lectures do not have a substantial impact on student effort or completion of an undergraduate statistics course. This suggests that non-traditional lectures do not diminish the learning results of students studying quantitative fields. The researchers in (Bowen et al., 2013) challenge the notion that students do not experience any consequences when they choose hybrid undergraduate statistics courses instead of traditional face-to-face courses. However, according to (Martínez-Caro & Campuzano, 2011), students in hybrid engineering courses expressed higher levels of satisfaction with their learning experience compared to those in face-to-face courses. The authors in (Farley et al., 2011) contend that finance students at a prominent Australian university have a clear inclination towards traditional in-person learning rather than hybrid or fully online courses. However, it is critical to note that their study lacks an assessment of both student learning outcomes and the opinions of students who may opt for live streaming of classes online.

In the HyFlex model, students have the independence to choose how they join in the class. They can choose to attend face-to-face classes, join online sessions through Adobe Connect, or watch recorded lessons later. This allows them to tailor their learning experience to their individual needs. In addition, in (Kyei-Blankson et al., 2014), the researchers indicate that when implemented effectively by the teacher, a HyFlex model guarantees an engaged attitude to studying and ability to make choices freely. Increased levels of course satisfaction reported by the students. Their research suggests that students select activities based on factors such as convenience, learning style, and flexibility. Both studies agreed that the HyFlex approach is a more effective option compared to typical hybrid or blended online course deployment choices (Kyei-Blankson et al., 2014; Kyei-Blankson et al., 2010). While there is conflicting information in the literature about hybrid and blended online course delivery models, recent research aims to provide a clearer understanding of the obstacles and advantages of the HyFlex course model through practical application.

It is crucial to operate essential notions that determine the scope of online learning. According to (Bernard et al., 2004), the term "distance education and learning" refers to the use of computers connected to internet networks to bring together instructors and learners for class participation, instead of the face-to-face approach. Distance learning and learning encompass both synchronous and asynchronous elements in its delivery, although this is just a broad definition. The synchronous component refers to the form of education and learning known as 'online distance education and learning', where all participants engage in real-time interactions in a shared virtual space. The asynchronous component includes the utilization of online recordings or interactive activities to facilitate learning or reviewing of class lectures later. Expanding on these ideas, the HyFlex type of model incorporates elements of learner-driven instruction, andragogy, flexible learning, and flexible delivery.

It is crucial to operate essential notions that determine the scope of online learning. According to (Bernard et al., 2004), "distance education and learning" refers to the use of computers connected to internet networks to bring together instructors and learners for class participation, instead of the usual face-to-face mode. Distance education and learning encompasses both synchronous and asynchronous components in its delivery, however this definition is simply a broad overview. The synchronous component refers to a form of education and learning known as 'online distance education and learning', where all participants engage in the process simultaneously and in the same virtual environment. The asynchronous component includes the ability to engage in learning or revisiting a class lecture later through an online recording or interactive activities.

Expanding on these ideas, the HyFlex model design incorporates principles of learner-driven instruction, andragogy, flexible learning, and flexible delivery. Furthermore, as stated by (Kyei-Blankson et al., 2014), HyFlex allows students to customize their course experience according to their preferences, learning styles, and special requirements. The HyFlex implementation at Texas A&M University - San Antonio's College of Business (COB) refers to the asynchronous component of the program.

3. STUDY DESIGN

3.1. Research Methodology

To answer the research question and test the hypothesis, the current study applied quasi-experimental method with one group pre/post-tests design [O1 X O2], where O1 is the pre-test, O2 is the post-test and X is the treatment by applying HyFlex Leaning Model. Also, a descriptive method was used to inquire the students' attitudes of Sohar University students toward applying Hyflex Model.

3.2. Research Tools

3.2.1. A Questionnaire

To answer the study question, a questionnaire was used to collect data about the students' attitudes of Sohar University students toward applying Hyflex.

The questionnaire was constructed as in the following procedures:

- Revising the related literature (Beatty, 2019; Chen & Lai, 2024; Rosen, 2021).
- Constructing a draft copy of the questionnaire with 13 items to measure the attitudes.
- Check the content validity of the questionnaire, to modify some items and add others. After that the final version of the questionnaire consisted of 16 items with 5 points Likert scale (strongly disagree = 1, disagree = 2, neutral = 3, agree = 4, strongly agree = 5).
- Check Reliability by applying the questionnaire on a pilot study of 20 students, then calculated the self-constancy by Cronbach's alfa formula; the value was 0.86 which means applicability of the questionnaire to implement.

3.2.2. The Acheivement Test

The post-test is an equivalent version of the pre-test; it was applied after 6 weeks of teaching.

The two achievement tests were designed according to the following procedures:

- The test consisted of 20 items were designed in a multiple-choice format, with five options for each item. The items were considered with respect to a relevant table of specification, ensuring consistency and covering the training program content (Hyflex learning Model).
- To check validity, the test in its initial form was verified by 8 specialists of information technology curricula to ensure that the items covered the training program's content, the suggested alternatives for each item were appropriate, the test was scientifically and linguistically accurate, and the items were suitable for the students' level targeted in the study. The specialists provided a few comments that were considered when preparing the final image.
- The Kuder-Richardson Formula 20 (KR-20) was used to measure of internal consistency reliability for tests. A pilot sample of 25 students were used to calculate the reliability value, it was (0.87) which refers that the test was applicable to measure the students' achievement.
- The sample consists of 21 students who were enrolled in the course entitled Wireless Sensor and Actuator Networks with code COMP3212 at the faculty of computing and IT during the first semester 2023/2024.

4. RESULT AND DISCUSSION

4.1. Student's Attitudes Analysis

Study findings showed an average and standard deviation for each item. Also, the availability ratio of the students' attitudes toward HyFlex strategy were determined by calculating the Range as follows; Range= max. score – min. score = 5-1= 4, then calculating the category interval by using category interval =Range/max. score = 4/5 = 0.8.

Table 1: Students' Attitudes Categories.

Average interval	Students' attitudes
1.00 – 1.80	Strongly negative
>1.80 – 2.60	negative
>2.60 – 3.40	Fairly well balanced
>3.40 – 4.20	positive
>4.20 – 5.00	Strongly positive

Also, averages were transformed to Percentage of Availability by using the formula: Percentage =

[(Average – 1)/Range] × 100%.

Data was collected and then arranged in table 2 to discuss the study question:

- What are the students' attitudes towards applying Hyflex Learning Model at Sohar University?

Table 2: Averages And Standard Deviations of Items in the Tool of Students' Attitude Toward Hyflex Strategy.

	Item	Avg.	St. dev.	Rank	% of availability	Attitude Ratio
1	HyFlex learning helps better achieve course objectives	3.67	0.80	12	66.67%	positive
2	HyFlex learning contributes to enhancing understanding of course content	3.76	0.83	8	69.05%	positive
3	HyFlex learning contributes to enhancing technology use skills	4.24	0.70	1	80.95%	strongly positive
4	The HyFlex learning environment stimulates students and increases their motivation to learn and carry out activities during the lecture	3.62	1.02	14	65.48%	positive
5	HyFlex learning increases students' focus and attention to the lecture	3.67	0.97	11	66.67%	positive
6	The classroom provides the necessary tools and means to implement HyFlex learning effectively	4.14	0.79	4	78.57%	positive
7	HyFlex learning helps in assessing students in various ways	3.76	0.94	9	69.05%	positive
8	HyFlex learning ensures (fair and impartial) assessment among all students	3.62	1.02	13	65.48%	positive
9	HyFlex learning helps organize and manage students' time during lectures	4.14	0.70	3	78.57%	positive
10	HyFlex learning improves class interaction (discussions) during lecture	3.86	0.85	7	71.43%	positive
11	HyFlex learning contributes to improving communication between students and the course teacher and among the students themselves outside of lecture times	4.19	0.81	2	79.76%	positive
12	Effective technical support is available while delivering the lecture using HyFlex learning	3.95	0.80	6	73.81%	positive
13	The educational platform used in HyFlex learning is easy to use and suitable for learning	4.14	0.91	5	78.57%	positive
14	The (electronic) learning resources used in HyFlex learning are better than the traditional (paper) learning sources.	3.71	0.78	10	67.86%	positive
15	There are difficulties (obstacles) when moving from direct learning to HyFlex learning	3.33	1.32	16	58.33%	fairly well balanced
16	I prefer to apply HyFlex learning in presenting all the courses that I will study in the future at the university	3.38	1.20	15	59.52%	fairly well balanced

Table 2 shows that most of students' responsibilities are directed towards positive and strongly positive attitudes to use HyFlex in learning Model. This indicates that students are generally receptive to the HyFlex approach, likely finding it beneficial for accommodating diverse learning styles and schedules. Their positive attitudes suggest that they appreciate the flexibility and accessibility provided by this model, which may enhance their engagement and overall learning experience.

Item 3 states that HyFlex learning contributes to enhancing technology use skills, and it has the highest means (M=4.24) and strongly positive attitudes. This result can be explained by several factors. There is likely a high correlation between the use of HyFlex and the integration of technology, which facilitates easier and more flexible learning. Students may find the HyFlex model particularly effective for language learning due to its ability to provide varied instructional methods, such as interactive online activities and face-to-face practice. Additionally, the flexibility to choose between in-person and online attendance allows students to tailor their learning experience to their personal needs, contributing to their strongly positive attitudes.

Also, items 11, 9, 6, and 13 had high averages with positive attitudes. This suggests that the HyFlex strategy enhances communication between the supervisor and students both inside and outside the classroom. It facilitates better interaction through various channels, ensuring that students can seek guidance and support at any time. Additionally, the HyFlex model aids in managing lecture time and organizing activities effectively by using instructional aids, such as multimedia presentations,

interactive online tools, and real-time feedback mechanisms.

The availability of e-platforms plays a crucial role in this context, as these platforms provide a structured environment for students to access course materials, participate in discussions, and complete assignments at their own pace. The ease of use of these platforms further contributes to students' acceptance of HyFlex procedures. The positive attitudes reflected in these items indicate that students appreciate the flexibility, enhanced communication, and efficient time management offered by the HyFlex approach, leading to a more engaging and productive learning experience.

On the other hand, two items, 15 and 16, had the lowest means (M15=3.38 and M16=3.33), indicating challenges in applying HyFlex. The students' attitudes are well balanced, possibly because they need more time to fully understand the HyFlex philosophy in teaching and learning.

One explanation could be that transitioning to a HyFlex model requires significant adaptation from both students and instructors. Students may initially struggle with self-discipline and time management skills needed to thrive in a more flexible learning environment. Moreover, understanding how to effectively navigate and utilize the technology and e-platforms integral to HyFlex learning can be a steep learning curve.

Another factor might be the need for more explicit guidance and support from instructors during the transition period. Students might feel uncertain about how to balance in-person and online components, and how to make the most of the resources available to them. Additionally, there might be a need for more comprehensive training sessions or orientation programs to familiarize students with the unique aspects of HyFlex learning.

Finally, students might also be experiencing a sense of uncertainty about the long-term benefits and efficacy of the HyFlex approach, needing more empirical evidence or success stories to fully buy into the model. Addressing these concerns through targeted interventions and ongoing support could help improve their attitudes and ease the transition. Figure 1 shows average scores of students' attitudes towards HyFlex learning across 16 items.

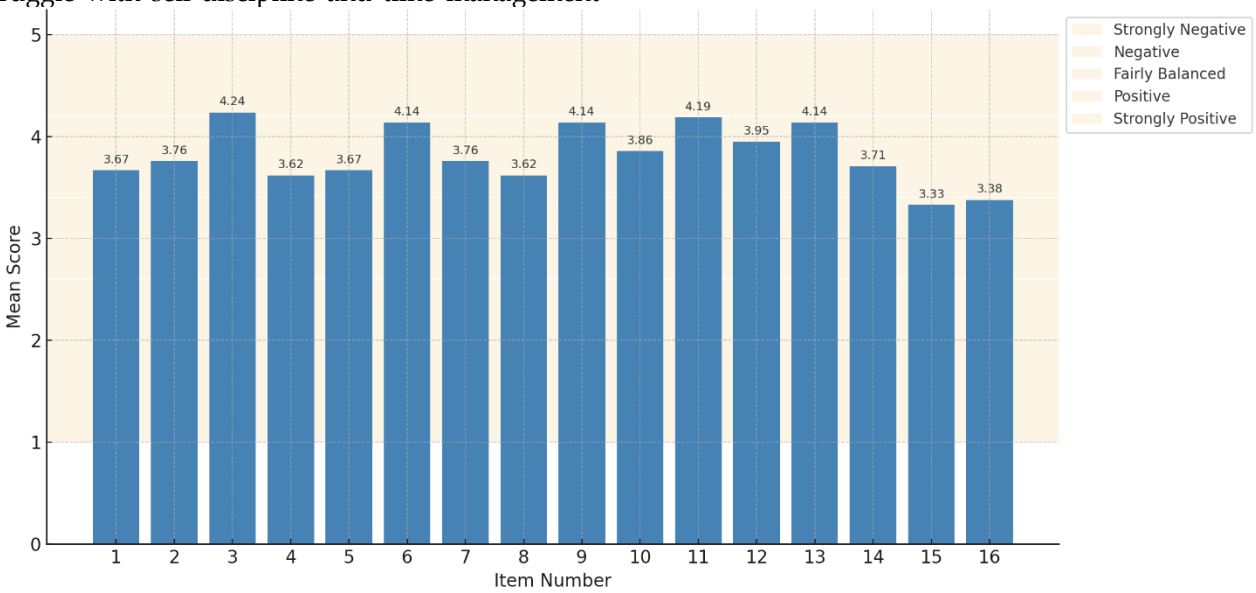

Figure 1: Average Scores of Students' Attitudes Towards Hyflex Learning Across 16 Items.

4.2. Test Hypothesis

Table 3 presents the results of a paired samples t-test comparing pre-test and post-test scores among 21 participants.

Table 3: Paired Samples Statistics and Test.

	Mean	N	St. deviation	df	t	Sig.
Pre-test	42.71	21	26.66	20	3.24	0.004
Post-test	61.90	21	20.34			

The table presents the results of a paired samples t-test comparing pre-test and post-test results among 21 participants. The average pre-test score was 42.71 with a standard deviation of 26.66, while the post-test

average was 61.90 with a standard deviation of 20.34. The degrees of freedom for the test were 20 (calculated as N - 1, or 21 - 1). The t-statistic value was 3.24, and the p-value was 0.004. Given that the calculated t-value (3.24) exceeds the critical t-value of 1.72 at a 0.05 significance level (Gay & Airasian, 2006). So, we reject the null hypothesis (There are no significant differences at $\alpha \leq 0.05$ in arithmetic means of the students' achievement in pre/post-tests), indicating a statistically significant difference between pre-test and post-test averages. Figure 1 illustrates that post-test scores were markedly elevated, corroborating the statistical results shown in Table 3.

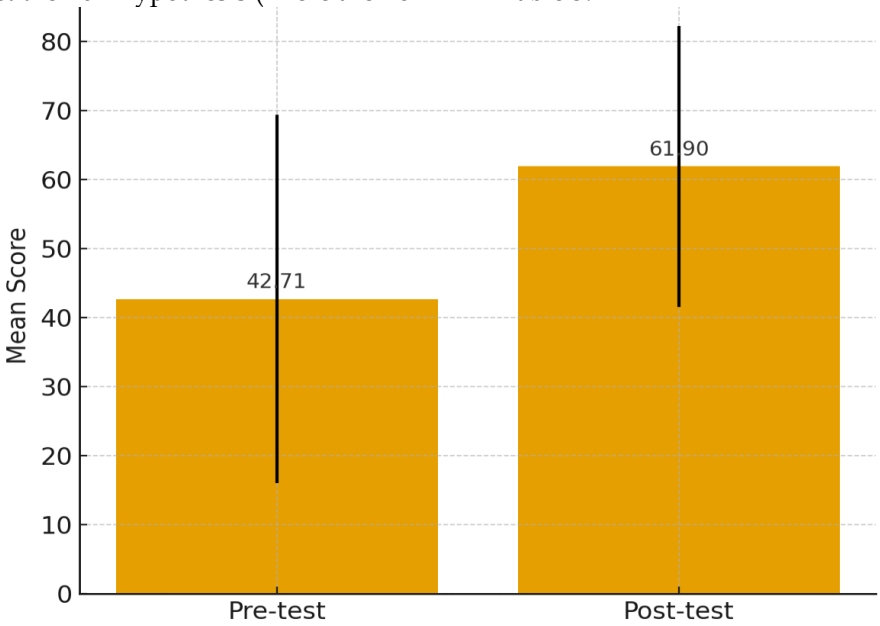

Figure 1: Comparison Of Pre-Test and Post-Test Scores with Standard Deviations.

The interpretation of the statistical results indicates that the calculated t-value exceeds the tabulated t-value at a significant level of $\alpha = 0.05$ with 20 degrees of freedom. Specifically, the tabulated t-value is 1.72. Since the calculated t-value is greater than this threshold, the null hypothesis is rejected. This means there is a statistically significant difference at the $\alpha \leq 0.05$ level between the pre-test and post-test averages when a training program based on the HyFlex strategy is applied. This significant difference suggests that the HyFlex strategy has a measurable impact on the outcomes of the training program.

This significant increase suggests that the training program based on the HyFlex strategy effectively improved student performance.

5. CONCLUSIONS

This study examined students' attitudes towards the HyFlex learning model, revealing generally positive and strongly positive responses, particularly in areas where the model enhances communication and flexibility. The results of this investigation suggest that students appreciate the improved interaction with supervisors and the efficient management of lecture time and activities facilitated by instructional aids and e-platforms. These aspects of HyFlex learning contribute to a more engaging and productive educational experience.

However, the study also identified challenges, as reflected in the lower means for items 15 and 16. These results indicate that some students may need additional time and support to fully grasp the HyFlex philosophy and adapt to its demands. Factors such as the need for better self-discipline, time management, and familiarity with technological tools are likely to contribute to these challenges.

Overall, while the HyFlex model shows significant promise in enhancing the learning experience through flexibility and improved communication, it also requires careful implementation and ongoing support to address students' initial challenges and ensure successful adoption. Future efforts should focus on providing comprehensive training and support to help students navigate and benefit from the HyFlex approach effectively.

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