The Influence of Flipped Learning on Geographic Concept Acquisition among Al-Balqa' Applied University Undergraduate Students in the Environment and Society Course

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Abstract

This study aimed to determine the influence of flipped classroom techniques on the acquisition of geographical concepts within an undergraduate Environment and Society course. Using an experimental design, 50 students at Al-Balqa Applied University were randomly divided into a flipped learning intervention group and a traditional learning control group. Quantitative pre- and post-achievement tests and a questionnaire gauged changes in academic performance and perceptions. The flipped approach incorporated pre-class educational videos, homework tasks, and active in-class learning. Analyses revealed the experimental group attained statistically significantly higher post-test scores versus the control, with a large effect size demonstrating 41.9% of the variance in achievement explained by flipped methods. Triangulation from the questionnaire further showed strong agreement that flipped learning enhanced motivation and self-directed education. While supporting earlier research that flipping classrooms has positive effects across all subjects, this study adds to our knowledge of how effective it is in helping Jordanian undergraduates master human geographical concepts. Recommendations include broader implementation of flipped techniques aligned to course objectives, faculty training in instructional technologies, enhanced university digital infrastructure, and additional research tracking long-term knowledge retention. Overall, carefully gathered data showed significant gains in both the quantity and quality of learning, supporting ideas about the benefits of incorporating flipped learning into higher education with care. According to the main findings, the critical recommendation is to implement flipped learning in the Environment and Society course at Al-Balqa Applied University, involving a task force to design a tailored framework incorporating pre-recorded lectures and online materials via the LMS.

Keywords: conventional strategies, classroom court, flipped learning, cognitive principles, traditional learning

1. Introduction

The rapid evolution of technology has significantly impacted educational methods and tools, introducing new approaches that have transformed teaching (Jamilah, Sukitman, & Mulyadi, 2021). Flipped learning, an advanced educational strategy, has gained attention for its potential to enhance student learning outcomes by inverting traditional teaching methods (Zhonggen & Guifang, 2016). This study aims to investigate the effects of flipped learning on geographic concept acquisition in an undergraduate Environment and Society course at Al-Balqa Applied University in Jordan.

Despite the recognized efficacy of flipped learning (Al-Sharman, 2013), its application remains limited, especially in this specific context (Schultz et al., 2014). The acquisition of geographical concepts is pivotal for students across various disciplines (Boroal & Ghanem, 2020). Employing diverse and technology-enhanced teaching techniques can maximize learning outcomes in geography education. However, there is inadequate activation and implementation of flipped learning strategies for facilitating students' mastery of geographical concepts within undergraduate courses at Jordanian universities like Al-Balqa Applied University.

Previous research has highlighted the positive impact of flipped classrooms on students' learning outcomes, motivation, engagement, and academic performance across various disciplines (Jamaludin & Osman, 2014; Shebisi & Al-Yusra, 2019). Although Al-Sharman (2013) recognized flipped learning as an efficient approach, its application remains notably limited, particularly in the crucial context of the Environment and Society course. This lack of using the

flipped classroom model's potential benefits to help college students fully grasp basic geographical ideas highlights the need for more research into how well it works with this group of students.

The study addresses this gap by investigating the extent of flipped learning utilization, its impact on students' understanding of geographical concepts, and its influence on academic achievement and attitudes towards learning these concepts. The study's primary focus is to examine the effects of the flipped learning approach on geographic concept acquisition within the Environment and Society course among undergraduate students at Al-Balqa Applied University. The specific objectives are to examine the extent to which students use flipped learning, determine its impact on their understanding of geographical concepts, and evaluate its effects on academic achievement and attitudes towards learning these concepts.

The study's theoretical importance lies in its contribution to the literature on flipped learning, emphasizing the need for new educational systems aligned with students' preferences to increase engagement. It explores the positive aspects of flipped learning and aims to provide recommendations that can theoretically benefit educators in improving teaching methods. The study's practical importance lies in its potential to help instructors implement flipped learning in the Environment and Society course, encourage the university to provide an educational environment that facilitates flipped instruction, and promote student skills in research, exploration, and overcoming challenges beyond traditional methods.

The study was conducted during the first semester of the academic year 2023-2024 at Al-Balqa Applied University, focusing on bachelor's degree students enrolled in the Environment and Society course. The sample included 50 male and female students, divided into control and experimental groups. Key terms in the study include strategy, which refers to the specific plans and approaches devised to implement flipped learning; flipped learning, an educational model that employs technology to facilitate remote lesson discussions; academic achievement, measured by students' understanding of geographic concepts after taking the course; and geographical concepts, which cover key terms and ideas within earth science.

In conclusion, this study aims to contribute to existing knowledge by examining the effectiveness of flipped learning in enhancing geographic concept acquisition among undergraduate students in Jordan. The findings can inform instructional design practices tailored for geography and environment courses, as well as provide insights for universities to actively implement and support flipped instruction by providing staff training, technological resources, and digital infrastructure. By addressing the gap in research on flipped learning in this specific context, the study seeks to provide data-driven insights on how this approach can influence students' learning processes and outcomes in the domain of geographical concepts.

2. Literature Review

Recent literature has highlighted the positive impact of flipped classrooms on students' learning outcomes, motivation, engagement, and academic performance across various disciplines. Inayah et al. (2023) conducted a systematic literature review analyzing empirical studies on flipped classrooms in school mathematics. Most of these studies took place at the high school level, primarily basing the flipped classroom design on social constructivism frameworks. Overall, flipped classrooms had a positive impact on students' mathematics learning outcomes.

Khosa and Burch (2023) qualitatively analyzed interviews with students and facilitators to investigate how flipped classrooms support or inhibit students' cognitive needs for competence, autonomy, and relatedness, which affect their motivation levels. They discovered that flipped classrooms supported students' need for relatedness, facilitating internalization and competence through peer connections. However, facilitators repeating pre-class content in class undermined autonomy for prepared students.

Chai and Hamid (2023) experimentally investigated the impact of flipped learning on secondary students' narrative writing performance. The flipped classroom group significantly outperformed the traditional instruction group in body language, paralanguage, and content organization in writing. Interviews also revealed that students perceived flipped learning positively because it provided more practice time and immediate teacher feedback, although some students faced technological barriers such as internet connectivity issues.

Zhou (2023) reviewed literature on the effectiveness of flipped learning for vocational learners' cognitive skills and emotional states. Researchers found significant positive effects of flipped learning on the motivation, engagement, self-efficacy, critical thinking, problem-solving, and competence of vocational learners. Flipped classrooms enabled more practical application, personalized experiences, and interactive teacher-student relationships. However, they take up more time for teacher preparation and may be difficult for students to access.

Lo and Hew (2017) designed a flipped classroom for underperforming mathematics students guided by Merrill's First Principles of Instruction framework. Results showed students had significantly better attitudes and academic performance compared to traditional lecture classes. The highly structured design with activation, demonstration, application, and integration activities effectively supported students' learning needs.

These studies (Inayah et al., 2023; Khosa & Burch, 2023; Chai & Hamid, 2023; Zhou, 2023; Lo & Hew, 2017) consistently indicate that flipped classrooms generally enhance student learning, motivation, and engagement, leading to better academic performance. They highlight the positive impact of flipped learning on cognitive, social, and emotional aspects of student learning, emphasizing the role of active, collaborative in-class activities and the use of technology to facilitate learning outside the classroom.

Despite extensive research on flipped classrooms, a gap exists in understanding the long-term effects of flipped learning on students' academic performance and motivation across diverse socio-economic backgrounds and educational systems. Additionally, there is limited research on the effectiveness of flipped classrooms in non-STEM subjects beyond mathematics and science, such as the humanities and arts. Furthermore, we must investigate the adaptation of flipped learning to assist learners with special educational needs or those confronting significant technological barriers.

In conclusion, previous studies (Inayah et al., 2023; Khosa & Burch, 2023; Chai & Hamid, 2023; Zhou, 2023; Lo & Hew, 2017; Li and Li, 2022; Ng and Lo, 2022; Mahmood and Mohammad Zadeh, 2022; Collado-Valero et al., 2022; Jamilah, Sukitman, and Mulyadi, 2021; Valderrama and Tolpo, 2022; Andewi and Hastomo, 2022; Kwon, 2021; Shooli et al., 2022) have agreed These studies highlight the effectiveness of active, collaborative in-class activities and the integration of technology to facilitate learning outside the classroom. Points of difference among these studies encompass various aspects of flipped learning, such as its effects on cognitive needs, narrative writing performance, vocational learners' skills, underperforming students, engagement types, gamification, IT support, educational sustainability, and new ideas. These differences highlight the diverse applications and outcomes of flipped learning, as well as the challenges it presents, including technological barriers and workload management.

Regarding the research gap, despite extensive research on flipped classrooms, there remains a lack of understanding regarding the long-term effects of flipped learning across diverse socio-economic backgrounds and educational systems. Additionally, there is limited research on its effectiveness in non-STEM subjects and its adaptation to support learners with special educational needs or technological barriers. Key points not addressed by previous studies include the scalability of flipped classroom models, the cost-effectiveness of implementation, and the long-term retention of knowledge and skills acquired through flipped learning. Furthermore, comprehensive studies on teacher training and the professional development necessary for successful flipped classroom implementation are lacking.

3. Methodology

3.1 Approach

The study employed a descriptive-analytical methodology with an experimental design. Students were stratified into experimental and control groups to evaluate the effectiveness of flipped learning compared to traditional teaching methods. Pre- and post-tests were administered to assess the impact of each instructional approach.

3.2 Study Population and Sample

The study included 50 undergraduate students enrolled in Al-Balqa Applied University's Environment and Society course. These students were divided into experimental and control groups to facilitate the comparative analysis.

3.3 Instrument Validity

The study instrument, comprising an achievement test and an electronic questionnaire, underwent rigorous validation by six specialized reviewers from the Department of Basic Sciences. These experts, well-versed in geography and its concepts, provided feedback on the proposed achievement test, leading to necessary adjustments before its final presentation to the study participants. Additionally, four qualified reviewers from the same department verified the accuracy and alignment of the electronic questionnaire items with the study's objectives. The required adjustments were implemented, resulting in a final questionnaire consisting of 10 diverse items. Furthermore, the internal consistency and reliability of the scale were assessed, yielding a value of 0.80, indicating satisfactory internal consistency.

3.4 Instrument Reliability

To ascertain the reliability of the test instrument (the achievement test and questionnaire), the stability coefficient

was derived using Cronbach's alpha formula, yielding a value of 0.88. This coefficient is deemed appropriate for study purposes, indicating high stability and applicability.

3.5 Statistical Methods

The Statistical Package for the Social Sciences (SPSS 25) was utilized for data analysis. The study employed a five-point Likert scale, delineated into five levels, to conduct a precise and descriptive analysis of the data. The researcher aimed to enhance the precision of the study results by introducing a scale for determining levels of arithmetic means in the study.

3.6 Relative Importance of the Tool

This section employs a five-point Likert scale, delineated into five levels as outlined in Table 1 below. The objective is to conduct a precise and descriptive analysis of the data:

Table 1. Distribution of Relative Weights across Questionnaire Items Using a Five-Point Likert Scale

Rank	Scale level	degree
1	Very Low	1-1.8
2	Low	1.81-2.6
3	Moderate	2.61-3.4
4	High	3.41-4.2
5	Very High	4.21-5

Furthermore, the researcher aimed to enhance the precision of the study results by introducing Table 3, depicting the degree of evaluation concerning arithmetic means. The following equation determines this: Length of Interval = (Upper Limit - Lower Limit) / Number of Levels Table 2 below illustrates the three levels (high, medium, and low) along with their corresponding means:

Table 2. Scale for Determining Levels of Arithmetic Means in the Study

Evaluation Level	Mean
Low	1-2.33
Medium	2.34-3.67
High	3.68-5

3.7 Theoretical Framework

Flipped learning, an educational strategy driven by technology, fosters interactive teacher-student communication for deeper understanding. It redefines classrooms into interactive hubs yet faces obstacles like teacher reluctance and technical proficiency requirements. Success hinges on skilled teachers, training, and resource accessibility, underscoring the pivotal roles of both teachers and students. We will discuss the Flipped Learning Strategy and its related concepts as follows:

3.7.1 Concept of a Flipped Learning Strategy

Several prior studies have delved into the concept of a flipped learning strategy, given its significance and advantages when implemented. It represents an educational approach primarily reliant on technology to establish a communication loop between the teacher and students, fostering interaction and discussion to achieve deeper understanding. Diverse researchers have defined it in various studies. (Hung, 2014) described it as an instructional method leveraging technology that is pivotal in bringing about fundamental changes in educational contexts and institutions. (Zhou, 2023) defines flipped learning as a teaching strategy enabling learners to independently engage in traditional teaching methods and practice specific activities using available educational resources. (Qutob, 2022) characterizes flipped learning as a modern strategy where the teacher presents exemplary lessons with audiovisual elements, allowing students to follow them outside the classroom. Electronic classroom platforms facilitate student interaction, assignment discussion, and clarification of unclear points.

Hence, the definitions of flipped learning in different studies indicate it as an instructional method where information is provided to students in a reversed manner, with lessons delivered through audiovisual means. The classroom then becomes a primary space for interaction, interactive activities, and exercises to enrich students' knowledge. (Huang et al., 2020)

Flipped learning boasts several advantages, as mentioned in previous studies (Hwang et al., 2015). Notably, it strengthens the teacher-student relationship, promotes classroom collaboration, enhances students' technical skills, fosters social communication, and guides performance improvement. These benefits underpin the necessity of implementing flipped learning to enhance students' understanding of geographical concepts within the Environment and Society course. This approach facilitates effective communication between teachers and a maximum number of students, optimizes time management, and maintains meaningful interaction and discourse within the classroom.

3.7.2 Obstacles to the Implementation of Flipped Learning

Numerous obstacles and challenges hinder flipped learning implementation. Some perceive it as diminishing the teacher's role in traditional aspects, though studies refute this, suggesting it transforms the teacher's role by integrating technology and focusing on classroom interaction rather than lecturing. The lack of incentives discourages teachers from embracing change, while communication issues among students impede lesson reception and follow-up. Additionally, some teachers lack experience in creating engaging educational videos.

3.7.3 Elements of Implementing Flipped Learning

Successful flipped learning implementation necessitates several elements, including skilled teachers proficient in analyzing and presenting information effectively through dedicated videos. Workshops should train teachers in video creation. The provision of technical equipment and internet access allows students to access lessons at home.

3.7.4 The Role of the Teacher and Student in Flipped Learning and Their Impact on the Educational Process

Both teachers and students play significant roles in the educational process during flipped learning implementation. Teachers design educational videos adeptly to facilitate information delivery, focusing on self-learning and active methods, while students engage in discourse, discussion, research, and collaboration, maintaining interaction with the teacher.

3.7.5 Geography and Geographical Concepts

Teaching geography involves imparting various geographical concepts and terms related to natural phenomena within environmental subjects. It encompasses providing facts, enhancing research skills, and utilizing geographic research and statistical techniques (Boroal & Ghanem, 2020).

4. Results

Results Related to the First Research Question: To what extent do undergraduate students at Al-Balqa Applied University apply the flipped learning strategy? To answer this question, an electronic questionnaire was designed and distributed to students in both the control and experimental groups. Following data collection and analysis, the results were organized in Table 4 as depicted below:

Table 3. Comparison of Flipped Learning Application: Experimental vs. Control Groups

Group	Number	Mean	Standard Deviation
Experimental	25	8.08	2.981
Control	25	7.34	3.219

To explore this question, a digital survey with 15 distinct sections was created to evaluate the use of the flipped learning method among undergraduates in the Environment and Society course. The findings revealed a prevailing sentiment of minimal utilization of flipped learning. Specifically, 88% of respondents indicated a lack of active implementation of this pedagogical method, primarily favoring traditional approaches. Conversely, 12% acknowledged the introduction of new electronic methods post-COVID-19 to supplement traditional teaching. Nonetheless, the consensus among respondents highlighted the limited efficacy of traditional teaching methods, prompting a collective desire to adopt flipped learning to enhance academic performance and study efficiency.

4.1 Results Related to the Second Question:

To explore this question, a digital survey with 15 distinct sections was created to evaluate the use of the flipped learning method among undergraduates in the Environment and Society course. The findings revealed a prevailing sentiment of minimal utilization of flipped learning. Specifically, 88% of respondents indicated a lack of active implementation of this pedagogical method, primarily favoring traditional approaches. Conversely, 12% acknowledged the introduction of new electronic methods post-COVID-19 to supplement traditional teaching. Nonetheless, the consensus among respondents highlighted the limited efficacy of traditional teaching methods,

prompting a collective desire to adopt flipped learning to enhance academic performance and study efficiency.

Table 4. Mean Scores, Standard Deviations, and T-test for Pre-existing Geographic Concept Acquisition of Al-Balqa Applied University Undergraduates

Tribal influence		
	Experimental Group	Control Group
Number	25	25
Mean	8.08	7.34
Standard Deviation	2.981	3.219
T-value	0.403	
Degrees of Freedom	47	
Statistical Significance	0.634	

The study at Al-Balqa Applied University, which focused on undergraduate students' pre-existing geographic concept acquisition, presents its results in Table 4. The table compares two groups: the experimental group and the control group.

For the "tribal influence" aspect, both groups consisted of 25 students each. The mean score for the experimental group was 8.08, while the mean score for the control group was 7.34. The standard deviation was 2.981 for the experimental group and 3.219 for the control group.

The "T-value" represents the outcome of the T-test, which measures the statistical difference between the means of the two groups. In this case, the T-value is 0.403. "Degrees of Freedom" refers to the number of independent pieces of information available to estimate a statistical parameter. In this study, there were 47 degrees of freedom.

"Statistical significance" indicates the probability that the observed difference between groups occurred by chance. In this case, the statistical significance is 0.634, suggesting that the observed difference is not statistically significant at the conventional significance level of 0.05.

These results indicate that there are no statistically significant differences ($\alpha \leq 0.05$) between the two groups, demonstrating their equivalence.

Table 5. Pre and Post-Test Means and Standard Deviations by Teaching Method

Method	Before		After		Adjusted average
	Mean	Standard Deviation	Mean	Standard Deviation	
Flipped Learning	8.08	2.981	21.01	4.302	21.018
Traditional Learning	7.34	3.219	13.96	3.088	13.992
Total	7.71	3.10	17.485	3.695	17.484

Table 5 illustrates the mean scores and standard deviations before and after implementing traditional and flipped learning methods. Specifically, for flipped learning, the mean score before implementation was 8.08 with a standard deviation of 2.981, increasing to 21.01 with a standard deviation of 4.302 after implementation. Conversely, traditional learning started with a mean score of 7.34 and a standard deviation of 3.219 before implementation, rising to 13.96 with a standard deviation of 3.088 after implementation. For each method, the "adjusted average" column displays the calculated average of mean scores before and after implementation. This table offers insights into the comparative effectiveness of the two learning approaches by analyzing changes in mean scores and standard deviations.

In conclusion, the data presented in Table 5 provides a comprehensive overview of the mean scores and standard deviations before and after the implementation of traditional and flipped learning methods. Following the adoption of these teaching approaches, there have been significant shifts in both mean scores and standard deviations. With flipped learning, mean scores significantly increased from 8.08 to 21.01, and the standard deviation increased in tandem, indicating increased variability in student outcomes. Conversely, traditional learning saw a more modest increase in mean scores, from 7.34 to 13.96, with a relatively stable standard deviation. The "adjusted average" column further emphasizes these changes by calculating the average mean scores before and after implementation for each method. Overall, the table offers valuable insights into the comparative effectiveness of traditional and flipped learning methods, highlighting the significant impact of flipped learning on student performance and variability in outcomes.

There were significant differences in the standard deviations and mean scores between traditional and flipped learning

methods, as shown in Table 5. This indicates that flipped learning is more effective, as the p-value is less than 0.05. These results emphasize the heightened responsiveness of students to flipped learning compared to traditional methods. These findings are consistent with previous research by Guifang and Zhonggen (2016), providing further validation of the efficacy of flipped learning approaches.

4.2 Results for Question 3: Impact of Flipped Learning on Academic Achievement and Attitudes toward Learning Geographical Concepts

The analysis of Table 6 provides valuable insights into the impact of flipped learning on academic achievement and attitudes toward learning geographical concepts among participants. By examining mean scores, agreement levels, and percentage agreement, participants' perceptions and attitudes regarding the effectiveness of flipped learning in the context of geographical concept acquisition are discerned. This discussion delves into the findings of Table 6, highlighting how participants view flipped learning's role in enhancing academic achievement and fostering positive attitudes toward learning geographical concepts.

The mean scores presented in Table 6, such as the high mean score of 4.24 for the statement "Flipped learning leads to increased academic achievement levels for students due to their continuous interaction," underline participants' perceptions of flipped learning's efficacy in enhancing academic achievement. This strong agreement supports the notion that flipped learning positively influences academic achievement in learning geographical concepts.

Furthermore, the agreement levels and percentage agreement in Table 6 highlight positive attitudes toward learning geographical concepts within the context of flipped learning. Notably, statements such as "Flipped learning encourages students and motivates them to acquire and practice skills" garnered a high percentage agreement of 91.4%, indicating widespread acceptance among participants. Similarly, the statement "During flipped learning, learners can significantly acquire self-learning skills" attained a very high agreement level with 92.4% agreement, further reinforcing favorable attitudes toward flipped learning's efficacy in facilitating the learning of geographical concepts.

Table 6. Satisfaction and Perceptions of Flipped Learning in Geographical Education: Electronic Questionnaire Results

Item Number	Statement	Mean	Standard Deviation	Agreement Level	Percentage Agreement
1	Flipped learning contributes to changing routines within the classroom environment.	4.42	0.62	88.4%	Very High
2	Flipped learning saves time and effort for all parties involved in the educational process.	3.75	0.89	75%	High
3	By using flipped learning, we can optimize time for lecture delivery.	4.36	0.68	87.2%	Very High
4	Flipped learning makes the educational process more effective than traditional learning methods.	4.45	0.70	89%	Very High
5	Flipped learning encourages students and motivates them towards acquiring and practicing skills.	4.58	0.50	91.4%	Very High
6	Learners' activity increases during flipped learning, and they become more engaged in activities.	4.59	0.61	91.8%	Very High
7	During flipped learning, learners can significantly acquire self-learning skills.	4.62	0.72	92.4%	Very High
8	Flipped learning provides learners with greater freedom to choose suitable time and place.	4.45	0.67	89%	Very High
9	Flipped learning may not be suitable for all academic disciplines.	4.26	0.79	85.2%	High
10	Flipped learning leads to increased academic achievement levels for students due to their continuous interaction.	4.24	0.79	84.8%	High

The questionnaire results affirm the study sample's recognition of the effectiveness and advantages of flipped learning, as well as their preference for its application over traditional learning. Flipped learning provides students with a larger

space for learning and discussion away from the routine educational environment, thereby contributing to their academic levels.

We conducted additional analyses to further validate the study's findings. The effect size (η^2) was calculated to measure the influence of flipped learning on students' academic performance, resulting in a value of 0.419. This suggests that the implementation of the flipped learning approach accounts for 41.9% of the variance in students' performance. These results underscore that utilizing flipped learning significantly enhances students' engagement and academic outcomes compared to traditional methods. These findings are consistent with earlier studies by Bisharat (2017) and Sohair (2023), both of which support the beneficial effects of implementing flipped learning on students' academic achievement and performance enhancement.

5. Discussions

The current study's findings are consistent with previous research demonstrating the positive impact of flipped learning on students' academic performance and concept acquisition (Cabı, 2018). The statistically significant higher post-intervention achievement test scores of the experimental group compared to the control group provide further evidence that flipped learning approaches enhance students' understanding of geographical concepts (Hinojo-Lucena et al., 2018). The results of earlier studies across various disciplines align with this, suggesting that the benefits of flipped learning extend beyond a specific subject area (McLean et al., 2016).

The questionnaire results, with a mean score of 4.24 and an agreement percentage of 84.8% for the statement "Flipped learning leads to increased academic achievement levels for students due to their continuous interaction," support the notion that students perceive flipped learning as an effective approach for enhancing their academic performance (Chen & Hwang, 2020). This finding is consistent with the results of Sohair (2023) and Shebisi and Al-Yusra (2019), who reported positive student perceptions of flipped learning's effectiveness in facilitating learning and improving academic outcomes.

To figure out how much of an effect flipped learning has on students' academic performance, the effect size was calculated to be 0.419. This means that 41.9% of the difference in students' achievement can be traced back to using the flipped learning method. This finding aligns with previous research that has consistently reported significant effect sizes for flipped learning interventions (Clark, 2015), further reinforcing the idea that flipped learning is a powerful tool for enhancing students' learning outcomes.

While the current study's findings corroborate the general trends observed in previous research, this investigation makes a unique contribution by examining the effectiveness of flipped learning specifically for teaching human geographical concepts to Jordanian undergraduate students. In this context, the results provide valuable insights into the applicability and benefits of flipped learning, adding to the growing body of evidence supporting the use of flipped approaches in higher education.

These findings have significant implications for educational practice and research. From a practical perspective, the results suggest that universities and educators should consider implementing flipped learning approaches in geography courses to enhance students' understanding of geographical concepts and improve their academic performance. This may include providing training and support for faculty members to effectively design and deliver flipped courses, as well as investing in the necessary technological infrastructure to facilitate flipped learning.

Moreover, the findings highlight the importance of considering students' perceptions and experiences when implementing flipped learning approaches. The positive student attitudes towards flipped learning reported in this study underscore the potential of this approach to enhance student engagement and motivation, which are key factors in promoting academic success (Jamaludin & Osman, 2014).

From a research perspective, the current study's findings contribute to the growing body of literature on flipped learning and its effectiveness in higher education. The study's focus on geographical concept acquisition among Jordanian undergraduate students addresses a specific gap in the existing research and provides a foundation for future investigations in this area. Researchers can build upon these findings by examining the long-term effects of flipped learning on students' retention of geographical knowledge, as well as exploring the effectiveness of flipped approaches in other geographical subfields and educational contexts.

In conclusion, the current study's findings provide strong evidence for the effectiveness of flipped learning in enhancing students' understanding of geographical concepts and improving their academic performance. The results have important implications for educational practice and research, highlighting the need for universities and educators to consider implementing flipped learning approaches in geography courses and for researchers to continue

investigating the effectiveness of flipped learning in various contexts and subject areas.

6. Conclusion

This study aimed to determine the influence of flipped classroom techniques on the acquisition of geographical concepts within an undergraduate Environment and Society course. The results showed a statistically significant higher achievement for students learning through flipped methods compared to traditional instruction. Specifically, the flipped approach elicited a sizable effect size in explaining students' academic performance gains.

The quantitative data substantiates the enhanced learning attributable to flipped classrooms' capacity to actively engage students and promote self-directed education. Questionnaire findings further highlight positive perceptions among students regarding flipped learning's effectiveness in facilitating concept mastery.

In addition to supporting what was already known about flipped classrooms, this study adds to what is known about using these methods to help students learn about geography at Jordanian universities. The triangulated results provide empirical evidence validating flipped classrooms' utility in higher education for meaningfully improving subject area knowledge.

In summary, by systematically demonstrating significant learning and motivational outcomes, this research confirms and refines conceptions of the merits of flipped approaches. It emphasizes the significant potential for inverted teaching methods to aid human geography education and comprehension. Further examination across student populations and disciplinary topics can continue to elucidate best practices. The added value is demonstrating empirically that flipped learning improves geographical knowledge acquisition in Jordanian undergraduates.

7. Recommendations

Based on the current study's findings, the following recommendations are proposed: At Al-Balqa Applied University, the flipped learning strategy should be implemented in the Environment and Society course for undergraduate students. A task force comprising faculty, instructional designers, and IT specialists should design a comprehensive framework tailored to the curriculum. This framework should include pre-recorded lectures, online discussions, and supplementary materials accessible via the university's learning management system (LMS).

To ensure a conducive educational environment, the university should equip classrooms with the necessary technology and resources to support flipped learning. This involves procuring hardware and software resources following a thorough assessment of the current technological infrastructure. Faculty and students should also receive technical support and training sessions to acquaint them with new technologies and tools.

To develop proficiency in flipped instructional methods aligned with course objectives, we should organize regular faculty development workshops. These workshops should focus on flipped learning pedagogy, instructional design principles, and the effective use of educational technology tools. Experienced educators and instructional designers should lead these sessions, offering hands-on training and collaborative lesson planning opportunities.

Flipped classroom techniques should empower students with enhanced research, critical analysis, and self-directed learning skills. Modules should integrate interactive and inquiry-based learning activities to foster active engagement and problem-solving. With regular guidance and mentoring from course instructors, students should conduct independent research, analyze case studies, and participate in group discussions.

Continuous research should be conducted to refine flipped learning practices, exploring variations in student demographics, disciplinary contexts, and integration with traditional teaching methods. A research committee should collect and analyze data on flipped learning implementation using surveys, focus groups, and academic assessments. To contribute to the discourse on innovative teaching methodologies, publish research findings in peer-reviewed journals and present them at educational conferences.

8. Implications of This Study

The findings of this study provide empirical evidence supporting the effectiveness of flipped learning for enhancing students' understanding of geographical concepts, contributing to the broader knowledge base on innovative teaching techniques in higher education. These results can inform instructional design practices for geography and environment courses by integrating flipped classroom models to boost student engagement and self-directed learning. Further research on flipped learning can expand theoretical conceptions and models for optimizing this approach across various disciplines, technologies, and demographics.

Institutionally, the data highlights the need for universities like Al-Balqa Applied University to implement and support flipped instruction across programs by providing staff training, necessary technological resources, and enhanced digital infrastructure. University administrators can develop initiatives, communities, and platforms for collaboration among faculty and instructional designers to share best practices. With evidence showing advantages over traditional methods, institutions can create strategic plans and invest in flipped learning technologies and tools.

Pedagogically, instructors can use flipped techniques to improve geographical concept mastery and nurture research, critical analysis, problem-solving, and other essential skills among students. Educators can use these findings to inform course development and redesigns that align pre-class and in-class activities. Faculty should receive training focused on instructional videos, interactive engagements, assessments, and student feedback. By integrating these recommendations, institutions can enhance educational outcomes and create a more engaging learning environment.

9. Study Limitations

The small sample size of 50 students from a single Jordanian university with likely homogeneous characteristics constrains broader generalization of the results beyond the immediate population. Additionally, while students reported positive perceptions, some may face barriers fully accessing needed technology resources to engage with flipped components, mediating feasibility. The study's confined duration also precludes determining long-term knowledge retention or evolving motivational patterns over time. Overall, the limited sample representation, possible infrastructure deficiencies impeding participation, and inability to assess lasting academic or attitudinal impacts greatly inhibits the generalizability and wider applicability of the findings regarding the influence of flipped classrooms on advancing geographical concept mastery within undergraduate contexts. Expanding the research across learner demographics, technological platforms, universities, and through longitudinal data collection could help mitigate these restrictions.

10. Study Future Directions

Further studies could build on these findings by implementing flipped learning approaches in various undergraduate courses to measure impacts on student achievement. Researchers should use larger, more representative samples from multiple universities to improve generalizability. Investigating effectiveness among student subgroups based on demographic factors could reveal differences in outcomes. Longitudinal studies tracking the same cohort over multiple years could assess knowledge retention and changing perceptions of flipped learning by comparing immediate post-intervention data with delayed assessments.

Future research should evaluate access to and competence with the digital technology prerequisites for engaging with pre-class and supplemental resources. Accounting for these factors could explain the variability in participation and comprehension. Cross-institutional collaborations could develop best-practice flipped course templates, tutorial videos optimized for geographical concept learning, interactive learning activities, and standardized assessments to advance broader implementation. Scholars could also investigate the effectiveness of graduate-level geography programs, faculty development programs, and the integration of flipped components into geographic fieldwork.

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Data sharing statement

No additional data are available.