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Engaging Minds, Inspiring Motivation: The Impact of Integrating OER in Informal Learning Environments

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ABSTRACT

This qualitative case study, conducted at a university in Southwest Florida, investigates the transformative role of Informal Learning Environments (ILEs) in enhancing student engagement and motivation. Examining diverse ILEs—including home settings, university spaces beyond classrooms, museums, community centers, malls, and digital platforms—the research highlights how these environments spark curiosity and promote self-directed learning. The study engaged twenty-nine participants, exploring how ILEs foster inquiry, critical thinking, and innovative problem-solving through dynamic, interactive experiences. Grounded in self-directed learning and constructivist theories, the research also examines the integration of Open Educational Resources (OERs) and informal strategies such as Autohistoria Teoría (learning through personal narrative), autodidacticism (self-guided learning), peripatetic learning (movement and dialogue) and several others. Semi-structured interviews captured qualitative insights into participants' experiences. Findings reveal that ILEs significantly enhances subject-specific knowledge, nurture intrinsic motivation, and supports lifelong learning. By empowering learners to take ownership of their education, ILEs foster deeper engagement and a sustained passion for learning. While the sample size limits generalizability, the study provides actionable recommendations, encouraging educators, policymakers, and institutions to incorporate ILEs into formal education systems. For example, creating interactive, hands-on spaces and involving students in course design can drive engagement and motivation. This study underscores the pivotal role of ILEs in advancing educational innovation, advocating for their integration into traditional educational paradigms to transform how learning is designed and delivered.

KEYWORDS
Informal Learning Environments (ILEs); Open Educational Resources (OERs); self-directed learning; intrinsic motivation; educational innovation.

INTRODUCTION

This mixed methods study, conducted at a university in Southwest Florida in 2024, investigates the role of Informal Learning Environments (ILEs) in fostering student engagement, motivation, and self-directed learning. ILEs, which encompass settings outside the formal classrooms such as home environments, museums, community centers, and online platforms—offer unique opportunities for students to engage in learning activities that are not typically part of traditional educational structures. With the increasing adoption of Open Educational Resources (OER), which are freely accessible, openly licensed materials, the study explores how these resources can enhance informal learning experiences. By focusing on ILEs and OER, this research aims to contribute to a growing body of literature that seeks to better understand how non-traditional learning environments can promote deeper, more meaningful learning experiences.

The objectives of this study are fourfold: (1) to identify key features of ILEs that effectively ignite passion for learning and enhance engagement, (2) to explore how different types of informal learning spaces motivate learners to explore new subjects or deepen existing interests, (3) to examine how demographic factors such as gender, year of study, and academic discipline influence the effectiveness of ILEs, and (4) to assess the role of self-directed learning opportunities in fostering intrinsic motivation within these settings. These objectives are addressed through a mixed methods approach, combining qualitative insights gathered from semi-structured interviews with quantitative data from student satisfaction and learning gains surveys.

This study draws on established theoretical frameworks, including Autohistoria Teoría, Autodidacticism, Peripatetic learning, and Transformative Learning Theory. These frameworks provide a lens through which to understand how informal learning methods and self-directed learning processes can enhance engagement and motivation in non-traditional educational settings. In particular, Autohistoria Teoría focuses on the role of personal narratives in learning, while Autodidacticism and Peripatetic learning emphasize the importance of self-directed learning and learning through exploration and dialogue, respectively. These theoretical perspectives are integrated with the use of OER, which enables flexible, personalized learning experiences that align with the principles of these informal learning methods.

To assess the impact of these initiatives, the study employs a combination of surveys and interviews. The surveys capture student satisfaction and learning gains, while the semi-structured interviews provide deeper insights into students' experiences with ILEs and their perceptions of how these spaces contribute to their learning. This research also includes a collaborative approach, with input from an education librarian and a mathematics expert who helped design the survey and analyze the data.

The findings of this study are intended to inform educators, policymakers, and scholars about the potential of ILEs and OER in enhancing student engagement and motivation. By identifying effective practices for creating meaningful informal learning experiences, this

research aims to inspire global dialogue about innovative teaching methods and the future of education.

Research Objectives

- To identify the key elements within informal learning environments that most effectively spark passion for learning and enhance learner engagement.
- To explore how various aspects of informal learning spaces motivate learners to explore new topics or deepen existing interests.
- To examine how demographic factors such as gender, year of study, and major influence the effectiveness of specific features of informal learning environments in engaging and motivating learners.
- To assess the role of self-directed learning opportunities in fostering intrinsic motivation within informal educational settings.

Research Questions

- How do informal learning environments foster curiosity and passion for learning in participants?
- What specific types of informal environments contribute most to learner engagement and motivation?
- How do demographic factors such as gender, year of study, and major influence the effectiveness of informal learning environments in sparking curiosity in learning?
- How do learners' perceptions of ownership and autonomy impact their engagement and passion for learning in informal learning spaces?

LITERATURE REVIEW

The literature review is organized into key sections to provide a comprehensive understanding of the role of Open Educational Resources (OER) in informal learning environments (ILEs), and how these resources contribute to student engagement and motivation. The first section discusses the evolution of OER and its advantages in informal learning, highlighting recent research on how OER supports self-directed and personalized learning experiences. The second section explores the role of student engagement and co-creation in informal learning contexts, emphasizing how involving students in the development of course materials foster ownership and intrinsic motivation. The third section examines various teaching strategies used in informal learning environments, such as cultural relevance, reflection, and experiential learning, which enhance engagement and deepen the learning experience. Finally, the review connects these findings to the study’s methodology and anticipated outcomes, illustrating how literature informs the research design and approach. Together, these sections provide a framework for understanding the impact of OER and informal learning environments on fostering motivation, engagement, and lifelong learning.

Introduction to Informal Learning and Open Educational Resources (OER)

The role of Informal Learning Environments (ILEs) in education has gained significant attention in recent years, particularly as technology has expanded access to learning materials beyond traditional classroom settings. ILEs encompass a wide variety of spaces such as museums, community centers, online platforms, and home environments, where learning is driven by curiosity, exploration, and self-directed engagement. Open Educational Resources (OER), which are freely available and openly licensed educational materials, play a crucial role in these informal settings. The growing integration of OER in informal learning contexts enables learners to access diverse content that is flexible, customizable, and engaging, making it a valuable tool for fostering self-directed and lifelong learning. This section reviews recent research on OER, its applications in informal learning, and how these resources are reshaping educational practices.

OER in Informal Learning: Benefits and Challenges

Several studies have highlighted the advantages of using OER to deliver content in informal learning environments (Suárez-Brito et al., 2022). Casanovas (2010) emphasized that OERs have made informal learning a more widely accepted and valued educational approach. Dabbagh and Kitsantas (2012) noted that OERs support constructivist learning by helping learners build personal learning environments, thus enabling more customized and meaningful educational experiences. In line with these observations, Molenaar and Van Campen (2019) observed that OERs foster more interactive learning in informal spaces, encouraging exploration and knowledge creation outside traditional classroom walls.

Research also highlights the collaborative nature of OER content creation. As illustrated by Farrow et al. (2015), OER can be pivotal in both formal and informal learning environments, helping to bridge gaps between traditional education and more flexible, student-driven approaches. Mikroyannidis and Connolly (2015) further observed that OERs offer greater opportunities for learners to engage with materials in ways that extend beyond traditional textbooks, fostering more creative and personalized learning experiences. This is especially important in informal learning contexts, where learners often seek autonomy and a deeper connection to the material.

However, the creation and implementation of OER are not without challenges. For instance, the labor involved in curating or authoring OER, which is often unpaid, can deter educators from developing high-quality content (Hatch, 2007). Additionally, while many OER materials undergo peer review, the quality of content can vary, requiring continuous updates and refinements (Cahill & Papageorgiou, 2020). Lai (2011) pointed out that despite these challenges, high-quality OERs significantly enhance engagement and motivation, particularly in informal settings, by empowering learners to take control of their educational experiences.

The Role of Student Engagement and Co-Creation in Informal Learning

A key theme emerging from literature is the importance of student engagement in the design and development of course materials. Several scholars emphasize that involving students in the creation of learning content fosters motivation, ownership, and a deeper commitment to the

learning process. Paniagua and Istance (2018) argued that when students collaborate with instructors to design course materials, they develop a stronger connection to the content, leading to increased motivation and more meaningful learning experiences. Ryan and Deci (2000) also highlighted that when students have a sense of ownership over the course design, it enhances their intrinsic motivation and encourages deeper investment in their education. This concept of co-creation is particularly relevant in informal learning environments, where the learner's voice is often central to the learning process. Furthermore, Healey et al. (2014) stressed that collaboration between students and faculty not only strengthens the learning experience but also fosters mutual respect and shared educational goals. This collaborative approach is consistent with the learner-centered pedagogy that underpins many informal learning spaces, where the learner's needs, interests, and feedback guide the learning experience.

Teaching Strategies in Informal Learning Environments

In addition to OER, a variety of teaching strategies are employed in informal learning contexts to enhance engagement and motivation. One approach focuses on cultural and contextual relevance. Falk and Dierking (2000) argued that learning in informal environments, such as museums, is most impactful when it is connected to the visitor's subjective experiences. This approach emphasizes integrating local knowledge, cultural practices, and community resources into the learning process. Similarly, Azevedo (2016) explored the importance of integrating cultural narratives and community-based knowledge in informal science education settings, such as museums and science centers. These culturally relevant strategies not only increase engagement but also help learners see the value of education in their own lives.

Another widely recognized approach is reflective practice, where learners are encouraged to regularly reflect on their experiences and receive constructive feedback. Wenger (1998) emphasized that structured informal learning opportunities foster personal meaning and self-identity. In this approach, learners engage in activities such as reflective journals and group discussions, which help them deepen their understanding of the content and develop critical thinking skills. Peer learning and collaboration are also integral components of this strategy, enabling learners to leverage their collective knowledge and enhance their understanding.

Experiential learning is another common approach in informal learning environments. Thomas and Brown (2011) observed that informal learning spaces often foster creativity and adaptability, as they encourage learners to engage directly with content through activities such as field trips, workshops, or real-world simulations. These experiences, often taking place in settings like museums, malls, or home environments, allow learners to apply their knowledge in authentic contexts, reinforcing learning through experience.

Connecting Literature to Methodology and Findings

This study draws on these theoretical perspectives and teaching strategies to investigate how OER and ILEs can enhance student engagement and motivation. The methodology, which combines semi-structured interviews with surveys, aligns with the literature's emphasis on

learner-centered approaches and the importance of reflecting on and evaluating informal learning experiences. The study's focus on co-creation and self-directed learning, as informed by Ryan and Deci (2000) and Paniagua and Istance (2018), is central to understanding how informal learning environments can foster intrinsic motivation. By connecting these theoretical insights to the study's findings, the research aims to offer actionable recommendations for educators and institutions seeking to optimize informal learning through OER and other student-driven strategies.

Conclusion

In conclusion, the literature reviewed highlights the transformative potential of OER and informal learning environments in fostering engagement, self-directed learning, and intrinsic motivation. By critically engaging with existing research, this study contributes to a deeper understanding of how informal learning spaces and OER can be leveraged to enhance the learning experience. The findings of this study, which emphasize the importance of co-creation, cultural relevance, and experiential learning, provide valuable insights for educators seeking to innovate and enhance their teaching practices in both informal and formal learning contexts.

THEORETICAL FRAMEWORK

The theoretical framework guiding this study is built around four core educational theories that inform our understanding of how informal learning environments (ILEs) can spark curiosity and passion for learning. These theories—motivational, constructivist, experiential, and ecological systems—are integrated to provide a comprehensive view of the factors that influence student engagement, autonomy, and intrinsic motivation in informal settings, particularly those enhanced by Open Educational Resources (OERs). By synthesizing these theoretical perspectives, the framework aims to explore how learners engage with ILEs and how these interactions foster self-directed learning, critical thinking, and lifelong curiosity.

Motivational Theories

Central to this framework are theories of motivation, which explore the psychological drivers that lead individuals to engage in learning. The Self-Determination Theory (SDT), proposed by Deci and Ryan (2000), posits that intrinsic motivation flourishes when learners experience autonomy, competence, and relatedness. In the context of ILEs, this theory is highly relevant as these environments often provide learners with greater control over their learning pace, content, and methods of exploration, aligning with the autonomy component of SDT. Learners' intrinsic motivation is enhanced when they could pursue topics of personal interest, as seen in OER-based courses where content can be tailored to individual preferences.

Additionally, Vroom's Expectancy Theory (1964), which emphasizes the importance of perceived outcomes in motivating individuals, can be applied to ILEs. This theory suggests that students are more likely to engage in learning activities if they believe the outcomes (e.g., knowledge acquisition, skill development) will be personally rewarding. In informal learning

environments, where learners often seek intrinsic rewards such as personal growth or deeper understanding, this theory can help explain the motivational dynamics at play.

Constructivist Learning Theories

The second foundational theory in this framework is constructivism, particularly the theories of Jean Piaget (Wadsworth, 1996) and Lev Vygotsky (Vygotsky, 1978). Constructivism holds that learners actively construct knowledge through interaction with their environment and through social interactions. This aligns with the nature of ILEs, which often provide hands-on, self-directed learning opportunities that encourage learners to engage with materials and contexts in meaningful ways. For instance, in informal learning settings like museums or online platforms, learners have the freedom to explore and experiment, building on prior knowledge through direct experiences and discovery. This active construction of knowledge supports the learner's autonomy and agency, central tenets of constructivist theory.

Vygotsky's (1978) emphasis on social interaction and the role of the "zone of proximal development" (ZPD) is also relevant in ILEs, as these environments often offer opportunities for peer learning, collaboration, and guided interactions with more knowledgeable individuals. In this study, the use of OERs also supports the constructivist view by allowing learners to access diverse perspectives, engage in collaborative learning, and co-create knowledge with instructors and peers.

Experiential Learning Theory

The third theory that informs this study is David Kolb's (1984; 2007) Experiential Learning Theory (ELT). ELT posits that learning occurs through a cyclical process involving concrete experiences, reflective observation, abstract conceptualization, and active experimentation. This theory is particularly applicable to informal learning environments, which often provide concrete, hands-on experiences that encourage reflection and experimentation. For instance, learners in museums or community spaces can directly interact with artifacts or engage in problem-solving activities, reflecting on their experiences and using these reflections to conceptualize innovative ideas. These processes of engagement and reflection, central to Kolb's theory, are enhanced in ILEs that promote self-directed learning, allowing learners to apply new knowledge in real-world contexts.

Experiential learning theory also underpins the design of many OERs, which provide learners with dynamic and interactive content that invites experimentation and reflection. In informal learning environments, learners are encouraged to not only consume knowledge but actively participate in constructing it, aligning with the core principles of ELT.

Ecological Systems Theory

Bronfenbrenner's Ecological Systems Theory (2000) provides another critical layer to the framework by emphasizing the role of the learner's broader environment in shaping their development and learning. According to this theory, learning is influenced by multiple layers of interconnected systems, from immediate surroundings (microsystems) like family and peers, to broader societal influences (macrosystems) such as cultural norms and educational policies. In

the context of ILEs, these environmental systems shape how learners interact with informal spaces and the content within them.

This theory is particularly relevant to understanding how ILEs operate as part of a larger educational ecosystem. Informal learning environments do not exist in isolation but are influenced by factors such as family support, community resources, and societal attitudes towards education. For example, a learner's access to a community center or museum may depend on socio-economic factors, cultural values, and institutional support. These ecological systems contribute to the learner's engagement and curiosity, offering rich, varied opportunities for learning outside traditional classroom settings.

Limitations of the Theoretical Framework

While these theories offer a robust foundation for understanding how ILEs can enhance curiosity and passion for learning, they also have limitations. For instance, motivation theories like SDT may overlook the complexities of extrinsic motivations, such as grades or external validation, which can still play a significant role in some learners' engagement in informal settings. Furthermore, while constructivist and experiential learning theories highlight the active role of the learner, they may not fully account for the challenges that some learners face in self-directed learning environments, such as lack of prior knowledge or support systems. Lastly, Ecological Systems Theory, though comprehensive, can be difficult to operationalize in research, particularly when trying to measure the influence of broader societal factors on individual learning experiences.

Alignment with Study Findings

This theoretical framework is aligned with the study's methodology and expected findings, which aim to explore how OER and ILEs foster intrinsic motivation, engagement, and self-directed learning. The research focuses on how learners interact with informal spaces and content, and how these interactions are shaped by motivation, constructivist learning, and hands-on experiences. By integrating these theories, the study can critically evaluate how various aspects of ILEs contribute to deep, meaningful learning and how these environments can be optimized to further enhance curiosity and passion for learning.

METHODS

Overview and Research Design

This study employed a qualitative case study design incorporating a mixed-methods approach to explore the transformative potential of Informal Learning Environments (ILEs) in fostering student engagement and motivation at a university in Southwest Florida. The case study design was chosen for its capacity to provide an in-depth exploration of the unique characteristics and impacts of ILEs within their real-world context.

Purposeful sampling was used to select twenty-nine students from diverse academic disciplines who regularly engaged with ILEs, ensuring broad representation. Data collection involved both surveys and semi-structured interviews, leveraging the strengths of quantitative

and qualitative methods to achieve a comprehensive understanding of how ILEs influence learning experiences.

The surveys included quantitative Likert-scale questions designed to measure engagement, motivation, and perceived ILE effectiveness, as well as qualitative open-ended questions capturing detailed participant narratives. These surveys provided measurable insights into trends and patterns while also offering rich descriptions of participant experiences. Semi-structured interviews were conducted with a purposeful subset of survey respondents, selected for their varied engagement with ILEs. These interviews delved into individual interactions, focusing on how ILEs stimulated curiosity, critical thinking, and creativity, and how participants perceived their distinctions from traditional learning environments.

Data analysis was conducted in two phases—quantitative and qualitative. Descriptive and inferential statistics were employed to analyze survey data, identifying patterns and correlations in student engagement and motivation. Qualitative analysis involved thematic coding of both open-ended survey responses and interview transcripts. The coding process included three stages: initial coding to identify recurring concepts, theme development to organize codes into broader categories, and member checking to validate themes with participants. This dual-phase analysis ensured a robust and nuanced understanding of ILEs' multifaceted roles, their perceived effectiveness, and their unique contributions compared to traditional learning settings.

Ethical considerations were integrated throughout the research process. Informed consent was obtained from all participants, and strict confidentiality was maintained. Data was anonymized during analysis and reporting to safeguard participants' privacy and uphold research integrity. This comprehensive and ethically sound methodology provided valuable insights into the potential of ILEs to enhance engagement and motivation in higher education.

Validity and Reliability

Validity and reliability were rigorously addressed to ensure the credibility and trustworthiness of the study findings.

To establish ***construct validity***, the study utilized multiple sources of evidence, including surveys and interviews, to triangulate data and provide a comprehensive understanding of how ILEs impact student engagement and motivation. The use of both quantitative Likert-scale questions and qualitative open-ended responses ensured that the constructs of engagement and motivation were captured accurately and holistically.

Internal validity was strengthened through a detailed thematic coding process and the use of member checking. By involving participants in validating the derived themes, the study ensured that the findings authentically represented their experiences and perceptions. Additionally, the use of inferential statistics helped identify significant patterns and relationships, enhancing the rigor of the data analysis.

External validity was addressed through purposeful sampling, which ensured a diverse representation of students across disciplines and demographic backgrounds. This diversity

supports the generalizability of the findings to broader contexts within higher education, while also accounting for the unique characteristics of ILEs.

Reliability was maintained through consistent data collection and analysis procedures. Surveys were pilot-tested to refine questions and ensure clarity, while the thematic coding process followed a systematic, replicable approach. Multiple researchers reviewed the coding and analysis to minimize bias and enhance reliability. By documenting all procedures transparently, the study ensured that its methodology could be replicated in future research.

Participant Selection

A total of twenty-nine students were purposefully selected based on their regular engagement with various ILEs. The inclusion criteria ensured a diverse representation across academic disciplines and backgrounds, promoting a holistic understanding of the role of ILEs. Participants were recruited from the various informal learning classes. These students majored in different fields and this recruitment ensured a broad spectrum of the student body.

A total of twenty-nine students were purposefully selected for this study, with the selection criteria emphasizing their regular engagement with various Informal Learning Environments (ILEs). Purposeful sampling was employed to ensure that participants represented a wide range of experiences and interactions with ILEs, providing a rich and diverse dataset for analysis. Inclusion criteria were designed to capture a variety of perspectives by incorporating students from different academic disciplines, class levels, and demographic backgrounds. This diversity was critical for achieving a holistic understanding of how ILEs influence student engagement and motivation across varied contexts.

Participants were recruited from informal learning classes and activities known for fostering collaborative, self-directed, and experiential learning. These students were majoring in fields such as the sciences, humanities, social sciences, and professional programs, reflecting a broad spectrum of the university's student body. By including students from diverse academic and personal backgrounds, the study aimed to uncover commonalities and differences in how students engage with ILEs. This approach ensured that the findings would be universally applicable, providing insights into the potential of ILEs to enhance learning for students with varied interests and needs.

Data Collection Methods

The study utilized a mixed-methods approach, incorporating surveys and semi-structured interviews, to gather data on participant experiences and perceptions of Informal Learning Environments (ILEs). The surveys were designed to capture both quantitative and qualitative data, ensuring a comprehensive understanding of engagement and motivation.

The quantitative component of the survey employed Likert-scale questions to measure participants' levels of engagement, motivation, and perceptions of ILE effectiveness. Respondents rated their agreement with various statements using a fixed scale ranging from strongly disagree to strongly agree, with each response assigned a numerical value. This allowed for the statistical analysis of subjective data, providing insights into how participants perceive

the reliability, academic rigor, and overall effectiveness of ILEs. These questions also aimed to quantify students' satisfaction with and interactions in informal learning opportunities.

The qualitative component of the survey consisted of open-ended questions that invited participants to share detailed narratives about their experiences. These responses were crucial for identifying specific instances of enhanced engagement and motivation and for understanding the contextual factors influencing these experiences.

Additionally, semi-structured interviews were conducted with a purposeful subset of survey respondents, selected to reflect diverse engagement with ILEs. The interviews explored individual experiences in greater depth, focusing on how ILEs stimulated curiosity, critical thinking, and creative problem-solving. Participants were also asked to compare ILEs with traditional learning environments, providing a nuanced perspective on the unique contributions of ILEs to the learning process.

This dual approach ensured a robust and multifaceted dataset, offering both measurable trends and rich, contextual insights into the transformative potential of informal learning environments.

Data Analysis

The data analysis was conducted in two complementary phases: quantitative and qualitative, to ensure a comprehensive understanding of the impact of Informal Learning Environments (ILEs) on student engagement and motivation.

Quantitative Analysis

Survey data were analyzed using both descriptive and inferential statistical techniques. Descriptive statistics, such as mean scores, standard deviations, and frequency distributions, were calculated to summarize trends in engagement and motivation levels among participants. Inferential statistics were applied to identify significant patterns and correlations within the data, providing deeper insights into the factors influencing student interactions with ILEs. This phase facilitated the identification of key metrics and trends, offering a clear quantitative picture of the effectiveness of ILEs.

Qualitative Analysis

Thematic coding was employed to analyze qualitative data from open-ended survey responses and semi-structured interviews. The analysis followed a three-stage process:

- *Initial Coding*: This stage involved identifying recurring phrases, concepts, and ideas within the qualitative data. Initial codes provided a foundation for recognizing patterns and key themes.
- *Theme Development*: Codes were grouped into broader categories to reflect the multifaceted roles of ILEs, their perceived effectiveness, and the specific informal learning methods employed. Themes captured the impact of ILEs on factors such as student motivation, critical thinking, and creativity, as well as the perceived value of Open Educational Resources (OERs) in these settings.

- *Member Checking*: To enhance the credibility and accuracy of the findings, interviewed participants were invited to review the themes derived. This step ensured that the analysis authentically represented their experiences and perspectives.

By integrating these quantitative and qualitative approaches, the analysis provided a nuanced and holistic understanding of how ILEs contribute to student learning. This robust methodology aimed to inform the best practices in higher education, highlighting the transformative potential of informal learning environments in fostering engagement and motivation.

Ethical Considerations

Ethical protocols were rigorously adhered to throughout the study to ensure the integrity of the research process and the protection of participant rights. Informed consent was obtained from all participants prior to their involvement, ensuring they fully understood the purpose, scope, and nature of the research. Participants were assured of the confidentiality of their responses, with all data anonymized during analysis and in any reporting of findings. These measures safeguarded participant privacy and maintained the ethical standards necessary for conducting research in educational settings.

FINDINGS

As noted in the methods, the collection of data involved two levels – the survey and the semi-structured open interviews. These two data collection methods produced comparable results. The findings below indicate that the quantitative findings from the survey were well complemented by the interviews. The findings from both quantitative and qualitative analyses were synthesized to produce actionable recommendations for educators, policymakers, and institutions. Key outcomes included:

- **Strategies for Enhancing ILEs**: Recommendations focused on creating hands-on learning spaces, promoting collaboration, and integrating real-world problem-solving into the curriculum.
- **Encouraging Learner Involvement**: Emphasized the importance of involving students in course creation and decision-making processes, thereby fostering a sense of ownership and agency in their learning journey.
- **Promotion of Open Educational Resources (OERs)**: Highlighted the potential of OERs to facilitate access to diverse learning materials in informal settings, encouraging self-directed learning.

Findings from the survey

The researchers of this study developed a survey focusing on the specific content of the course—informal learning experiences (see Appendix A). By evaluating both overall satisfaction and student learning gains related to the course content, the authors' objective was to achieve a more comprehensive understanding of the student experience and the factors that influenced their motivation and engagement. Upon completion of the course, a total of twenty-nine

students participated in the study by completing the survey, with 31% identifying as male and 69% as female, as shown in Table 1 below.

Participants indicated (Table 2) that autodidacticism (44.8%) and trial-and-error (41.4%) were the most effective informal learning methods, while approaches such as peripatetic learning (6.9%) and the silent way (6.9%) were less favored. Furthermore, the home environment was identified as the most effective informal learning setting (48.3%), followed by non-educational environments (20.7%), as illustrated in Table 3. Less favored learning environments included non-traditional education settings (10.3%), university campuses outside the classroom (10.3%), online informal learning environments (6.9%), and other informal learning contexts (3.4%).

Table 1.

Descriptive Statistics: Gender

	Frequency	Percent	Valid Percent	Cumulative Percent
Male	9	31.0	31.0	31.0
Female	20	69.0	69.0	100.0
Total	29	100.0	100.0	

Table 2.

Which type of informal learning method provides the greatest learning?

	Frequency	Percent	Valid Percent	Cumulative Percent
Autodidacticism	13	44.8	44.8	44.8
Peripatetic learning	2	6.9	6.9	51.7
The Silent way	2	6.9	6.9	58.6
Trial-and-error	12	41.4	41.4	100.0
Total	29	100.0	100.0	

Independent sample t-tests were conducted to see if there are differences between two gender groups in terms of a) their ratings on how student learning outcomes were achieved and b) their level of agreement on the survey statements comparing traditional and informal learning classrooms. Results of t-test analysis (table 4) indicated that there were no statistically significant differences between male and female participants regarding their ratings of how well the course student learning outcomes were achieved ($p = 0.194$) and their agreement levels on the survey statements comparing traditional and informal learning environments ($p = 0.12$).

Table 3.

Which informal learning environment provides you with the greatest learning?

	Frequency	Percent	Valid Percent	Cumulative Percent
Non-education environments	6	20.7	20.7	20.7
Non-traditional education environments	3	10.3	10.3	31.0
Online informal learning environments	2	6.9	6.9	37.9
Other	1	3.4	3.4	41.4
The Home environment	14	48.3	48.3	89.7
University campus outside the classroom	3	10.3	10.3	100.0
Total	29	100.0	100.0	

Table 4.

Independent sample t-tests between gender groups

	Gender	N	Mean	Std. Dev.	t	df	P
Total Score -SLORating	Male	9	20.22	6.06	-1.332	27	0.194
	Female	20	22.45	3.03			
TotalScore -Statement Agreement	Male	9	34.44	6.91	-1.605	27	0.12
	Female	20	37.5	3.44			

Multiple one-way ANOVA tests were conducted to examine the differences in students' ratings of course learning outcomes and perspectives on informal learning. The results of these ANOVA tests revealed no statistically significant differences across the variables considered. Here is a summary of the findings:

- **Students' Ratings of Course Learning Outcomes by Major**: No statistically significant difference was found among students from different majors regarding their ratings of the course learning outcomes ($p = 0.805$).
- **Students' Ratings of Course Learning Outcomes by Informal Learning Methods**: There were no significant differences in students' ratings of course learning outcomes based on the type of informal learning methods they used ($p = 0.970$).
- **Students' Ratings of Course Learning Outcomes by Informal Learning Environments**: Similarly, no significant differences were found in students' ratings of course learning outcomes based on the informal learning environments they used ($p = 0.430$).

- **Students' Perspectives on Informal Learning by Major**: There was no statistically significant difference among students from different majors regarding their perspectives on informal learning, as reflected in their agreement with the survey statements ($p = 0.523$).
- **Students' Perspectives on Informal Learning by Informal Learning Methods**: No significant differences were found in students' perspectives on informal learning based on the type of informal learning methods they chose ($p = 0.649$).
- **Students' Perspectives on Informal Learning by Informal Learning Environments**: Finally, no significant differences were observed in students' perspectives on informal learning based on the informal learning environments they utilized ($p = 0.784$).

These findings suggest that students favored autodidactic and trial-and-error learning approaches and felt that the home environment was the most conducive to informal learning. Moreover, the results of t-test and ANOVA analyses indicated that demographic factors (gender, major) and the choice of informal learning methods or environments did not significantly impact students' perceptions of the course learning outcomes or their views on informal learning approaches. This suggests a uniform effectiveness of the course across different student groups and learning contexts.

Table 5.

Students' ratings on the achievement level of each learning objective.

Survey Item: The following are the student learning outcomes of the Informal Learning Environment course. How were they achieved?				
Student Learning Outcomes	**Very well achieved**	**Well achieved**	**Partially achieved**	**Neutral**
Comparing and contrasting with formal learning	15	10	1	3
Learning using unique informal learning methods	16	10	1	2
Learning from different informal learning environments	18	8	0	3
Connecting the learner with different informal learning settings	16	9	1	3
Highlighting significance of connecting learning with the natural environment	16	10	1	2

Results of the data analysis also indicated that the student learning outcomes of the course show an elevated level of achievement across all dimensions. Most students reported that the learning objectives were "well achieved" or "very well achieved," with minimal reports of neutral or partially achieved outcomes. This indicates that the course was successful in

meeting its primary learning objectives (Table 5). On average 88.27% of the participants reported that all five learning outcomes were either "very well achieved" or "well achieved."

Furthermore, in response to the survey item in which students' level of satisfaction with the course was asked, the results revealed that most students reported high satisfaction with the course. Specifically, sixteen students were "very satisfied," 9 were "satisfied," 3 remained "neutral," only one student reported being "dissatisfied." This result suggests that the course structure, content, and teaching methods resonated positively with most students.

Moreover, the results also indicated that the course appears to have had a significant impact on students' understanding of informal learning concepts. Most students reported that their understanding had significantly increased. More specifically, twenty-two students indicated a "significant increase," 6 reported a "somewhat increased" understanding, and only one student claimed that there was "no noticeable impact."

The data analysis indicates that the Informal Learning Environment course was highly effective in achieving its learning outcomes and enhancing students' understanding of informal learning concepts. Most students expressed high satisfaction with the course, and very few reported neutral or negative experiences. The feedback reflects positively on the course's ability to engage students in comparing formal and informal learning, utilizing unique learning methods, and emphasizing connections between learning and the natural environment.

The data from the second part of the survey reveals a strong preference for informal learning methods over traditional classroom approaches. As seen in table 6, 68.97% of students "strongly agreed" that informal learning fosters more passion, with an additional 17.24% "somewhat agreeing." Moreover, 48.28% "strongly agreed" that they learned more through informal learning compared to formal learning, with another 31.03% "somewhat agreeing." Results also show that 62.07% "strongly agreed" that informal learning offers more experiential learning opportunities. 75.86% of students "strongly agreed" that informal learning offers more flexibility, supporting the idea that informal environments can adapt better to individual learning needs. Furthermore, 79.31% of students "strongly agreed" that informal learning fosters skills that are more relevant to life-long learning. Results of the data analysis also indicated that 72.41% of students "strongly agreed" that informal learning creates opportunities for engagement with diverse learning environments. Finally, informal learning was also rated highly for its ability to offer customized learning (75.86% "strongly agreed") and diverse learning sources (72.41% "strongly agreed").

Table 6.

Students' preferences for informal learning over traditional classroom approaches

	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree

There is more passion through informal learning	68.97%	17.24%	10.34%	3.45%	0.00%
I learned more from informal learning than in the formal learning	48.28%	31.03%	13.79%	0.00%	6.90%
There is more experiential learning using informal learning	62.07%	24.14%	13.79%	0.00%	0.00%
Compared with the learning from the traditional classroom, informal learning class creates opportunities for Flexibility in learning	75.86%	17.24%	6.90%	0.00%	0.00%
Compared with learning from the traditional classroom, informal learning class creates opportunities for relevance with life-long learning	79.31%	13.79%	6.90%	0.00%	0.00%
Compared with the learning from the traditional classroom, informal learning class creates opportunities for the Engagement with diverse learning environments	72.41%	20.69%	6.90%	0.00%	0.00%
Compared with the learning from the traditional classroom, informal learning class creates opportunities for the Customization of learning	75.86%	17.24%	6.90%	0.00%	0.00%
Compared with the learning from the traditional classroom, informal learning class creates opportunities for the More diverse learning sources	72.41%	20.69%	6.90%	0.00%	0.00%

Findings from the semi-structured interviews

The follow-up of the study involved the use of semi-structured interviews conducted with a subset of survey respondents. They provided a qualitative lens through which to explore the nuanced ways Informal Learning Environments (ILEs) foster curiosity, critical thinking, and

creative problem-solving. This analysis synthesizes the insights gathered, highlighting four common themes based on individual experiences that enrich our understanding of the role ILEs play in motivating learners. The themes included the fostering of curiosity, enhancement of critical thinking, encouraging problem-solving and continuing education.

Theme One: Fostering curiosity

A predominant theme that emerged from the interviews was the role of ILEs in igniting curiosity. Participants consistently described how engaging with diverse materials and activities in informal settings prompted them to ask questions and seek deeper understanding. For instance, one participant recounted their experience at a science museum, where interactive exhibits encouraged exploration beyond surface-level knowledge. This environment not only stimulated initial interest but also led to independent research and further exploration in related fields. Several students have engaged in research for their honors thesis where they apply their learning from this class to real-life settings.

Theme Two: Enhancing critical thinking

Several participants interviewed revealed that ILEs promote critical thinking by providing learners with real-world problems to solve. Many participants shared experiences where they were faced with challenges that required analytical reasoning and decision-making. For example, a participant involved in a community project discussed how collaborative problem-solving in a real-world context enabled them to weigh different perspectives and make informed choices. The freedom to navigate these challenges without the constraints of formal assessment allowed for more profound engagement with critical thinking processes.

Theme Three: Encouraging creative problem-solving

Participants highlighted the importance of ILEs in fostering creative critical thinking skills. Many described instances where they were encouraged to think creatively and experiment with unconventional solutions. One interviewee mentioned a workshop that incorporated art and technology, which prompted them to merge different disciplines with their approach to problem-solving. This cross-disciplinary exposure not only nurtured creativity but also demonstrated the interconnectedness of various fields, reinforcing the idea that innovative solutions often arise from diverse sources of knowledge.

Theme Four: Individual experiences and future personal growth

This study revealed that this is the start of an on-going adult and continuing education. Several participants noted that they will continue with the informal learning and apply it to their lives. The interviews also illuminated how ILEs contribute to personal growth and self-directed learning. Many participants reflected on their journeys of self-discovery, noting how the freedom and flexibility of informal settings allowed them to pursue their interests without the fear of failure. One respondent articulated a transformative experience where their participation in an informal coding club led to increased confidence and a sense of community. This sense of belonging was frequently mentioned as a critical factor that motivated learners to engage deeply and persist in their pursuits.

Lastly, the semi-structured interviews provided rich qualitative data that underscore the significant impact of Informal Learning Environments on fostering curiosity, critical thinking, and creative problem-solving. The insights gained from individual experiences highlight the transformative potential of ILEs in cultivating motivated, self-directed learners. As we continue to explore the dynamics of informal learning, these narratives serve as a compelling reminder of the value of engaging environments that inspire and empower individuals to explore their passions and develop essential skills for the future.

In conclusion, the combined findings from surveys and semi-structured interviews provide a comprehensive understanding of the positive impacts of Informal Learning Environments. ILEs not only stimulate curiosity and enhance critical thinking but also nurture creative problem-solving and personal growth. The data collectively illustrates the transformative power of informal learning in motivating individuals to engage deeply with their interests, leading to lifelong learning and development.

The findings from both the surveys and the interviews collectively point to a phenomenally successful way of learning in an informal learning environment through the application of different OERs. Students not only achieved the outlined learning outcomes but also demonstrated a strong preference for the flexibility, customization, and diverse experiential opportunities offered by informal learning compared to traditional classroom settings. This reinforces the notion that informal learning environments are more aligned with fostering engagement, relevance to lifelong learning and diverse educational experiences.

DISCUSSION

The study on informal learning environments (ILEs) underscores the pivotal role these spaces play in fostering self-directed, experiential, and lifelong learning. As highlighted by Cross (2007), informal learning allows individuals to rediscover natural pathways to knowledge, and our findings resonate with this notion. The integration of Open Educational Resources (OER) has emerged as a transformative element in this context, facilitating greater flexibility, accessibility, and collaboration among learners and educators alike. It is important to highlight in this discussion some significant outcomes from this study on the role of OERs, the implications for pedagogy, the evaluation of learner outcomes and the challenges and opportunities.

The Role of OER in Informal Learning Environments

Among other components of this study was the investigation of how OER can be effectively utilized to create courses tailored to various informal learning settings, such as museums, libraries, and online communities. These environments, often rich in resources and diverse learning opportunities, challenge traditional educational frameworks, necessitating innovative pedagogical approaches. The findings reveal that OER not only enriches the learning experience but also empowers educators to design customized, context-sensitive curricula that resonate with learners' interests and needs. As noted by Wiley & Hilton (2018), OER has an enormous impact in various educational contexts, including informal learning.

OER serves as a vital tool in this process. It fosters environments where learners interact with educational content freely, encouraging experimentation, problem-solving, and collaboration. Its inherent flexibility allows educators to adapt materials to specific informal contexts, enhancing the relevance and applicability of learning content. In addition, OER promotes personalized learning, where learners can access diverse resources, construct knowledge independently, and collaborate with peers in informal and formal learning contexts. For instance, a course designed around an exhibition in a museum can integrate multimedia resources, interactive assignments, and community engagement projects, promoting deeper engagement and critical thinking among students. In addition, as noted by Beetham & Sharpe (2013), OER provides strategies for integrating digital tools and OER in innovative educational designs that promote motivation and engagement.

Lastly, when applied to informal settings, OER enables learners to engage with open, flexible materials, which supports self-directed learning. As in constructivist theories, OER posits that learners actively construct their knowledge and understanding through experiences and interactions. Siemens (2006) noted that OER enables learners to engage with open, flexible materials, which support self-directed learning. OER platforms often function as knowledge networks that allow learners to connect with peers, experts, and educational content, facilitating the creation and exchange of knowledge on a global scale.

Implications for Pedagogy

The study highlights the importance of innovative pedagogical strategies when developing an engaging curriculum for ILEs. The insights from Bell et al. (2009) reinforce that informal learning techniques can be applied across disciplines, with efficacy in science education. The use of inquiry-based learning methods in informal settings, as examined by Cahill and Papageorgiou (2020) and Krauss (2013), demonstrates how these environments can nurture critical thinking and scientific inquiry.

This research shows that by leveraging OER, educators can create engaging and learner-centered courses that encourage active participation and exploration. The emphasis on flexibility and adaptability within OER allows educators to respond to the unique dynamics of informal learning spaces, creating opportunities for students to engage with content in ways that are personally meaningful and contextually relevant.

Evaluating learner outcomes

A key aspect of this study is the rigorous evaluation of learner outcomes associated with the newly designed courses utilizing OER. This evaluation not only assesses knowledge acquisition but also examines shifts in student motivation, engagement, and the ability to apply learned concepts in real-world contexts. By employing both quantitative and qualitative evaluation methods, the study provides a comprehensive picture of how OER-enhanced courses impact learners.

The findings suggest that students who engaged with OER in informal settings reported increased motivation and a stronger sense of ownership over their learning experiences. This

aligns with Vaill's (1996) assertion that informal learning provides strategies for survival in a rapidly changing world, equipping learners with the skills needed to navigate diverse contexts and challenges.

Challenges and opportunities

While the study reveals significant benefits of integrating OER in informal learning environments, it also highlights challenges faced by educators. Issues such as the digital divide, varying levels of technological proficiency, and the need for ongoing support and training in OER utilization are critical considerations. Addressing these challenges requires a collaborative effort among institutions, educators, and policymakers to create supportive ecosystems that promote OER adoption and effective teaching practices.

In conclusion, this study contributes to the broader discourse on the impact of OER in higher education, particularly within informal learning contexts. By providing actionable insights and highlighting pedagogical best practices, it aims to equip educators with the tools necessary to craft engaging, learner-centered courses. As the landscape of education continues to evolve, fostering an understanding of how OER can be harnessed in ILEs is essential for enhancing student engagement and motivation, enriching the overall educational experience.

Limitations

This study faces several notable limitations that should be acknowledged. First, as with any case study, it centers on a specific example, which may hinder the generalizability of the findings to other contexts. Second, the sample size is relatively small, comprising only a limited number of students. Smaller sample sizes may produce lower reliability and have less external validity. Consequently, the results may not accurately reflect the broader experiences with Open Educational Resources (OER) in various informal learning environments. However, in this study, the content and design of the questionnaire and interview process could be adapted and repurposed for many distinct types of OER courses. The findings of this study and the quality of the OER resources could be further substantiated through peer-review of the OER materials and the Quality Matters credentialing process, which is widely recognized on the campus of the study site.

As this study identifies best practices, the effectiveness of these practices can vary significantly based on instructor experience, subject matter, and student demographics. By focusing exclusively on the informal learning experience, the study may inadvertently oversimplify the complexities of formal education. Fourth, not all OER materials are created equal. Although this study concentrates on the most current and high-quality OER resources, it may not fully address issues related to the consistency and credibility of the materials used across different courses. There may be need for a further study on the role of OER in enhancing learning in informal spaces.

Lastly, there are external factors that could impact on the effectiveness of the course, including institutional support, funding, and changes in educational policy regarding OER implementation. Currently, at the study institution, there is strong campus-wide support for

OER implementation, including a textbook adoption process which requires faculty to confirm that they have first explored open textbook options before requiring students to purchase a textbook. However, faculty are not compensated or recognized for adopting or creating OER textbooks. Future instructors of the course may choose to revert to a traditional textbook which may or may not affect student satisfaction and learning gains in the course. However, the current instructor of the course is committed to using the OER materials, which he believes is superior to the current traditional textbooks on this topic, so the course will continue to improve with corresponding increases in student satisfaction. In any case, despite these limitations, the study contributes significantly to our understanding of the application of OER in teaching and learning.

CONCLUSION

This study unequivocally demonstrates the transformative potential of Open Educational Resources (OER) in course development, particularly within informal learning environments in keeping students engaged and increasing passion for learning. Zimmerman (2002) noted that this helps inspiring students to become self-regulated learners. By harnessing OER, the course not only delivered accessible and adaptable content but also embraced the essential flexibility and diversity needed to foster engagement in non-traditional educational settings.

Two of the key findings of this study, the student preference for autodidactic and trial-and-error learning, as well as the preference for the home environment, is an opportunity for future course redesign and enhanced student engagement. The results of this study could be shared with future students enrolled in the course. Those students could participate in the course design and learning outcomes. This might include designing home-based learning activities focused on trial-and-error methods and documentation of learning gains, based on a rubric created by the students. This approach of co-creating learning materials increases student collaboration and ownership of the learning process (Healey et al., 2014; Paniagua & Istance, 2018; Ryan & Deci, 2000). A longitudinal study of the replicated survey questions and interviews, along with tracking student outcomes through subsequent semesters of the course could provide additional validity to the study and result in course improvements and increased student learning outcomes.

Furthermore, the case study reveals several pivotal outcomes: OER's capacity to enhance learner agency, the critical role of interactive and experiential learning in informal contexts, and the significance of customizing resources to address varied educational needs. The assessment of learner outcomes further validates that, when thoughtfully integrated, OER can catalyze deeper learning, critical thinking, and greater autonomy among students. Wenger-Trayner et al. (2015) observed that informal spaces provide an excellent forum for practice-based learning that can be part of continuing education.

Boud and Solomon (2003) noted that informal learning using the different OERs is going to become the new higher education within a limited time to come. Emerging pedagogical best

practices highlight the importance of learner-centered design, work-based learning, the incorporation of diverse and multimedia-rich resources, and the cultivation of collaboration both among learners and with external communities. These practices exemplify the adaptability and inclusivity that OER can infuse into informal learning environments. As noted by Abramenka-Lachheb et al. (2021) amidst the challenges of a pandemic, the distinct pedagogy of informal learning environments significantly contributes to effective learning during crises.

While the study acknowledges challenges—such as the necessity for ongoing updates of OER materials and the imperative of ensuring digital literacy among students, the overall findings affirm the effectiveness of OER in enhancing educational experiences. More recently with increased technology, studies on informal learning like Sefton-Green (2019) and Lai (2011) provided a critical look at how learners engage with digital and physical spaces outside the traditional classroom, promoting creativity and critical thinking. They examined how digital technologies enable informal learning opportunities within and beyond higher education settings, emphasizing student engagement. This research adds to the expanding body of evidence supporting OER in higher education and offers actionable insights for educators aiming to design innovative courses within informal learning contexts.

It is also important to note that the methods of informal learning are not limited to the college years. Marsick and Watkins (2001) noted that learning provides new directions for adults and continuing learning. Siemens (2006) referred to this as knowing knowledge or rather knowing how to know.

Future iterations of the course will be improved by the findings of this study. As stated earlier, students will have the opportunity to be co-creators of course content which will enhance student experience and increase engagement. The three perspectives of the authors have contributed to a comprehensive understanding of the findings and have helped to establish an action plan for course improvements. The primary author is a former history and geography K-12 teacher with a deep understanding of learning theory and pedagogical best practices from the child to adult learning spectrum. This deep engagement with pedagogy across the critical developmental milestones will facilitate creative course redesign incorporating the student creation of course content, which may include a home-based trial-and-error module. The second author is a librarian and art educator, who can help with future course design. This might include developing information literacy modules and facilitating engagement with learning environments such as schools and museums. The third collaborator is a mathematician who may support future quantitative assessments of the course and help incorporate a STEM based module of the course. The building of relationships and cross-campus collaboration is an unexpected and welcome outcome of this study that will benefit the student experience.

In conclusion, this study reinforces the notion that OER can profoundly enrich educational practices, particularly in dynamic, learner-driven environments. It paves the way for more inclusive and adaptable teaching and learning strategies, applicable to both formal and

informal educational settings. OER promotes a collaborative learning atmosphere in which students and instructors co-create knowledge, enhancing social and cognitive engagement through the open sharing and adaptation of resources.

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