TEACHING PRACTICES ON THE ADOPTION OF EDUCATION 4.0:EXAMINING PUBLIC ELEMENTARY SCHOOL TEACHERS' PERSPECTIVES AS BASES FOR A PROFESSIONAL DEVELOPMENT PROGRAM

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ABSTRACT
This study determined the teaching practices on the adoption of Education 4.0 among 173 public elementary school teachers in Masinloc District, Schools Division of Zambales during the School Year 2023-2024. Utilizing quantitative-descriptive research, the study employed a validated questionnaire for data collection. Results indicated that most teachers, primarily females in the 30-39 age group holding the position of Teacher I, exhibited slight adoption of Education 4.0. Notably, teachers with 5-9 years of experience and Master's degree units demonstrated this trend. Teaching practices showed partial engagement, incorporating elements like the flipped classroom, personalized learning paths, collaborative online projects, and educational technology use. Significant differences in adoption were observed based on factors such as sex, teaching position, years in service, and highest educational attainment, leading to the rejection of null hypotheses. A strong positive correlation was identified between Education 4.0 adoption and teaching practices, emphasizing the importance of elements like the flipped classroom, personalized learning paths, collaborative projects, and technology. A tailored professional development program was proposed for public elementary school teachers, addressing individual needs for effective Education 4.0 integration. Recommendations included integrating Education 4.0 components into teaching practices, actively participating in professional development, and emphasizing continuous learning for optimal educational experiences and learner outcomes.

Keywords: Teaching Practices, Adoption, Education 4.0, Public Elementary School Teachers, Perspectives

1. INTRODUCTION
This study aligns with current research on Education 4.0 and its impact on teachers. A key theme emerging from existing literature is the growing use of technology in classrooms. Studies highlight the potential of blended learning and Learning Management Systems (LMS) to develop 21st-century skills and competencies (Palestina, 2021; Arpilleda et al., 2023). Frameworks like flipped classrooms and DeELS are gaining traction for integrating digital technologies across various subjects (Salinas-Navarro et al., 2023; Rahmadani, 2020).

Another theme is the need for teacher training and support. Research emphasizes the importance of equipping teachers with practical experiences, digital literacy, and innovative teaching methods to thrive in Education 4.0 (Lapo, 2021; Chigbu et al., 2023).

2. STATEMENT OF THE PROBLEM

This study determined the teaching practices on the adoption of Education 4.0 among public elementary school teachers in Masinloc District, Schools Division of Zambales during the School Year 2023-2024.

Specifically, it aimed to answer these questions:

1. How may the profile of respondents be described in terms of:
    1.1. age;
    1.2. sex;
    1.3. teaching position;
    1.4. years in service; and
    1.5. highest educational attainment?

2. How may the adoption of Education 4.0 of respondents be described in terms of:
    2.1. awareness and familiarization;
    2.2. experimentation and exploration;
    2.3. integration and refinement; and
    2.4. continued improvement?

3. How may the teaching practices of respondents be described in terms of:
    3.1. flipped classroom approach;
    3.2. personalized learning path;
    3.3. collaborative online project; and
    3.4. use of educational technology?

4. Is there a significant difference between the adoption of Education 4.0 of respondents and their profile when grouped accordingly?

5. Is there a significant correlation between the adoption of Education 4.0 of respondents and their teaching practice?

6. What professional development program can be offered to the public elementary school teachers in adopting Education 4.0 in their teaching practices?

3. METHODS AND MATERIALS

This study determined the teaching practices on the adoption of Education 4.0 among public elementary school teachers in Masinloc District, Schools Division of Zambales during the School Year 2023-2024. Utilizing a quantitative-descriptive method, data were collected, classified, summarized, and presented using percentages and means. The respondents comprised 173 public elementary school teachers, employing simple random sampling technique to ensure unbiased representation and validity. A researcher-designed questionnaire served as the primary data collection instrument, consisting of three parts covering the profile of respondents, respondents' adoption of Education 4.0, and the teaching practices of respondents. Internal consistency was confirmed through Cronbach's Alpha scores, indicating excellent reliability across dimensions. Parametric testing, specifically Analysis of Variance (ANOVA) and Pearson's Product Moment Correlation Coefficient, were employed due to normal distribution of data, revealing no significant findings across various dimensions.

4. RESULTS AND DISCUSSIONS
4.1. Profile of Respondents

Table 1 breaks down respondents' age profile, illustrating the distribution through frequency and percentage. The table reveals that 59 teachers (24.10%) were in the 30-39 age bracket, 49 teachers (28.32%) were in the 20-29 age bracket, 41 teachers (23.70%) were in the 40-49 age bracket, and 24 teachers (13.87%) were in the 50-59 age bracket. The mean age of teachers was 36.81 or 37 years old.

Table 1. Frequency and Percentage Distribution of the Profile of Respondents in terms of Age

Age	Frequency	Percentage
50-59 years old	24	13.87
40-49 years old	41	23.70
30-39 years old	59	34.10
20-29 years old	49	28.32
Total	**173**	**100.00**
Mean	**36.81 years old**	

Multiple studies (Alcido, 2021; Esposo, 2020; Falsario, 2020) conducted in different towns in the Province of Zambales, consistently demonstrated that the age group of 30-39 years old constituted the largest population of teachers. These findings suggest a significant presence of experienced and committed teachers actively contributing to research and educational initiatives.

Table 2 encapsulates the distribution of sex profile among respondents, presenting both frequency and distribution. The table indicates that the majority (70.52%) of teachers were female, while 51 (29.48%) were male.

Table 2. Frequency and Percentage Distribution of the Profile of Respondents in terms of Sex

Sex	Frequency	Percentage
Male	51	29.48
Female	122	70.52
Total	**173**	**100.00**

Studies (Asuncion, 2021; Bugarin, 2021; Bundang, 2021) conducted in Zambales consistently revealed a significant predominance of female teachers in the teaching profession, indicating a gender imbalance. This trend is attributed to the caring nature, dedication to learners, and effective learner behavior management demonstrated by female teachers, highlighting their crucial role, particularly in lower grade levels.

Table 3 details the distribution of respondents' teaching position profile, including both frequency and percentage. According to the table, 61 teachers (35.26%) were identified as Teacher I, 55 teachers (31.79%) were categorized as Teacher II, 49 teachers (28.32%) were assigned the role of Teacher III, 5 teachers (2.89%) were designated as Master Teacher I, and 3 teachers (1.73%) held the role of Master Teacher II.

Table 3. Frequency and Percentage Distribution of the Profile of Respondents in terms of Teaching Position

Teaching Position	Frequency	Percentage
Master Teacher II	3	1.73
Master Teacher I	5	2.89
Teacher III	49	28.32
Teacher II	55	31.79
Teacher I	61	35.26
Total	**173**	**100.00**

The studies (Fablatin, 2021; Fuñe, 2021; Rana, 2021) indicate a pyramid-shaped career progression in the teaching field, with a majority of teachers holding the entry-level position of Teacher I and limited advancement to higher positions. Despite opportunities for promotion and professional growth based on performance and guidance, there is a need for support and further opportunities for advancement, as some teachers remain in the entry-level position for more than 20 years.

In terms of years in service, Table 4 displays the frequency and distribution of respondents' profile. It is observable that 47 teachers (27.17%) had served for 5-9 years, 37 teachers (21.39%) had served for 10-14 years, 35 teachers (20.23%) had served for 0-4 years, 28 teachers (16.18%) had served for 20-24 years, 6 teachers (3.47%) had served for 25-29 years, and 4 teachers (2.31%) had served for 30 and above years. The mean years in service of teachers was 11.34 or 11 years old.

Table 4. Frequency and Percentage Distribution of the Profile of Respondents in terms of Years in Service

Years in Service	Frequency	Percentage
30 years and above	4	2.31
25-29 years	6	3.47
20-24 years	16	9.25
15-19 years	28	16.18
10-14 years	37	21.39
5-9 years	47	27.17
0-4 years	35	20.23
Total	**173**	**100.00**
Mean	**11.34 years**	

Various studies (Marmito, 2023; Martinez, 2021; Rillon, 2023) conducted in the Province of Zambales consistently demonstrated that elementary teachers had served for 5-9 years, indicating a stable and experienced teaching workforce. This denotes that these teachers possess a valuable blend of classroom expertise and longevity in their profession, likely contributing to a deep understanding of local educational contexts and effective teaching practices in the province.

Table 5 outlines the highest educational attainment profile of respondents, illustrating the frequency and percentage distribution. The data on the table shows that 63 teachers (36.42%) had completed MA units, 52 teachers (30.06) were MA graduates, 38 teachers (21.97%) graduated in

education, 18 teachers (10.40%) were college graduates with education units, and 1 teacher (0.58%) had earned EdD/PhD degree and possessed EdD/PhD units, respectively.

Table 5. Frequency and Percentage Distribution of the Profile of Respondents in terms of Highest Educational Attainment

Highest Educational Attainment	Frequency	Percentage
EdD/PhD Graduate	1	0.58
with EdD/PhD units	1	0.58
MA Graduate	52	30.06
with MA units	63	36.42
Education Graduate	38	21.97
College Graduate with Education units	18	10.40
Total	**173**	**100.00**

The studies (Manuevo, 2021; Tomelden, 2021; Yap, 2021) indicate that most teachers seek higher education, like Master's degrees, reflecting their dedication to growth, career progress, and staying current in education. This echoes the Department of Education's push for postgraduate studies, emphasizing continuous learning and critical thinking in teaching.

4.2. Adoption of Education 4.0 of Respondents

In Table 6, the mean rating and interpretations of respondents' adoption of Education 4.0 in terms of awareness and familiarization are provided. The table indicates that respondents slightly adopted Education 4.0 when they were aware of the concept and its implications in the education sector ($\mu = 2.27$); were familiar with associated technologies and digital tools ($\mu = 2.33$); believed in the enhancement of the teaching and learning process ($\mu = 2.29$); felt confident in incorporating Education 4.0 in their teaching practices ($\mu = 2.30$); sought information to stay updated on advancements ($\mu = 2.30$); attended workshops or training sessions for a deeper understanding ($\mu = 2.31$); perceived Education 4.0 as valuable for addressing education challenges ($\mu = 2.30$); were open to experimenting with new tools and technologies ($\mu = 2.35$); discussed concepts with colleagues ($\mu = 2.28$); and saw Education 4.0 as a potential solution for learner engagement and academic performance ($\mu = 2.33$). The general mean rating for awareness and familiarization was 2.31, interpreted as slightly adopted.

Table 6. Mean Rating and Interpretations of the Adoption of Education 4.0 of Respondents in terms of Awareness and Familiarization

Item	Descriptor	Mean Rating	Interpretation
1	I am aware of the concept of Education 4.0 and its implications in the education sector.	2.27	Slightly Adopted
2	I am familiar with the technologies and digital tools associated with Education 4.0.	2.33	Slightly Adopted
3	I believe that Education 4.0 can significantly enhance the teaching and learning process.	2.29	Slightly Adopted
4	I am confident in my ability to incorporate Education 4.0 in my teaching practices.	2.30	Slightly Adopted
5	I seek information and resources related to Education 4.0 to stay updated on its advancements.	2.30	Slightly Adopted
6	I have attended workshops or training sessions to gain a deeper understanding of Education 4.0.	2.31	Slightly Adopted
7	I perceive Education 4.0 as a valuable approach to address the challenges in today's education landscape.	2.30	Slightly Adopted
8	I am open to experimenting with new digital tools and technologies to enhance my teaching methods.	2.35	Slightly Adopted
9	I have discussed the concept of Education 4.0 with my colleagues and exchanged ideas on its implementation.	2.28	Slightly Adopted
10	I see Education 4.0 as a potential solution to improve learner engagement and academic performance.	2.33	Slightly Adopted
General Mean Rating		**2.31**	**Slightly Adopted**

Gupta et al. (2023) reveal the challenges faced by Indian higher education institutions in adopting Education 4.0 (EDUC4), emphasizing the crucial role of faculty support and resource provision. Meanwhile, Almacen et al. (2023) emphasize the significance of human resources in EDUC4 preparedness, and Tikhonova and Raitskaya's (2023) overview underscores the global transformations in education, providing valuable insights for elementary teachers in Zambales navigating the shift to Education 4.0.

The mean rating and interpretations of respondents' adoption of Education 4.0 in terms of experimentation and exploration are displayed in Table 7. The data suggests a slight adoption when respondents explored new digital teaching tools and technologies (μ = 2.31); were willing to experiment with instructional methods aligned with Education 4.0 principles (μ = 2.35); believed in innovative and more effective teaching strategies (μ = 2.34); were open to trying various online learning platforms (μ = 2.34); viewed experimentation as an opportunity to adapt teaching styles (μ = 2.34); were excited about exploring AI and machine learning for personalized learning experiences (μ = 2.29); sought feedback to evaluate Education 4.0 experiments (μ = 2.34); were willing to step out of their comfort zone for Education 4.0 potential (μ = 2.35); saw experimentation and exploration as vital steps in improving teaching practices (μ = 2.31); and considered challenges during experimentation as valuable learning experiences (μ = 2.34). The general mean rating for experimentation and exploration was 2.33, interpreted as slightly adopted.

Table 7. Mean Rating and Interpretations of the Adoption of Education 4.0 of Respondents in terms of Experimentation and Exploration

Item	Descriptor	Mean Rating	Interpretation
1	I explore new digital teaching tools and technologies to incorporate Education 4.0 in my classroom.	2.31	Slightly Adopted
2	I am willing to experiment with different instructional methods and approaches that align with Education 4.0 principles.	2.35	Slightly Adopted
3	I believe that embracing Education 4.0 will lead to innovative and more effective teaching strategies.	2.34	Slightly Adopted
4	I am open to trying out various online learning platforms and resources to enhance learner engagement.	2.34	Slightly Adopted
5	I see experimentation with Education 4.0 as an opportunity to adapt my teaching style to meet diverse learner needs.	2.34	Slightly Adopted
6	I am excited about exploring how artificial intelligence and machine learning can support personalized learning experiences for my learners.	2.29	Slightly Adopted
7	I seek feedback from learners and colleagues to evaluate the effectiveness of my Education 4.0 experiments.	2.34	Slightly Adopted
8	I am willing to step out of my comfort zone to explore the potential of	2.35	Slightly Adopted

	Education 4.0 in transforming education.		
9	I see experimentation and exploration as vital steps in improving my teaching practices with Education 4.0.	2.31	Slightly Adopted
10	I view challenges encountered during experimentation as valuable learning experiences that can lead to growth and improvement.	2.34	Slightly Adopted
General Mean Rating		**2.33**	**Slightly Adopted**

The adoption of Education 4.0 requires teachers to experiment and explore innovative methods to enhance digital literacy, critical thinking, and problem-solving skills in students. Research indicates that teachers must develop competencies in technology integration, collaborative learning, and adaptive teaching strategies to meet the demands of Industry 4.0 (Ramirez-Montoya et al., 2021; Pandey, 2023; Gonzalez-Perez & Ramirez-Montoya, 2022). Consequently, teacher training programs must prioritize these skills to prepare educators for the evolving educational landscape.

Table 8 outlines the mean rating and interpretations concerning the adoption of Education 4.0 among respondents in terms of integration and refinement. It is evident from the table that Education 4.0 was slightly adopted when respondents integrated technology into lessons ($\mu = 2.29$); refined instructional strategies based on feedback and data analysis ($\mu = 2.32$); believed in Education 4.0 as an integral part of the curriculum ($\mu = 2.31$); updated teaching materials to align with Education 4.0 ($\mu = 2.31$); collaborated with colleagues to share best practices ($\mu = 2.30$); encouraged learner collaboration through technology ($\mu = 2.31$); used data analytics for learner progress ($\mu = 2.29$); sought professional development for integrating Education 4.0 ($\mu = 2.32$); believed in improved learner outcomes through effective integration ($\mu = 2.32$); and viewed integration and refinement as a continuous journey of growth ($\mu = 2.32$). The general mean rating for integration and refinement was 2.31, interpreted as slightly adopted.

Table 8. Mean Rating and Interpretations of the Adoption of Education 4.0 of Respondents in terms of Integration and Refinement

Item	Descriptor	Mean Rating	Interpretation

1	I integrate technology into my lessons to support the seamless implementation of Education 4.0.	2.29	Slightly Adopted
2	I refine my instructional strategies based on feedback and data analysis to enhance the integration of Education 4.0 principles.	2.32	Slightly Adopted
3	I believe that Education 4.0 should be an integral part of the curriculum to prepare learners for the demands of the future.	2.31	Slightly Adopted
4	I update my teaching materials and resources to align them with the latest advancements in Education 4.0.	2.31	Slightly Adopted
5	I collaborate with colleagues to share best practices and ideas for effectively integrating Education 4.0 into my teaching.	2.30	Slightly Adopted
6	I encourage learner collaboration and peer learning through technology-enabled platforms to foster a learner-centered learning environment.	2.31	Slightly Adopted
7	I use data analytics and assessment tools to monitor learner progress and make data-driven decisions to refine my teaching approach.	2.29	Slightly Adopted
8	I seek professional development opportunities to enhance my skills and knowledge in integrating Education 4.0 in my classroom.	2.32	Slightly Adopted
9	I believe that effective integration of 4.0 can lead to improved learner outcomes and academic success.	2.32	Slightly Adopted
10	I see the integration and refinement of Education 4.0 as a continuous journey of growth and improvement in my teaching practices.	2.32	Slightly Adopted
General Mean Rating		**2.31**	**Slightly Adopted**

Education 4.0 aims to prepare students for Industry 4.0 by combining technology and new teaching methods (Miranda et al., 2021). However, a standard approach is lacking (Chakraborty et al., 2023). Teachers also need to adapt their skills (Sarangao-Lapo et al., 2021). Overall, Education 4.0 needs technology, pedagogy, and clear frameworks to succeed.

The mean rating and interpretations of the adoption of Education 4.0, specifically in terms of continued improvement, are presented in Table 15. The table reveals a slight adoption when

respondents were open to exploring new technology for teaching improvement ($\mu = 2.30$); sought feedback for identifying improvement areas ($\mu = 2.32$); believed in lifelong learning for staying updated ($\mu = 2.32$); reflected on teaching methods based on learner needs ($\mu = 2.31$); embraced a growth mindset for skills enhancement ($\mu = 2.33$); were willing to take risks for innovative teaching ($\mu = 2.33$); participated in workshops for teaching strategy enhancement ($\mu = 2.31$); encouraged learner feedback for instructional improvement ($\mu = 2.34$); collaborated with educators for sharing best practices ($\mu = 2.32$); and viewed challenges as opportunities for learning and growth ($\mu = 2.32$). The general mean rating for continued improvement was 2.32, interpreted as slightly adopted.

Table 9. Mean Rating and Interpretations of the Adoption of Education 4.0 of Respondents in terms of Continued Improvement

Item	Descriptor	Mean Rating	Interpretation
1	I am open to exploring new technology and digital tools to continually improve my teaching practices under Education 4.0.	2.30	Slightly Adopted
2	I seek feedback from learners and colleagues to identify areas for improvement in my implementation of Education 4.0.	2.32	Slightly Adopted
3	I believe in the importance of lifelong learning and professional development to stay updated with the latest trends in Education 4.0.	2.32	Slightly Adopted
4	I reflect on my teaching methods and adjust them based on the needs and preferences of my learners in the context of Education 4.0.	2.31	Slightly Adopted
5	I embrace a growth mindset, always looking for opportunities to enhance my skills and knowledge related to Education 4.0.	2.33	Slightly Adopted
6	I am willing to take risks and try innovative approaches to teaching, even if it means stepping out of my comfort zone under Education 4.0.	2.33	Slightly Adopted
7	I participate in workshops, seminars, and webinars related to Education 4.0 to continually enhance my teaching strategies.	2.31	Slightly Adopted
8	I encourage my learners to provide feedback on their learning	2.34	Slightly Adopted

	experiences, and I use this feedback to improve my instructional practices.		
9	I collaborate with other educators to share best practices and insights on how to improve the adoption of Education 4.0.	2.32	Slightly Adopted
10	I view challenges and setbacks as opportunities to learn and grow in my journey of continued improvement under Education 4.0.	2.32	Slightly Adopted
General Mean Rating		**2.32**	**Slightly Adopted**

The Fourth Industrial Revolution demands changes in higher education (Singaram et al., 2023). Education 4.0 shows promise in areas like language skills (Srivani & Hariharasudan, 2023; Sri Dhivya et al., 2023). This highlights the transformative potential of Education 4.0 in preparing students for the future.

The summary on respondents' adoption of Education 4.0 is detailed in Table 10. It can be seen from the table that there was a slight adoption of Education 4.0 among the respondents in terms of awareness and familiarization ($\mu = 2.31$), experimentation and exploration ($\mu = 2.33$), integration and refinement ($\mu = 2.31$), and continued improvement ($\mu = 2.32$). The overall mean rating was 2.32, and it was interpreted as slightly adopted.

Table 10. Summary on the Adoption of Education 4.0 of Respondents

Item	Descriptors	GMR	Interpretation
1	Awareness and Familiarization	2.31	Slightly Adopted
2	Experimentation and Exploration	2.33	Slightly Adopted
3	Integration and Refinement	2.31	Slightly Adopted
4	Continued Improvement	2.32	Slightly Adopted
Overall Mean Rating		**2.32**	**Slightly Adopted**

Studies on open education, computer science education, and smart digital education highlight the diverse applications of Education 4.0 (Patiño et al., 2023; Rienties et al., 2023; Mhlongo et al., 2023). These findings emphasize the importance of integrating technology, open practices, and innovative pedagogies in Education 4.0.

4.3. Teaching Practices of Respondents

Table 11 outlines the mean rating and interpretations of the teaching practices of respondents, specifically in relation to the flipped classroom approach. As observed from the table, the teaching practices were partially implemented by the respondents when they recorded and uploaded video lectures or instructional materials for learners to access outside of class as part of the flipped classroom approach ($\mu = 2.23$). They also created engaging and interactive online activities for learners to complete before coming to class to prepare them for in-depth discussions ($\mu = 2.29$). The respondents encouraged learners to come to class prepared by reviewing the pre-recorded materials and completing pre-class assignments ($\mu = 2.27$). During class time, they facilitated active and collaborative learning activities to deepen learners' understanding and application of the pre-learned content ($\mu = 2.27$). The respondents provided timely feedback on learners' pre-class assignments and performance in class activities to support their learning

progress (μ = 2.29). They promoted a learner-centered learning environment where learners took ownership of their learning during in-class discussions and activities (μ = 2.31). The respondents used technology tools and platforms to foster learner engagement and participation in the flipped classroom approach (μ = 2.29). They assessed the effectiveness of the flipped classroom approach through learner feedback and reflection on their learning experiences (μ = 2.31). The respondents updated and improved the pre-recorded materials and in-class activities based on learner feedback and the evolving needs of the class (μ = 2.27). Additionally, they collaborated with colleagues to share best practices and strategies for implementing the flipped classroom approach effectively in their teaching (μ = 2.31). In terms of the flipped classroom approach, the general mean rating on the teaching practices of respondents was 2.28, and it was interpreted as partially practiced.

Table 11. Mean Rating and Interpretations of the Teaching Practices of Respondents in terms of Flipped Classroom Approach

Item	Descriptor	Mean Rating	Interpretation
1	I record and upload video lectures or instructional materials for learners to access outside of class as part of the flipped classroom approach.	2.23	Partially Practiced
2	I create engaging and interactive online activities for learners to complete before coming to class to prepare them for in-depth discussions.	2.29	Partially Practiced
3	I encourage learners to come to class prepared by reviewing the pre-recorded materials and completing pre-class assignments.	2.27	Partially Practiced
4	I facilitate active and collaborative learning activities during class time to deepen learners' understanding and application of the pre-learned content.	2.27	Partially Practiced
5	I provide timely feedback on learners' pre-class assignments and performance in class activities to support their learning progress.	2.29	Partially Practiced
6	I promote a learner-centered learning environment where learners take ownership of their learning during in-class discussions and activities.	2.31	Partially Practiced
7	I use technology tools and platforms to foster learner engagement and participation in the flipped classroom approach.	2.29	Partially Practiced

8	I assess the effectiveness of the flipped classroom approach through learner feedback and reflection on their learning experiences.	2.31	Partially Practiced
9	I update and improve the pre-recorded materials and in-class activities based on learner feedback and the evolving needs of the class.	2.27	Partially Practiced
10	I collaborate with colleagues to share best practices and strategies for implementing the flipped classroom approach effectively in my teaching.	2.31	Partially Practiced
General Mean Rating		**2.28**	**Partially Practiced**

Studies show the flipped classroom boosts motivation, learning, and cost-effectiveness in social science (Ritter & Arsian-Ari, 2023) and higher education (Baig & Yadegaridehkordi, 2023). Shikha and Naliya (2023) offer best practices for its successful implementation. This aligns with Education 4.0's focus on active learning and catering to diverse learner needs.

The mean rating and interpretations of respondents' teaching practices related to the personalized learning path are depicted in Table 12. The table suggests that the respondents practiced teaching in this manner to a partial extent when they gathered and analyzed learner data, such as assessment results and learning preferences, to identify individual learning needs and strengths ($\mu = 2.29$). They also developed personalized learning plans for each learner based on their unique abilities, interests, and goals ($\mu = 2.32$). The respondents provided learners with choices and options for learning activities and assignments to accommodate their diverse learning styles ($\mu = 2.32$). They used adaptive learning technologies or software to tailor instructional content and pace according to each learner's progress and mastery level ($\mu = 2.31$). The respondents communicated with learners to discuss their learning goals and progress, and adjusted the learning path accordingly ($\mu = 2.34$). They integrated self-paced learning modules and resources that allowed learners to explore topics of interest at their own pace ($\mu = 2.31$). The respondents encouraged learners to reflect on their learning journey and set personal learning goals to foster a sense of ownership and responsibility for their education ($\mu = 2.32$). They facilitated one-on-one conferences with learners to discuss their learning preferences and adapt the learning path accordingly ($\mu = 2.29$). The respondents fostered a supportive and collaborative classroom environment where learners felt comfortable sharing their learning preferences and progress with their peers ($\mu = 2.32$). Lastly, they evaluated the effectiveness of the personalized learning path through ongoing assessment and feedback from learners, making necessary adjustments to optimize their learning experiences ($\mu = 2.28$). In terms of the personalized learning path, the general mean rating on the teaching practices of respondents was 2.31, and it was interpreted as partially practiced.

Table 12. Mean Rating and Interpretations of the Teaching Practices of Respondents in terms of Personalized Learning Path

Item	Descriptor	Mean Rating	Interpretation

1	I gather and analyze learner data, such as assessment results and learning preferences, to identify individual learning needs and strengths.	2.29	Partially Practiced
2	I develop personalized learning plans for each learner based on their unique abilities, interests, and goals.	2.32	Partially Practiced
3	I provide learners with choices and options for learning activities and assignments to accommodate their diverse learning styles.	2.32	Partially Practiced
4	I use adaptive learning technologies or software to tailor instructional content and pace according to each learner's progress and mastery level.	2.31	Partially Practiced
5	I communicate with learners to discuss their learning goals and progress, and adjust the learning path accordingly.	2.34	Partially Practiced
6	I integrate self-paced learning modules and resources that allow learners to explore topics of interest at their own pace.	2.31	Partially Practiced
7	I encourage learners to reflect on their learning journey and set personal learning goals to foster a sense of ownership and responsibility for their education.	2.32	Partially Practiced
8	I facilitate one-on-one conferences with learners to discuss their learning preferences and adapt the learning path accordingly.	2.29	Partially Practiced
9	I foster a supportive and collaborative classroom environment where learners feel comfortable sharing their learning preferences and progress with their peers.	2.32	Partially Practiced
10	I evaluate the effectiveness of the personalized learning path through ongoing assessment and feedback from learners, and make necessary adjustments to optimize their learning experiences.	2.28	Partially Practiced
General Mean Rating		**2.31**	**Partially Practiced**

A study by Motteli et al. (2023) shows a decline in learning enjoyment among secondary school students. Personalized learning with learner voice is seen as a solution (Shemshack & Spector, 2020; Thomas, 2023). This aligns with Education 4.0, where personalization increases enjoyment (Motteli et al., 2023). Learner voice is key to shaping positive learning experiences (Thomas, 2023). Therefore, personalized learning with student voice is crucial in Education 4.0.

In terms of the collaborative online project, Table 13 summarizes the mean rating and interpretations of respondents' teaching practices. It can be observed from the table that the respondents partially incorporated this teaching approach when they facilitated collaborative online projects that involved learners working together in virtual teams to complete tasks and achieve shared objectives ($\mu = 2.31$). They used digital collaboration tools, such as Google Docs or Microsoft Teams, to enable real-time collaboration and communication among learners during online projects ($\mu = 2.29$). The respondents provided clear guidelines and expectations for the collaborative online projects, outlining each learner's roles and responsibilities in the team ($\mu = 2.30$). They encouraged learners to communicate effectively and respectfully with their team members, fostering a positive and inclusive virtual team environment ($\mu = 2.34$). The respondents monitored and assessed the progress of each collaborative online project, providing timely feedback and support to ensure successful outcomes ($\mu = 2.32$). They promoted critical thinking and problem-solving skills by presenting learners with authentic, real-world challenges within the context of the online projects ($\mu = 2.31$). The respondents incorporated opportunities for learners to reflect on their experiences, identifying strengths and areas for improvement in their teamwork skills ($\mu = 2.35$). They scaffolded the collaborative online projects, providing resources and guidance to help learners effectively plan and execute their tasks ($\mu = 2.33$). The respondents encouraged learners to leverage technology and multimedia tools to enhance their collaborative online projects, such as creating videos, presentations, or interactive content ($\mu = 2.33$). Lastly, they celebrated and showcased the achievements of each collaborative online project, fostering a sense of accomplishment and pride in learners' collaborative efforts ($\mu = 2.34$). In terms of the collaborative online project, the general mean rating on the teaching practices of respondents was 2.32, and it was interpreted as partially practiced.

Table 13. Mean Rating and Interpretations of the Teaching Practices of Respondents in terms of Collaborative Online Project

Item	Descriptor	Mean Rating	Interpretation
1	I facilitate collaborative online projects that involve learners working together in virtual teams to complete tasks and achieve shared objectives.	2.31	Partially Practiced

2	I use digital collaboration tools, such as Google Docs or Microsoft Teams, to enable real-time collaboration and communication among learners during online projects.	2.29	Partially Practiced
3	I provide clear guidelines and expectations for the collaborative online projects, outlining each learner's roles and responsibilities in the team.	2.30	Partially Practiced
4	I encourage learners to communicate effectively and respectfully with their team members, fostering a positive and inclusive virtual team environment.	2.34	Partially Practiced
5	I monitor and assess the progress of each collaborative online project, providing timely feedback and support to ensure successful outcomes.	2.32	Partially Practiced
6	I promote critical thinking and problem-solving skills by presenting learners with authentic, real-world challenges within the context of the online projects.	2.31	Partially Practiced
7	I incorporate opportunities for learners to reflect on their collaborative experiences, identifying strengths and areas for improvement in their teamwork skills.	2.35	Partially Practiced
8	I scaffold the collaborative online projects, providing resources and guidance to help learners effectively plan and execute their tasks.	2.33	Partially Practiced
9	I encourage learners to leverage technology and multimedia tools to enhance their collaborative online projects, such as creating videos, presentations, or interactive content.	2.33	Partially Practiced
10	I celebrate and showcase the achievements of each collaborative online project, fostering a sense of accomplishment and pride in learners' collaborative efforts.	2.34	Partially Practiced
General Mean Rating		**2.32**	**Partially Practiced**

Education 4.0 integrates technology with collaborative learning (Lin & Wang, 2023). Studies show collaboration quality and group dynamics are key to success in online PBL (Zhang et al., 2023). Social media and mobile tools can enhance collaboration and improve learning

outcomes (Ansari & Khan, 2020). These findings highlight the transformative power of technology-driven collaboration in Education 4.0.

The teaching practices of respondents, with a focus on the use of educational technology, are outlined in Table 14. The table indicates that the respondents engaged in this teaching method to a partial extent when they integrated educational technology into their lessons to enhance learners' learning experiences and engagement ($\mu = 2.33$). They used interactive multimedia tools, such as educational videos and simulations, to supplement traditional instructional materials ($\mu = 2.32$). The respondents provided learners with opportunities to use digital devices and online resources to access educational content and conduct research ($\mu = 2.28$). They leveraged educational software and applications to create personalized learning experiences that catered to individual learner needs ($\mu = 2.30$). The respondents incorporated online assessment tools to track learners' progress and gather real-time data to inform instructional decisions ($\mu = 2.29$). They encouraged learners to collaborate and communicate through digital platforms, fostering a collaborative and connected learning environment ($\mu = 2.30$). The respondents used online learning management systems to organize and deliver course materials, assignments, and resources to learners ($\mu = 2.28$). They facilitated virtual discussions and online forums to promote learner interaction and active participation in class discussions ($\mu = 2.29$). The respondents employed educational technology to differentiate instruction and provided varied learning pathways for learners with different learning styles ($\mu = 2.27$). Lastly, they stayed updated with the latest educational technology trends and explored innovative ways to integrate technology into their teaching practices ($\mu = 2.31$). In terms of the use of educational technology, the general mean rating on the teaching practices of respondents was 2.30, and it was interpreted as partially practiced.

Table 14. Mean Rating and Interpretations of the Teaching Practices of Respondents in terms of the Use of Educational Technology

Item	Descriptor	Mean Rating	Interpretation
1	I integrate educational technology into my lessons to enhance learners'	2.33	Partially Practiced

	learning experiences and engagement.		
2	I use interactive multimedia tools, such as educational videos and simulations, to supplement traditional instructional materials.	2.32	Partially Practiced
3	I provide learners with opportunities to use digital devices and online resources to access educational content and conduct research.	2.28	Partially Practiced
4	I leverage educational software and applications to create personalized learning experiences that cater to individual learner needs.	2.30	Partially Practiced
5	I incorporate online assessment tools to track learners' progress and gather real-time data to inform instructional decisions.	2.29	Partially Practiced
6	I encourage learners to collaborate and communicate through digital platforms, fostering a collaborative and connected learning environment.	2.30	Partially Practiced
7	I use online learning management systems to organize and deliver course materials, assignments, and resources to learners.	2.28	Partially Practiced
8	I facilitate virtual discussions and online forums to promote learner interaction and active participation in class discussions.	2.29	Partially Practiced
9	I employ educational technology to differentiate instruction and provide varied learning pathways for learners with different learning styles.	2.27	Partially Practiced
10	I stay updated with the latest educational technology trends and explore innovative ways to integrate technology into my teaching practices.	2.31	Partially Practiced
General Mean Rating		**2.30**	**Partially Practiced**

In the context of Education 4.0, the evolution of technology integration in teaching practices is evident, with Voltonen et al. (2022) highlighting a gradual shift in research goals despite rapid technological advancements, while Akram et al. (2022) underscore positive perceptions of Pakistani teachers towards technology integration, emphasizing its effectiveness in

enhancing instruction and motivating learners, albeit hindered by infrastructure challenges. Additionally, Bell and Barr's (2023) study emphasizes the crucial role of teachers, particularly in humanities, in overcoming barriers to technology use in A-level history classrooms, providing strategies for effective integration and highlighting the importance of subject-specific considerations in the diverse landscape of Education 4.0.

The summary of respondents' teaching practices is detailed in Table 15. It can be seen from the table that they partially practiced teaching with the flipped classroom approach ($\mu = 2.28$), personalized learning path ($\mu = 2.31$), collaborative online project ($\mu = 2.32$), and use of educational technology ($\mu = 2.30$). The overall mean rating was 2.30, and it was interpreted as partially practiced.

Table 15. Summary on the Teaching Practices of Respondents

Item	Descriptor	GMR	Interpretation
1	Flipped Classroom Approach	2.28	Partially Practiced
2	Personalized Learning Path	2.31	Partially Practiced
3	Collaborative Online Project	2.32	Partially Practiced
4	Use of Educational Technology	2.30	Partially Practiced
Overall Mean Rating		**2.30**	**Partially Practiced**

South African universities are embracing Education 4.0 technologies, with virtual learning and various 4IR tools showing promise for improving teaching and learning (Nwosu et al., 2023). Mhlongo et al. (2023) analyze smart digital education through a complexity lens, emphasizing the range of technologies, their benefits and drawbacks, and their potential to transform learning environments. Gueye and Exposito (2022) propose an autonomous architecture for Education 4.0, using digital tools to personalize learning paths and promote student-centered teaching. These studies highlight the transformative power of technology integration in Education 4.0, creating opportunities for better teaching practices and richer learning experiences.

4.4. Difference between the Adoption of Education 4.0 of Respondents and their Profile

Table 16 displays the results of an Analysis of Variance (ANOVA) examining the difference between the adoption of Education 4.0 by respondents and their age profile. The computed values for different dimensions of adoption, including awareness and familiarization, experimentation and exploration, integration and refinement, and continued improvement, all exceeded the significance level of 0.05 (Sig. = 0.173, 0.106, 0.105, 0.126, respectively). As a result, the null hypothesis is accepted, indicating no significant difference between the adoption of Education 4.0 and respondents' age profile, with an overall computed value of Sig. = 0.123.

Table 16. Difference between the Adoption of Education 4.0 of Respondents and their Profile in terms of Age

Sources of Variations		SS	df	MS	F	Sig.	Decision/ Interpretation
Awareness and Familiarization	Between Groups	5.819	3	1.940	1.680	.173	
	Within Groups	195.186	169	1.155			Accept H_{01} Not Significant
	Total	201.005	172				

		SS	df	MS	F	Sig.	Decision/Interpretation
Experiment-ation and Exploration	Between Groups	7.482	3	2.294	2.068	.106	
	Within Groups	203.802	169	1.206			Accept H_{01} Not Significant
	Total	211.284	172				
Integration and Refinement	Between Groups	7.390	3	2.463	2.075	.105	
	Within Groups	200.612	169	1.187			Accept H_{01} Not Significant
	Total	208.001	172				
Continued Improvement	Between Groups	6.926	3	2.309	1.934	.126	
	Within Groups	201.727	169	1.194			Accept H_{01} Not Significant
	Total	208.653	172				
Overall	Between Groups	6.866	3	2.289	1.953	.123	
	Within Groups	198.081	169	1.172			Accept H_{01} Not Significant
	Total	204.947	172				

Several studies examine the link between teacher age and Education 4.0 adoption (Jatileni et al., 2023; Mukul & Buyukozkan, 2023; Liu et al., 2024). Liu et al. (2024) found that teachers of different ages utilize Game Learning Analytics (GLA) differently. Jatileni et al. (2023) explored how in-service teachers' confidence and views on the relevance of teaching AI may vary based on age. Mukul & Buyukozkan (2023) conducted a broader analysis, highlighting how Education 4.0's impact on educational systems and teaching practices might affect teachers of different age groups. Collectively, these studies emphasize the need to consider age-related variations in teachers' perspectives and adoption of Education 4.0.

Table 17 showcases the outcomes of an Analysis of Variance (ANOVA) investigating the difference between respondents' sex and the adoption of Education 4.0. The computed significant values for dimensions such as awareness and familiarization, experimentation and exploration, integration and refinement, and continued improvement (Sig. = 0.007, 0.009, 0.002, 0.005, respectively) all fall below the 0.05 significant threshold. As a result, the null hypothesis is rejected, signifying a notable difference between respondents' sex profile and the overall adoption of Education 4.0, with an overall computed value of Sig. = 0.005.

Table 17. Difference between the Adoption of Education 4.0 of Respondents and their Profile in terms of Sex

Sources of Variations		SS	df	MS	F	Sig.	Decision/Interpretation
Awareness and Familiarization	Between Groups	8.481	1	8.481	7.533	.007	
	Within Groups	192.524	171	1.126			Reject H_{01} Significant
	Total	201.005	172				

		SS	df	MS	F	Sig.	Decision/Interpretation
Experiment-ation and Exploration	Between Groups	8.257	1	8.257	6.955	.009	
	Within Groups	203.026	171	1.187			Reject H_{01} Significant
	Total	211.284	172				
Integration and Refinement	Between Groups	11.156	1	11.156	9.691	.002	
	Within Groups	196.845	171	1.151			Reject H_{01} Significant
	Total	208.001	172				
Continued Improvement	Between Groups	9.518	1	9.518	8.174	.005	
	Within Groups	199.135	171	1.165			Reject H_{01} Significant
	Total	208.653	172				
Overall	Between Groups	9.319	1	9.319	8.146	.005	
	Within Groups	195.628	171	1.144			Reject H_{01} Significant
	Total	204.947	172				

Studies by Oladele et al. (2022), Moreira-Choez et al. (2023), and Ortega-Sanchez (2023) collectively highlight the impact of sex profiles on the adoption of Education 4.0. Moreira-Choez et al. (2023) found differences in digital pedagogy levels influenced by sex and academic profiles, while Oladele et al. (2022) provided insights into how these factors affect learners' experiences in STEM education. Ortega-Sanchez (2023) emphasized the inclusion of non-binary gender groups and the importance of co-education and equality training. These studies stress the importance of sex-related factors in adopting Education 4.0 practices.

In Table 18, the outcomes of an Analysis of Variance (ANOVA) are presented, exploring the difference between respondents' teaching positions and the adoption of Education 4.0. The computed significant values for dimensions such as awareness and familiarization, experimentation and exploration, integration and refinement, and continued improvement (Sig. = 0.000, 0.000, 0.000, 0.000, respectively) all fall below the 0.05 significance threshold. Therefore, the null hypothesis is rejected, suggesting a significant difference between respondents' teaching positions and the overall adoption of education 4.0, with an overall computed value of Sig. = 0.000.

Table 18. Difference between the Adoption of Education 4.0 of Respondents and their Profile in terms of Teaching Position

Sources of Variations		SS	df	MS	F	Sig.	Decision/Interpretation
Awareness and Familiarization	Between Groups	27.314	4	6.829	6.605	.000	
	Within Groups	173.691	168	1.034			Reject H_{01} Significant
	Total	201.005	172				

		SS	df	MS	F	Sig.	Decision/Interpretation
Experiment-ation and Exploration	Between Groups	28.533	4	7.133	6.557	.000	
	Within Groups	182.751	168	1.088			Reject H$_{01}$ Significant
	Total	211.284	172				
Integration and Refinement	Between Groups	26.544	4	6.636	6.144	.000	
	Within Groups	181.457	168	1.080			Reject H$_{01}$ Significant
	Total	208.001	172				
Continued Improvement	Between Groups	28.228	4	7.057	6.571	.000	
	Within Groups	180.425	168	1.074			Reject H$_{01}$ Significant
	Total	208.653	172				
Overall	Between Groups	27.622	4	6.906	6.542	.000	
	Within Groups	177.325	168	1.056			Reject H$_{01}$ Significant
	Total	204.947	172				

Studies by Chan (2023), Ibda et al. (2023), and Nguyen et al. (2023) collectively enhance our understanding of the relationship between Education 4.0 adoption and teachers' professional profiles. Ibda et al. (2023) and Nguyen et al. (2023) examine the professional competence and development of elementary and preschool teachers, respectively, in light of technological advancements, while Chan (2023) focuses on developing AI education policies for higher education. These studies highlight the necessity for tailored teacher preparation and policy frameworks to meet the demands of Education 4.0 across various teaching positions.

In Table 19, an Analysis of Variance (ANOVA) is presented to investigate the difference between respondents' years in service and the adoption of Education 4.0. The computed significance values for dimensions such as awareness and familiarization, experimentation and exploration, integration and refinement, and continued improvement (Sig. = 0.002, 0.003, 0.002, 0.002, respectively) are all below the 0.05 significance level. Hence, the null hypothesis is rejected, suggesting a significant difference between respondents' years in service and the overall adoption of Education 4.0, with an overall computed value of Sig. = 0.002.

Table 19. Difference between the Adoption of Education 4.0 of Respondents and their Profile in terms of Years in Service

Sources of Variations		SS	df	MS	F	Sig.	Decision/Interpretation
Awareness and Familiarization	Between Groups	23.913	6	3.986	3.736	.002	
	Within Groups	177.092	166	1.067			Reject H$_{01}$ Significant
	Total	201.005	172				

		SS	df	MS	F	Sig.	Decision/Interpretation
Experiment-ation and Exploration	Between Groups	23.210	6	3.868	3.414	.003	Reject H_{01} Significant
	Within Groups	188.074	166	1.133			
	Total	211.284	172				
Integration and Refinement	Between Groups	23.811	6	3.968	3.577	.002	Reject H_{01} Significant
	Within Groups	184.190	166	1.110			
	Total	208.001	172				
Continued Improvement	Between Groups	23.807	6	3.968	3.563	.002	Reject H_{01} Significant
	Within Groups	184.846	166	1.114			
	Total	208.653	172				
Overall	Between Groups	23.615	6	3.936	3.603	.002	Reject H_{01} Significant
	Within Groups	181.332	166	1.092			
	Total	204.947	172				

Studies by Baena-Rojas et al. (2023), Dahri et al. (2023), and Singh et al. (2023) collectively contribute to understanding the factors influencing the adoption of Education 4.0 and its implications for teachers across different years of service. Dahri et al. (2023) highlight the potential of mobile learning technology to enhance 21st-century skills-based training, while Singh et al. (2023) address the challenges and solutions related to teacher training and digital infrastructure for Education 4.0. Baena-Rojas et al. (2023) propose a guidebook integrating AI and SR in teaching, emphasizing technological integration. These findings underscore the importance of training, infrastructure, and acceptance in effectively adopting Education 4.0, regardless of teachers' years of service.

Within Table 20, the results of an Analysis of Variance (ANOVA) are displayed, examining the difference between respondents' highest educational attainment and the adoption of Education 4.0. Notably, the computed significance values for various dimensions – awareness and familiarization, experimentation and exploration, integration and refinement, and continued improvement (Sig. = 0.000, 0.000, 0.000, 0.000, respectively) – all fall below the 0.05 significance level. Consequently, the null hypothesis is rejected, suggesting a significant difference between respondents' highest educational attainment and the overall adoption of Education 4.0, with an overall computed value of Sig. = 0.000.

Table 20. Difference between the Adoption of Education 4.0 of Respondents and their Profile in terms of Highest Educational Attainment

Sources of Variations		SS	df	MS	F	Sig.	Decision/Interpretation
Awareness and Familiarization	Between Groups	33.745	5	6.749	6.738	.000	Reject H_{01} Significant

	Within Groups	167.261	167	1.002			
	Total	201.005	172				
Experiment-ation and Exploration	Between Groups	33.004	5	6.601	6.183	.000	
	Within Groups	178.279	167	1.068			Reject H_{01} Significant
	Total	211.284	172				
Integration and Refinement	Between Groups	30.821	5	6.164	5.810	.000	
	Within Groups	177.180	167	1.061			Reject H_{01} Significant
	Total	208.001	172				
Continued Improvement	Between Groups	32.314	5	6.463	6.120	.000	
	Within Groups	176.340	167	1.056			Reject H_{01} Significant
	Total	208.653	172				
Overall	Between Groups	32.441	5	6.488	6.281	.000	
	Within Groups	172.506	167	1.033			Reject H_{01} Significant
	Total	204.947	172				

Studies by Alenezi (2023), Almela (2023), and Caldarulo et al. (2023) collectively enhance our understanding of the influence of digital transformation, broadband adoption, and Industry 4.0 on higher education. Alenezi (2023) focuses on the digital transformation process in higher education, while Caldarulo et al. (2023) explores the impact of broadband adoption on educational achievement. Almela (2023) discusses the broader implications of Industry 4.0 on the education system. Together, these findings suggest that Education 4.0 adoption is intertwined with higher education transformation, digital technologies, and Industry 4.0 demands, with education level and digital infrastructure playing crucial roles.

4.5. Correlation between the Adoption of Education 4.0 of Respondents and their Teaching Practices

Table 21 presents the correlation between the adoption of Education 4.0 by respondents and their teaching practices regarding the flipped classroom approach, utilizing Pearson's Product Moment Correlation Coefficient. The adoption of Education 4.0 in terms of awareness and familiarization ($r = 0.975$), experimentation and exploration ($r = 0.966$), integration and refinement ($r = 0.970$), and continued improvement ($r = 0.973$) exhibits a positively very high significant correlation with their teaching practices in the flipped classroom approach. The corresponding p-values (0.000, 0.000, 0.000, 0.000, respectively) are all significant at the 5% level, leading to the rejection of the null hypothesis. Overall, there exists a positively very high significant correlation ($r = 0.977$, p-value = 0.000) between the adoption of Education 4.0 by respondents and their teaching practices in terms of the flipped classroom approach.

Table 21. Correlation between the Adoption of Education 4.0 of Respondents and their Teaching Practices in terms of Flipped Classroom Approach

Adoption of Education 4.0	Correlation Coefficient	Interpretation	Sig. (2-tailed)	Decision
Awareness and Familiarization	.975	Positive Very High Correlation	.000	Reject Ho$_2$ Significant
Experimentation and Exploration	.966	Positive Very High Correlation	.000	Reject Ho$_2$ Significant
Integration and Refinement	.970	Positive Very High Correlation	.000	Reject Ho$_2$ Significant
Continued Improvement	.973	Positive Very High Correlation	.000	Reject Ho$_2$ Significant
Overall	**.977**	**Positive Very High Correlation**	**.000**	**Reject Ho$_2$ Significant**

Studies by Al-Said et al. (2023), Deng et al. (2023), and Li & Wang (2023) collectively emphasize the positive impact of innovative teaching approaches, aligning with the principles of Education 4.0. The integration of technology, such as pre-class videos and online platforms, enhances learner engagement and learning outcomes. The flipped classroom model, as explored in these studies, demonstrates adaptability to modern educational demands, showcasing the potential synergy between Education 4.0 principles and evolving teaching practices.

In Table 22, the correlation between respondents' adoption of Education 4.0 and their teaching practices concerning the personalized learning path is presented using Pearson's Product Moment Correlation Coefficient. The adoption of Education 4.0, measured in terms of awareness and familiarization (r = 0.983), experimentation and exploration (r = 0.982), integration and refinement (r = 0.976), and continued improvement (r = 0.984), exhibits a positively very high significant correlation with their teaching practices in the personalized learning path. The corresponding p-values (0.000, 0.000, 0.000, 0.000, respectively) are all below the 5% significance level, leading to the rejection of the null hypothesis. Overall, a positively very high significant correlation (r = 0.987, p-value = 0.000) exists between the adoption of Education 4.0 by respondents and their teaching practices in terms of the personalized learning path.

Table 22. Correlation between the Adoption of Education 4.0 of Respondents and their Teaching Practices in terms of Personalized Learning Path

Adoption of Education 4.0	Correlation Coefficient	Interpretation	Sig. (2-tailed)	Decision
Awareness and Familiarization	.983	Positive Very High Correlation	.000	Reject Ho$_2$ Significant

Experimentation and Exploration	.982	Positive Very High Correlation	.000	Reject Ho$_2$ Significant
Integration and Refinement	.976	Positive Very High Correlation	.000	Reject Ho$_2$ Significant
Continued Improvement	.984	Positive Very High Correlation	.000	Reject Ho$_2$ Significant
Overall	**.987**	**Positive Very High Correlation**	**.000**	**Reject Ho$_2$ Significant**

Studies by Bonfield et al. (2020), Sharma et al. (2023), and Sri Dhivya et al. (2023) highlight the transformative potential of Education 4.0 in creating personalized learning paths. Sri Dhivya et al. (2023) demonstrate the effectiveness of an Education 4.0 tool in enhancing communication skills, while Sharma et al. (2023) emphasize its importance in innovative curricular practices and digital literacy. Additionally, Bonfield et al. (2020) review the role of digital personal assistants and online learning in higher education, aligning with Education 4.0 principles.

Table 23 outlines the correlation between the adoption of Education 4.0 by respondents and their teaching practices in terms of collaborative online projects, employing Pearson's Product Moment Correlation Coefficient. The adoption of Education 4.0, specifically in terms of awareness and exploration (r = 0.970), integration and refinement (r = 0.957), and continued improvement (r = 0.960) displays a positively very high significant correlation with their teaching practices in collaborative online projects. The associated p-values (0.000, 0.000, 0.000, 0.000, respectively) all fall below the 5% significance level, leading to the rejection of the null hypothesis. Overall, a positively very high significant correlation (r = 0.969, p-value = 0.000) is evident between the adoption of Education 4.0 by respondents and their teaching practices related to collaborative online projects.

Table 23. Correlation between the Adoption of Education 4.0 of Respondents and their Teaching Practices in terms of Collaborative Online Project

Adoption of Education 4.0	Correlation Coefficient	Interpretation	Sig. (2-tailed)	Decision
Awareness and Familiarization	.968	Positive Very High Correlation	.000	Reject Ho$_2$ Significant
Experimentation and Exploration	.970	Positive Very High Correlation	.000	Reject Ho$_2$ Significant
Integration and Refinement	.957	Positive Very High Correlation	.000	Reject Ho$_2$ Significant
Continued Improvement	.960	Positive Very High Correlation	.000	Reject Ho$_2$ Significant
Overall	**.969**	**Positive Very High Correlation**	**.000**	**Reject Ho$_2$ Significant**

Studies by Bizami et al. (2022), Jakoet-Salie and Ramalobe (2022), and Patiño et al. (2023) underscore the correlation between Education 4.0 adoption and collaborative online projects in teaching practices. Patiño et al. (2023) emphasize the integration of 4.0 technologies in open

education through collaborative OER production, while Bizami et al. (2022) provide a guide for optimizing immersive blended learning practices with technological tools. Additionally, Jakoet-Salie and Ramalobe (2022) highlight the transformative impact of the Covid-19 pandemic on teaching, stressing the need for flexibility and adaptation in higher education.

Table 24 presents the correlation between the adoption of Education 4.0 by respondents and their teaching practices in terms of the use of educational technology, using Pearson's Product Moment Correlation Coefficient. The adoption of Education 4.0, specifically in terms of awareness and familiarization (r = 0.978), experimentation and exploration (r = 0.978), integration and refinement (r = 0.966), and continued improvement (r = 0.972), exhibits a positively very high significant correlation with their teaching practices in the use of educational technology. The associated p-values (0.000, 0.000, 0.000, 0.000, respectively) all meet the 5% significance criterion, resulting in the rejection of the null hypothesis. Overall, a positively very high significant correlation (r = 0.979, p-value = 0.000) exists between the adoption of Education 4.0 by respondents and their teaching practices concerning the use of educational technology.

Table 24. Correlation between the Adoption of Education 4.0 of Respondents and their Teaching Practices in terms of the Use of Educational Technology

Adoption of Education 4.0	Correlation Coefficient	Interpretation	Sig. (2-tailed)	Decision
Awareness and Familiarization	.978	Positive Very High Correlation	.000	Reject Ho$_2$ Significant
Experimentation and Exploration	.978	Positive Very High Correlation	.000	Reject Ho$_2$ Significant
Integration and Refinement	.966	Positive Very High Correlation	.000	Reject Ho$_2$ Significant
Continued Improvement	.972	Positive Very High Correlation	.000	Reject Ho$_2$ Significant
Overall	**.979**	**Positive Very High Correlation**	**.000**	**Reject Ho$_2$ Significant**

Studies by Arpilleda et al. (2023), Flores-Chacon et al. (2023), and Radovic (2023) collectively highlight the correlation between Education 4.0 adoption and the use of educational technology in teaching practices. Arpilleda et al. (2023) emphasize learner-centric practices through teachers' knowledge and attitudes towards Education 4.0, while Radovic (2023) demonstrates educational technology's effectiveness in enhancing mathematics learning. Additionally, Flores-Chacon et al. (2023) show how digital technologies in university teacher training foster digital skills and drive educational innovation.

4.6. A Program on a Professional Development Program Entitled Adoption of Education 4.0 in the Teaching Practices of Public Elementary School Teachers

In response to the evolving educational landscape, the Masinloc District, Schools Division of Zambales, has launched a professional development program titled "Adoption of Education 4.0 in the Teaching Practices of Public Elementary School Teachers." This initiative emphasizes integrating technology, collaborative learning, and personalized instruction to prepare students for the demands of the 21st century. Tailored to the district's unique needs, the program aims to

optimize existing technological infrastructure and enhance teaching practices. School heads and ICT coordinators will receive specialized training, while teachers will gain tools and strategies for continuous professional growth. The program aspires to improve learner outcomes, foster community engagement, and position the district as a leader in educational innovation.

5. CONCLUSIONS

1. Most of the respondents belonged to the 30-39 age brackets, predominantly identifying as female and occupying the position of Teacher I. Additionally, a significant proportion reported having 5-9 years of teaching experience and had acquired MA units.

2. The study revealed that teachers demonstrated a slight adoption of Education 4.0, showcasing awareness and familiarization, experimentation and exploration, integration and refinement, and continued improvement.

3. In terms of teaching practices, the teachers were observed to engage in a partial manner, specifically incorporating elements of the flipped classroom approach, personalized learning path, collaborative online project, and use of educational technology.

4. In terms of the adoption of Education 4.0, a significant difference was observed across all dimensions, namely awareness and familiarization, experimentation and exploration, integration and refinement, and continued improvement. This variance was evident concerning factors such as sex, teaching position, years in service, and highest educational attainment. The computed values fell below the predetermined level of significance (0.05), prompting the rejection of the null hypothesis.

5. A very highly significant positive correlation was identified between the adoption of Education 4.0 and respondents' teaching practices. This correlation encompassed awareness and familiarization, experimentation and exploration, integration and refinement, and continued improvement, with a particular emphasis on the flipped classroom approach, personalized learning paths, collaborative online projects, and the use of educational technology. The computed value achieved significance at the 5% level, resulting in the rejection of the null hypothesis.

6. The professional development program designed for public elementary school teachers to facilitate the adoption of Education 4.0 in their teaching practices has been developed.

6. RECOMMENDATIONS

1. The teacher must tailor professional development opportunities to address the specific needs and preferences of the majority of respondents, focusing on enhancing the skills and knowledge of Teacher I professionals in the 30-39 age bracket with 5-9 years of teaching experience.

2. The teacher must design targeted training programs to further advance teachers' adoption of Education 4.0, emphasizing continuous improvement and practical application in the classroom.

3. The teacher must encourage and support educators in fully embracing innovative teaching practices, promoting comprehensive incorporation of flipped classroom elements, personalized learning paths, collaborative online projects, and educational technology in their instructional strategies.

4. Tailored professional development programs, addressing diverse needs based on factors like sex, teaching position, years in service, and highest educational attainment, ensure educators receive Education 4.0 training aligned with their unique backgrounds, enhancing proficiency.

5. Teachers should integrate Education 4.0 components, such as the flipped classroom, personalized learning paths, collaborative projects, and technology, into their practices for an improved overall educational experience and learner outcomes.

6. Teachers must actively engage in professional development, demonstrating commitment to continuous learning and adapting innovative Education 4.0 teaching methods for effective implementation and integration into classrooms, benefiting both educators and learners.

7. Conduct further studies to investigate the long-term effectiveness of tailored professional development for Teacher I professionals, including the School ICT Coordinators (30-39 years old, 5-9 years of experience), exploring sustained impacts on teaching skills, classroom practices, and overall professional growth.

8. Other researchers must explore the influence of demographic factors on the success of tailored professional development programs, contributing to a nuanced understanding of diverse needs in the teaching community and their impact on educators' proficiency in adopting Education 4.0 practices.

7. ACKNOWLEDGMENT

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