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Effects of differentiated instruction, blended learning and lecture methods on students' cognitive styles and learning outcome in physics

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Abstract

The effects of differentiated instruction, blended learning, and lecture methods on students' learning outcomes and cognitive style have been researched in past research. However, there remains a gap when it comes to its application in physics. The study investigated the effects of differentiated instruction, blended learning, and lecture methods on students' cognitive styles and learning outcomes in physics. The research adopted a quasi-experimental control group, pretest, and posttest planned variation design. Four research questions and six hypotheses were formulated and tested. A total of one hundred and forty-three (143) from three local government schools in Delta north senatorial participated. The study employed a Physics achievement test (PAT) and cognitive style inventory scale as instruments. The result indicated a significant effect and difference between the three methods. It was recommended among others that faculties of education should include differentiated instruction and blended learning as a method of teaching Physics to enhance learning outcomes in Physics classrooms.

Keywords: Blended learning; cognitive style; differentiated instruction; lecture method; physics.

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1. Introduction

The meaning of physics as a science subject that deals with the study of matter and energy and their interaction with one another has been long established (Abamba, 2021; Abamba & Chukwuka 2021). Also, Abamba (2021) highlighted the importance of physics to the study of other applied sciences like engineering, and medicine, among others. Ovuworie et al., (2021) noted that, aside from dealing with the laws and physical principles that govern the universe, Physics is important for the growth and development of any nation in terms of science and technology. The study established some of the tilting factors affecting the study of physics especially in developing countries like Nigeria among which is how best to teach Physics to improve learning outcomes. In this regard, Bybee (2011) noted that educators are constantly finding out how best to teach the sciences. Bybee (2011), and Abamba & Chukwuka (2021) noted that the use of models has been adopted by educators because of its effectiveness.

Differentiated learning is based on the framework for effective teaching that enables teachers to provide all students with a range of different values for understanding new concepts in terms of content, processing, constructing, and making sense of ideas within the same classroom, irrespective of their ability: The process allows students to learn, how he/she learns it, and how they demonstrate how they learn (Tomlinson, 2021). It involves:

- Content: in which to be adapted to students' interests, age, readiness, and language proficiency level. That is, they must adapt what they want to teach to meet the needs of the learner.
- Process: This includes individualized, paring small groups and whole groups.
- Product: videos/photos, writing oral presentations, graphic organizers, and projects.
- Effects: a safe environment, students being free to make mistakes, students feeling accepted, and positive feedback.

Differentiation at the classroom level revolves around content, process, product, and effect. The content level enables the teacher to adapt what they are teaching to meet the needs of the learner which increases interest and makes them challenged into finding solutions: The process enables the teacher to assign problems through collaborations to small groups, individuals, partners, or whole groups depending on their needs (Han & Ellis 2021). The process level allows the teacher to decide how students present what they have learned. It could be video presentations, graphic organizers, or oral presentations, among other things. The effects reside in the fact that all these take place in the classroom.

According to Kado et al., (2021), differentiated instruction is a theory founded on meeting the needs of academically diverse learners according to their readiness, learner profile, and interest. It is a strategy that is designed to fit the requirements of a varied set of learners. It is a strategy in which the teacher changes instruction depending on the academic needs of the learners. According to Riza & Umit (2022), students build their knowledge and understanding of the world around them. Riza & Umit (2022) further advanced that diversities in students' achievement, interests, and previous life experiences can lead to different learning needs. It is an approach that is based on the understanding that students have individual differences in terms of learning interests, skills, learning styles, and learning needs (Ruhan & Sefic, 2010). Individual behaviors and interest levels affect the degree of effectiveness of learning (Karthika et al., 2023). According to Paolini (2015), differentiation is an aspect of a teacher's professional, pedagogical competence that ensures that each student achieves the intended learning target. According to him, effective instruction should utilize a variety of learning modalities to differentiate instruction from an array of students' learning styles.

Studies on differentiated learning have been quite revealing. For instance, Kado et al., (2021) found a statistically significant difference in favor of the experimental group over the control group in post-test

analysis when differentiated learning was employed in teaching derivative in mathematics. Riza & Umit (2021) found that differentiated instruction improved the academic achievement of low and mid-achieving students when differentiated instruction and the 5E learning cycle were employed in teaching Electricity. Ruhan and Sefik (2010) found a positive influence on students' attitude towards Turkish courses positively when differentiated instruction was employed. Osuafor & okigbo (2013) found a significant difference between the achievement of students taught with differentiated instruction and those taught with conventional methods. Obafemi (2022) found that groups treated with differentiated instruction had a significant effect on pupils' academic achievement in mathematics. The study also showed that gender and school type did not have a significant effect on pupils' performance in mathematics.

E-learning is gaining popularity and acceptability, especially with the COVID-19 global experience which led to its increasing application in the field of education (Berestova et al., 2022). In E-learning, the information aspect of a course is implemented using an online-based approach. That is presenting both theoretical and practical aspects of learning online (Berestova et.al., 2022) with the aid of video lectures and recorded video elements demonstrating manipulations. Also, E-learning means technologies that allow students to learn digitally, both online and offline. According to Jawad & Shalash (2020), E-learning is the acquisition, use, distribution, and facilitation of knowledge by electronic means, learning that depends on the internet and computers. According to Lai et al., (2024), E-learning benefits from its flexibility with time and space which allows greater access to enormous information with less time and effort. Outside of its effectiveness in teaching and learning, it is deemed ineffective in the area of students' motivation. Some students are not motivated fully motivated to learn in the absence of other students, and interaction with the teacher and students in the teaching process. Against this background, blended learning surfaced (Marcellis et al., 2024).

Blended learning is also referred to as hybrid learning or mixed learning (Abidoye 2015). Blended learning is a mixture of e-learning with traditional classroom teaching (Yu et al., 2023). According to Graham, it is a combination of face-to-face with computer computer-mediated learning. Ijeh (2022), and Feng & Yao (2023) described blended learning as an educational program that combines online digital media with traditional classroom methods. Blended learning requires the physical presence of both teacher and student. Some elements of student control over time, place, path, or pace. In the same vein, Yayi, (2018) described blended learning as a formal form of educational arrangement in which students learn through the delivery of contended instruction via digital and online media with some evidence of learner control over time, place, path or pace while still attending a normal school with bricks: face-to-face classroom methods are combined with computer-assisted/online activities. Hadiya (2018) noted that blended learning may consist of one or more program combinations which include combining online and offline learning environments, structured and non-structured learning environments, and combining pedagogical approaches with instructional technology. Abidoye (2015) found that blended learning was more effective in enhancing students' achievement in geography than the lecture method. Aqila & Mohammad (2017) showed a notable distinction between the effectiveness of the traditional method and introducing E-learning as a supplement in teaching.

Also, Yayi, (2018) found a significantly improved performance of high medium and low-ability level students taught using blended learning. Also, the study showed no interactive effect of method, gender, and ability level of students. Aziz et al., (2021) found that blended and traditional methods improved students' performance in electrochemistry. The study established that there was no significant difference in the post-test mean score. Kanyi & Dambo (2018) showed a significant difference between groups taught

using blended learning and lecture methods in favor of blended learning when employed in teaching business education studies.

Cognitive styles refer to the preferred way an individual processes information. Unlike individual differences in abilities (Gardner, Guilford, Sternberg) which describe peak performance, styles describe a person's typical mode of thinking, remembering, or problem-solving. Arisi (2011) defined cognition as the process of perception, thinking, understanding, problem-solving, reasoning, and remembering. Her study on the effect of Cognitive Style and Gender on Students' Academic Achievement helped in the understanding of how and to what extent individual differences account for apparent variation in learning outcomes among learners who are faced with the same learning tasks. Cognitive learning styles, however, are thought to be relatively stable ways in which a learner approaches a learning task across a range of different domains (Sternberg & Grigorenko, 1997; Kahtz & Kling, 1999). Abilities are rather about subject-content mastery and the individual's performance capacity in a specific subject-matter domain. Nevertheless, even this distinction has been doubted by some other workers (McKenna, 1990) who see certain aspects of cognitive style (such as field-dependence) as a nonverbal measure of fluid intelligence. Arisi (2011) found a significant main effect of cognitive style on student's academic achievement in social studies. According to the research, field-independent students performed significantly better than field-dependent social studies students, and Cognitive style accounted for 15.2% of the total variation in the post-test scores.

Against the foregoing, the problem of this study is: what are the effects of differentiated instruction, blended learning, and lecture methods on students' learning outcomes and cognitive style? The following research questions were raised and answered:

1. What is the effect of differentiated instruction, blended learning, and lecture methods on students' learning outcomes?
2. What is the difference between field-independent and field-dependent learners taught using DI?
3. What is the difference between field-independent and field-dependent learners taught using BL?
4. What is the difference between field-independent and field-dependent learners taught using LM?

The following null hypotheses were formulated and tested at a 0.05 level of significance:

Ho1: There is no significant effect of differentiated instruction, blended learning, and lecture methods on students' learning outcomes.
Ho2: There is no significant difference between differentiated instruction, blended learning, and lecture methods on students' learning outcomes.
Ho3: There is no significant difference between field-independent and field-dependent learners taught using DI.
Ho4: There is no significant difference between field-independent and field-dependent learners taught using BL.
Ho5: There is no significant difference between field-independent and field-dependent learners taught using LM.
Ho6: There are no significant interaction effects of method and cognitive styles on learning outcome

1.1. Purpose of study

The purpose of this study is to examine the effect of lecture methods and differentiated learning on students' learning outcomes and cognitive styles. Specifically, the study will:

- Examine the effect of differentiated learning, blended learning, and lecture methods on students' learning outcomes.
- Find out whether there is a significant difference between differentiated instruction, blended learning, and lecture methods on students' cognitive style.

2. METHODS AND MATERIALS

2.1. Data collection instrument

The study is a quasi-experimental design. It employed pre-test, post-test, and planned variation design. Planned variation enables each group to serve as a control for the group. The study used the Physics achievement test (PAT) which comprises a fifty (50) items multiple choice test on the concept of heat energy drawn from past WAEC questions to determine students' learning outcomes and thirty-three (33) item cognitive style inventory in determining the cognitive styles of students and helping to know both the field-dependent and field-independent learners. The instrument was a four (4) point Likert scale of Strongly Agreed (SA), Agreed (A), Disagreed (D), and Strongly Disagreed (SD). Students with scores above 66 were regarded as field-independent learners while those who score below 66 were classified as field-dependent learners. In validating the Physics Achievement Test instrument, three experts from Science Education, Measurement, and Evaluation and a secondary school Physics teacher with over fifteen years registered with the Teachers Registration Council of Nigeria (TRCN). All necessary corrections were taken into cognizance in producing the final copy. Also, the cognitive style inventory was validated by an expert in psychology. In establishing the reliability of PAT, Kuder-Richardson formula 21 was used and a reliability coefficient of 0.85 was obtained. In determining the reliability of the cognitive style inventory, the Cronbach alpha was employed and a reliability coefficient of 0.81 was obtained.

2.2. Participants

The study participants are SS2 students in three randomly selected schools selected from Delta North senatorial District. The study population consisted of several schools. Three schools were sampled using a simple ballot system without replacement. The sample size is one hundred and forty-three students (143). That is three intact classes with a population of forty-eight (48), forty-six (46), and forty-nine (49) respectively.

2.3. Procedure

The field study began with the researcher visiting the schools sampled for the study. The first day was a visit to the school that will employ differentiated instruction. The researcher sought the permission of the school head and the research assistant to carry out the research in the school. After permission, the research assistant was then trained on the implementation of differentiated instruction in a classroom situation. Emphasis was made on each of the activities on the four (4) stages of the DI and the necessity of grouping students either on interest or felt need line. While the first researcher was training the assistant to handle DI, the second researcher was also training the researcher for Blended learning (BL). It also began with the process of obtaining permission and training of research assistants. The process employed first, submitting the WhatsApp number of their parents to enable them to receive online materials. Secondly, forming a WhatsApp group of all participants. Thirdly, transferring online materials before face-to-face instruction and finally, sticking strictly in class to only the materials earlier forwarded and adding additional material on uploaded material. In this case, the teaching was lecture method. This is the predominant process of teaching in schools here in Nigeria. The emphasis here was on the effective coverage of the concept under consideration. The training lasted for one week. The second stage was the

administration of PAT for the post-test scores. This was one before the commencement of instruction across the three schools. The next stage was the handing over of the intervention for the three groups of learners for the commencement of instruction to the research assistants of the groups. The instruction research assistant administered PAT for the post-test scores. The scripts were handed over to the researcher for marking and analysis of the scores.

2.4. Data analysis

The research question was answered using mean and standard deviation. In testing the hypotheses raised, independent and paired sample t-tests were employed. Also, the Scheffe post-hoc test was used to determine the direction.

3. RESULTS

In establishing the equivalence of the groups before instruction, the pretest scores of students across groups were tested and the result is presented below.

Table 1

Analysis of Variance (ANOVA) for pretest of equivalence of group

Pretest Scores	Sum of Square	Df	Mean Square	F	Sig.
Between Groups	2.876	2	1.438	.112	.894
Within Groups	1585.502	124	12.786		
Total	1588.378	126			

The result showed F (2,124) =0.112, P=0.894 which means no significant difference between groups before instruction. Therefore, the groups were equivalent before instruction.

3.1. Research Question 1: What is the effect of differentiated instruction, blended learning, and lecture methods on students' learning outcomes?

Table 2

Mean and Standard deviation for effects of learning outcome among the groups

Source of Variation	Test	Mean	N	Std. Deviation	Std. Error Mean
Differentiated Instruction (DL)	Posttest	61.6190	42	3.45672	.53338
	Pretest	19.8333	42	3.51940	.54306
Blended Learning (BL)	Posttest	70.6667	48	2.46104	.35522
	Pretest	19.8958	48	3.63341	.52444
Lecture Method (LM)	Posttest	49.1351	37	5.98685	.98423
	Pretest	19.5405	37	3.56366	.58586

In answering the research question, the mean and standard showed that all three methods of instruction improved learning (table 2). The mean achievement for pretest and posttest was 19.83 and 61.62 for DI, 19.90 and 70.67 for BL, and 19.54 and 49.14 for LM. Therefore, there is an effect of DI, BL, and LM on students' learning outcomes.

3.2. Hypothesis 1: There is no significant effect of differentiated instruction, blended learning, and lecture methods on students' learning outcomes.

In determining whether the effect was significant, Paired sample t-test was employed and the result is presented in Table 3 below.

Table 3

Paired Sample t-test for significant effects between Dl, BL, and LM

Method	Test	Mean	Std. Deviation	t-cal	Df	Sig. (2-tailed)
Differentiated Instruction (DL)	Posttest Pretest	41.78571	4.93141	54.914	41	.000
Blended Learning (BL)	Posttest Pretest	50.77083	4.33805	81.085	47	.000
Lecture Method (LM)	Posttest Pretest	29.59459	7.07680	25.438	36	.000

Table 3 showed that all three methods of instruction had a significant effect on students' learning outcomes. DI had t (54.914)>P (0.000) which is significant, BL had t (81.085)>P (0.000) which is significant, LM had t (25.44)> P (0.000) which is significant.

3.3. Hypothesis 2: There is no significant difference between differentiated instruction, blended learning, and lecture methods on students' learning outcomes.

In testing hypothesis 2, ANOVA was employed and the result is presented in the table below.

Table 4

ANOVA table for significant differences between methods and learning outcomes.

Posttest Scores	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	9689.624	2	4844.812	290.938	.000
Within Groups	2064.896	124	16.652		
Total	11754.520	126			

From Table 4 above, F (2, 124) =290.938, P=0.000 which is significant. Therefore, there is a significant difference between DI, BL, and LM in students' learning outcomes. To determine the direction of the difference between groups, the Scheffe post-hoc test was employed and the result is presented below.

Table 5

Scheffe Post-hoc Analysis Comparison of DI, BL, and LM

(I)DI=2, LM=3, BL=2	(J)DI=1, BL=2, LM=3	Mean Difference (I-J)	Std. Error	Sig.	95% confidence interval Lower Bound	Upper Bound
Differentiated Instruction	2	-9.04762*	.86221	.000	-11.1838	-6.9114
	3	12.48391*	.92008	.000	10.2043	14.7635
	1	9.04762*	.86221	.000	6.9114	11.1838
Blended Learning						
	3	21.53153	.89274	.000	19.3197	23.7434
Lecture Method	1	-12.48391*	.92008	.000	-14.7635	-10.2043
	2	-21.53153*	.89274	.000	-23.7434	-19.3197

*. The mean difference is significant at the 0.05 level.

From Table 5 above, the post-hoc result showed that Blended learning and Differentiated Instruction had a higher learning outcome with a mean difference of 21.53153 and 12.48391 than the lecture method in that order.

3.4. Research Question 2: What is the difference between field-independent and field-dependent learners taught using DI?

In answering research question 2, mean and standard deviation were employed and the result is presented in table 6 below.

Table 6

Mean and Standard Deviation of learning outcome between Field-Dependence and Field-Independence learners when DI is employed

Source of Variation	N	Mean	Std. Deviation	Std. Error Mean
Field-independent	23	61.6087	3.76273	0.78458
Field-dependent	19	61.6316	3.14838	0.72229

The result showed a slight difference in achievement between the two variables in favor of field-dependent learners. To establish whether this difference is significant, an independent sample t-test was employed and the result is tested in hypothesis 3.

3.5. Ho3: There is no significant difference between field-independent and field-dependent learners taught using DI.

In testing 3, an independent t-test was employed and the result is presented in 7

Table 7

Independent t-test for Field-Dependent and Field-Independent learners taught using DI

Source of Variation	N	Mean	Std. Deviation	Df	T	Sig.
Field-independent	23	61.6087	3.76273	40	0.021	0.157
Field-dependent	19	61.6316	3.14838			

The result showed t (0.021)>P (0.157) which is not significant. Hence, hypothesis 3 is retained. Therefore, there is no difference in the learning outcome of Field-independent learners and field-dependent learners when taught using DI.

3.6. Research Question 3: What is the difference between field-independent and field-dependent learners taught using BL

Table 8

Mean and Standard Deviation of learning outcome between Field-Dependence and Field-Independence learners for BL

Source of Variation	N	Mean	Std. Deviation	Std. Error Mean
Field-dependent	23	70.5652	2.40881	0.50227
Field-independent	25	70.7600	2.55408	0.51082

Also, the result showed a slight difference in achievement between the two variables in favor of field-independent learners when taught using blended learning (table 8). To establish whether the difference is significant, an independent sample t-test was used and the result is tested in hypothesis 4.

3.7. Ho4: There is no significant difference between field-independent and field-dependent learners taught using BL

In testing, an independent t-test was employed and the result is presented in 9

Table 9

Independent t-test for Field-Dependent and Field-Independent learners taught using BL

Source of Variation	N	Mean	Std. Deviation	Df	T	Sig.
Field-dependent	23	70.5652	2.40881	46	0.271	0.787

Field-independent	25	70.5600	2.55408

The result showed t (0.271)>P (0.787) which is not significant. Hence, hypothesis 4 is retained. Therefore, there is no difference in the learning outcome of Field-independent learners and field-dependent learners when taught using BL.

3.8. Research Question 4: What is the difference between field-independent and field-dependent learners taught using LM

Table 10

Mean and Standard Deviation of learning outcome between Field-Dependence and Field-Independence learners for LM

Source of Variation	N	Mean	Std. Deviation	Std. Error Mean
Field-independent	18	54.9444	1.51356	0.35675
Field-dependent	19	43.6316	1. 94966	0.44728

Also, the result (table 10) showed a difference in achievement between the two variables in favor of field-dependent learners when taught using blended learning. To establish whether the difference is significant, an independent sample t-test was used and the result is tested in hypothesis 5.

3.9. Ho5: There is no significant difference between field-independent and field-dependent learners taught using LM

In testing Ho5, an independent t-test was employed and the result is presented in 11

Table 11

Independent t-test for Field-Dependent and Field-Independent learners taught using LM

Source of Variation	N	Mean	Std. Deviation	Df	T	Sig.
Field-dependent	18	54.9444	1.51356	35	19.638	0.000
Field-independent	19	43.6316	1.94966			

The result showed t (19.638)>P (0.000) which is significant. Hence, the hypothesis is rejected. Therefore, there is a significant difference in the learning outcome of Field-independent learners and field-dependent learners when taught using LM in favor of field-dependent learners.

3.10. Ho6: There are no significant interaction effects of method and cognitive styles on learning outcome

In testing hypothesis 6, ANOVA was employed and the result is presented in Table 12 below.

Table 12

ANOVA table for Interaction Effects of Method and Cognitive Styles on Learning Outcome

Dependent Variable: posttest scores

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	10891.507[a]	5	2178.301	305.412	0.000
Intercept	458374.599	1	458374.599	64267.129	0.000
Cognitive styles	312.222	1	312.222	43.776	0.000
Methods	9523.661	2	4761.831	662.640	0.000
Cognitive styles * method	978.805	2	489.402	68.617	0.000

Error	863.012	121	7.132
Total	490564.000	127	
Corrected Total	11754.520	126	

a. R Squared = .927 (Adjusted R Squared = .923)

The result showed F (2,121) =68.617, P=0.000 which is significant. Hence, hypothesis 6 is rejected. Therefore, there is a significant interaction effect between methods and cognitive styles on learning outcomes.

4. DISCUSSION

The study sought to find out the effects of differentiated instruction, blended learning, and lecture methods on students' cognitive styles and learning outcomes. The result showed from the paired sample t-test that all three methods improved learning outcomes significantly with DI having t (54.914)>P (0.000), BL having t (81.085)>P (0.000), and LM had t (25.44)> P (0.000). Therefore, all three methods had a positive effect on students' learning outcomes. On whether there is a significant difference between DI, BL, and LM, F (2, 124) =290.938, P=0.000 is significant using ANOVA. Therefore, there is a significant difference between DI, BL, and LM in students' learning outcomes. To determine the direction of the difference between groups, the Scheffe post-hoc test was employed and the result showed students taught using Blended learning and Differentiated learning had the highest learning outcome followed by the lecture method in that order. The result is in agreement with Aziz, et. al., (2021); and Yayi, (2018) that showed a significant difference between blended learning and lecture method. Also, the result is consonance with Kado, et.al., (2021), Riza & Umit (2021), and Osuafor & Okigbo (2013) that showed a significant difference between Differentiated instruction and the lecture method.

In examining whether there is a significant difference between field-dependent and field-independent learners taught using differentiated learners. The result showed a slight difference in the learning outcome between the two variables in favor of field-dependent learners. In determining whether the difference is significant, the independent t-test result showed t (0.021)>P (0.157) which is not significant. Hence, hypothesis 3 is retained. Therefore, there is no difference in the learning outcome of Field-independent learners and field-dependent learners when taught using DI.

Also, in examining whether there is a significant difference between field-dependent and field-independent learners taught using blended learning, the result showed a slight difference in achievement between the two variables in favor of field-independent learners when taught using blended learning. To establish whether the difference is significant, an independent sample t-test was used and the result was tested in hypothesis 4. The result showed t (0.271)>P (0.787) which is not significant. Hence, hypothesis 4 is retained. Therefore, there is no difference in the learning outcome of Field-independent learners and field-dependent learners when taught using BL.

Furthermore, in examining whether there is a significant difference between field-dependent and field-independent learners taught using the lecture method, the result showed a difference in achievement between the two variables in favor of field-dependent learners when taught using blended learning. To establish whether the difference is significant, an independent sample t-test was used and the result is tested in hypothesis 5. The result showed t (19.638)>P (0.000) which is significant. Hence, the hypothesis is rejected. Therefore, there is a significant difference in the learning outcome of Field-independent learners and field-dependent learners when taught using LM in favor of field-dependent learners.

Lastly, the interaction effects showed a significant interaction effect between methods and cognitive styles on students' learning outcomes with F (2,121) =68.617, P=0.000 which is significant. This established that both methods and cognitive styles interacted in causing the desired learning outcome.

5. Conclusion

The following conclusions were made based on the findings: The result established the fact that all three methods had a significant effect on students' learning outcomes when used in teaching Physics. However, results showed a significant difference in students' learning outcomes. The results further showed no significant difference between field-independence and field-dependence learners when differentiated instruction and blended learning were employed in teaching Physics. However, the result established a significant difference between field-dependent and field-independent learners in favor of field-independent learners. Lastly, the result showed a significant interaction effect between method and cognitive style on students' learning outcomes.

Based on the findings of this study, the following recommendations were proffered:

1. Faculties of Education should include differentiated instruction and blended learning as a method of teaching Physics and the sciences, in general, to prepare pre-service teachers for its implementation in classroom practice.
2. Ministries of education should include differentiated instruction and blended learning in their periodical training of in-service Physics and science teachers generally to improve learning outcomes and bridge the cognitive style of learners.

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