

Investigating Learning Progress of Children Aged 6–12 in the Kidedu Digital Environment: A Comparative Analysis of Three Age Groups

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Abstract: Kidedu is an adaptive digital learning environment that has been extensively examined in research conducted at the University of Piraeus, particularly with respect to its pedagogical foundations, user interface design, and alignment with children's developmental characteristics. As educational technologies become increasingly integrated into primary education, understanding how learners of different ages interact with adaptive systems is essential for designing effective and inclusive digital learning experiences. Building upon the theoretical and pedagogical framework established in previous studies, the present research aims to comparatively investigate the performance and interaction patterns of three distinct age groups (6–8, 8–10, and 10–12 years old) while engaging with the Kidedu platform. The study explores the extent to which developmental differences influence learners' engagement, accuracy, navigation strategies, and overall learning trajectories within the adaptive environment. Particular attention is given to the ways in which cognitive maturity, reading ability, attention span, and problem-solving skills affect pupils' interactions with educational content and system features. By examining behavioral data and learning outcomes across age groups, the research seeks to identify patterns that may inform the design of more personalized and developmentally appropriate learning experiences. A mixed-methods approach is employed, combining quantitative indicators such as task completion rates, response accuracy, time-on-task, and progression levels with qualitative observations of user behavior and interaction strategies. Comparative analyses are conducted to determine whether significant differences emerge among the three age groups and to evaluate how effectively the adaptive mechanisms of Kidedu respond to learners' varying needs and capabilities. The findings are expected to contribute to the growing body of research on adaptive educational technologies by providing evidence regarding age-related differences in digital learning environments. Furthermore, the study aims to offer practical recommendations for the design and implementation of adaptive learning systems that support children's cognitive development, enhance engagement, and promote meaningful learning outcomes across different stages of primary education.

Keywords: Kidedu, Game-based learning, Adaptive learning, Primary education, Learning analytics, Age-group comparison

1. Introduction

Digital learning environments increasingly support individualized learning pathways for primary school children. Kidedu, as described across University of Piraeus work, integrates adaptivity, gamification, and real-time feedback to enhance learning experiences. While previous research has examined the design and usability of the environment, direct comparison across age groups remains limited. This study addresses that gap by analyzing developmental differences in learning behaviour and performance.

The increasing integration of digital technologies into educational practice has transformed the ways in which children interact with knowledge and develop essential cognitive skills. Among contemporary educational innovations, Digital Game-Based Learning (DGBL) has emerged as a promising approach for promoting engagement, motivation, and conceptual understanding through interactive and learner-centered environments (Prensky, 2007; Connolly et al., 2012). Educational games provide opportunities for learners to actively construct knowledge, experiment with ideas, and receive immediate feedback, creating conditions that support meaningful learning experiences.

In this context, the notions of differentiated teaching are quickly gaining momentum. The Greek schooling communities have gained increased cultural diversity as well as substantial socio-economic variety in recent decades. These changes have resulted in growing heterogeneity within the classroom, especially in the Attica prefecture, which in turn has raised the demand for differentiated instruction. According to Panteliadou and Antoniou the term differentiated instruction denotes the systematic approach, which is assumed in the design of the teaching process and addresses the learning needs of the learners on an individual basis (Panteliadou et. al 2008). Consequently, differentiated teaching approaches are capable of adequately facing the raised diversity of a mixed school classroom, which is formed in the context of social change and dynamic requirements (Mylroy et. al 2003). Several studies have acknowledged the benefits of the adoption of differentiated instruction methods. Such studies include Smith and Throne (2007) Hall et al. (2003), Theisen (2003), and Johnsen (2003). However, the Greek primary and secondary schools still lack in relevant initiatives. As noted in Mavroudi (2017), differentiated instruction as well as individual learning strategies are only partially implemented in the Greek state schools, which is attributed to the misconceptions in the teachers' part as well as the limited resources and training initiatives. In addition, Papadakis and Ziskos (2015) argue that scarcity in the implementation of

differentiated instruction can be attributed to the time-demanding nature of the process, considering both the preparation and the class conduct.

Another key idea that renders highly relevant to the scopes of modern teaching is that of guided discovery learning. Primary and secondary schools have been placing considerable effort in the development as well as in the practice of new teaching approaches. These approaches often involve significant innovations, which rely heavily on advanced technology means, to develop the cognitive ability of the individual and to achieve the efficient skills development and facilitate the transfer of knowledge in a group scale. The study by Kalyani & Rajasekaran (2018) stresses the importance of innovative teaching for both for the present and the future of education, given that it helps students reach their full potential. In more detail, in accordance with Neber (2012) the notion of discovery learning indicates a general instructional approach, which represents the first broad development of constructivist learning intended for the school-based learning environment.

Within this context, the University of Piraeus developed KIDEDU (Play–Create–Learn), an adaptive educational platform designed for primary school pupils aged 6–12 years. The platform combines principles of Digital Game-Based Learning, Guided Discovery Learning, and Differentiated Instruction to support learning in mathematics and natural sciences through immersive and developmentally appropriate activities. The design of KIDEDU reflects contemporary educational theories that emphasize active participation, exploration, and personalized learning pathways rather than passive knowledge acquisition. Previous studies have demonstrated high levels of learner engagement, positive attitudes toward learning, and improved perceptions of understanding mathematical and scientific concepts while using the platform (Tsami et al., 2025; Tsami et al., 2026). Furthermore, research on differentiated instruction suggests that educational environments capable of responding to individual readiness, interests, and learning profiles can improve both engagement and academic achievement (Tomlinson, 2014).

Therefore, the purpose of the present study is to comparatively examine the performance and interaction patterns of three age groups while using the KIDEDU platform. By analyzing differences in engagement, response accuracy, navigation strategies, and learning progression, the study seeks to evaluate the effectiveness of KIDEDU's adaptive mechanisms across developmental stages and to provide evidence-based recommendations for the design of future adaptive educational technologies. Ultimately, the findings aim to contribute to the growing body of research on game-based and adaptive learning environments for primary education.

2. Methodology

The present study employed a mixed-methods research design combining quantitative and qualitative data collection techniques to investigate the performance and interaction patterns of children using the KIDEDU adaptive learning environment.

A comparative cross-sectional approach was adopted, allowing the simultaneous examination of the three age groups within the same educational context. Quantitative data were collected through learning analytics generated by the KIDEDU platform and structured questionnaires, while qualitative observations were recorded during gameplay sessions.

The sample consisted of approximately 368 pupils enrolled in Greek primary schools. Participants were divided into three age groups corresponding to the developmental levels incorporated within the KIDEDU open online platform: Group A: 6–8 years old (Grades 1–2), Group B: 8–10 years old (Grades 3–4) and Group C: 10–12 years old (Grades 5–6).

The participants were selected from schools representing diverse socio-economic backgrounds in order to ensure a heterogeneous sample. Participation was voluntary, and parental consent was obtained prior to data collection. All ethical guidelines regarding anonymity, confidentiality, and data protection were strictly followed.

KIDEDU (Play–Create–Learn) is a three-dimensional educational open and on-line platform developed by the University of Piraeus to support the learning of Mathematics and Natural Sciences, open and online as mentioned.

The study was conducted during regular school hours in computer laboratories equipped with desktop computers or tablets. Before the implementation phase, pupils received a brief introduction explaining the objectives of the activities and the basic navigation features of the platform.

The questionnaire examined levels of enjoyment, motivation, engagement, ease of use, perceived learning effectiveness, and intention to reuse the platform. Responses were used to evaluate learners' attitudes toward the adaptive learning environment and to identify potential age-related differences in user experience.

Classroom observations were conducted throughout the implementation process to record learners' interaction behaviors, problem-solving strategies, collaboration tendencies, and persistence when facing challenging tasks. These observations provided qualitative insights into how children approached the learning activities and how their behaviors differed across developmental stages.

Quantitative data were analyzed using descriptive and inferential statistical methods. When significant differences were identified, post-hoc comparisons were conducted to determine which groups differed significantly.

The study addresses the following questions:

1. Gender
2. Age
3. Did you like the game?
4. How easy or difficult was the game?
5. Did you understand the questions you had to answer?
6. Did you know the answers based on what you have learned at school?
7. Did you like the character of the mom?
8. Did you like the character of the wizard?
9. Which character did you like the most?
10. Did the theory help you solve the Mathematics exercises?
11. Did the theory help you solve the exercises in Geology and the Environment?
12. How difficult did you find the exercises in mathematics?
13. Do the Mathematics exercises cover the entire syllabus?
14. How difficult did you find the exercises in Geology and the Environment?
15. Do the exercises in Geology and the Environment cover the entire syllabus?
16. How much would you like to play the game again?
17. Have you previously played games on a PC, Laptop or Tablet?
18. Did the game help you learn more in Mathematics?
19. Did the game help you understand Mathematics better?
20. Did the game help you better understand geology and the environment?
21. Did the game help you learn more about geology and the environment?
22. Would you recommend your friends to play this game?
23. If you had to rate the game on a scale of 5 (excellent) to 1 (very bad), what rating would you give it?

3. Findings

The questionnaire was administered to 368 pupils. The questionnaire items were grouped into four distinct thematic categories based on the research questions: Engagement and game acceptance (questions 3, 16, 22, 23), Perceived usability and educational appropriateness (questions 4, 5, 12, 13, 14, 15), Learning support and problem-solving (questions 18, 19, 20, 21), and Character and game elements (questions 7, 8). Binary items (questions 6, 9, 10, 11, and 17) were excluded from the thematic scale grouping. Selected items were analyzed separately using frequency tables. The following results were obtained by using the statistical package IBM SPSS Statistics version 31.0.

3.1 Reliability

Reliability analysis was conducted for the Learning support and problem-solving dimension (questions 18–21), which was identified as a key thematic scale aligned with the research objectives. This subscale was considered suitable for internal consistency assessment due to the conceptual coherence of its items in measuring pupils' perceived educational benefits. Cronbach's alpha was 0.894 and McDonald's omega was 0.890, indicating good to excellent internal consistency. The close agreement between Cronbach's alpha and McDonald's omega further supports the robustness of the scale (Table 1,2).

Table 1: Reliability Statistics (Cronbach's Alpha)

Cronbach's Alpha	N of Items
.894	4

Table 2: Reliability Statistics (Mc Donald's Omega)

McDonald's Omega	N of Items
.890	4

3.2 Descriptive Statistics

Descriptive statistics were conducted for selected questionnaire items aligned with the research questions. Frequencies and percentages were used to summarize categorical responses, while cross-tabulation analyses were performed to explore response patterns across age groups (Table 3,4).

Table 3: Demographic Characteristics - Age

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	6-8 years	108	29.3	29.3	29.3
	8-10 years	116	31.5	31.5	60.9
	10-12 years	144	39.1	39.1	100.0
	Total	368	100.0	100.0	

Among the 368 pupils, 29.3% were aged 6–8 years, 31.5% were aged 8–10 years and 39.1% were aged 10–12 years.

Table 4: Age * Gender

			Gender		Total
			Boy	Girl	
Age	6-8 years	Count	52	56	108
		% within Age	48.1%	51.9%	100.0%
	8-10 years	Count	44	72	116
		% within Age	37.9%	62.1%	100.0%
	10-12 years	Count	72	72	144
		% within Age	50.0%	50.0%	100.0%
Total		Count	168	200	368
		% within Age	45.7%	54.3%	100.0%

Table 4 presents the gender distribution across age groups. Overall, girls represented a slightly larger proportion of the sample (54.3%) compared with boys (45.7%). The 6–8 years and 10–12 years age groups showed a relatively balanced gender distribution, whereas the 8–10 years group included a higher proportion of girls (62.1%).

The questionnaire employed five-point Likert-type questions to measure pupils' level of agreement or disagreement with each question. As Likert-type items are measured on an ordinal scale, the recommended descriptive statistics are the median, mode, and range. Descriptive Statistics for the questions 3, 4 16, 22 and 23 are presented in the table below.

Table 5: Descriptive Statistics for the questions 3, 4 16, 22 and 23

		Did you like the game?	How easy or difficult was the game?	How much would you like to play the game again?	Would you recommend your friends to play this game?	If you had to rate the game on a scale of 5 (excellent) to 1 (very bad), what rating would you give it?
N	Valid	368	368	368	368	368
	Missing	0	0	0	0	0
Median		5.00	3.00	5.00	4.00	4.00
Mode		5	3	5	5	5
Range		3	4	4	4	4

The following tables present the frequencies and percentages of responses for selected items (questions 6, 9, 10, 11, and 17) (Tables 6–9).

Table 6: Which character did you like the most?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Mom	272	73.9	73.9	73.9
	Wizard	96	26.1	26.1	100.0
	Total	368	100.0	100.0	

Table 7: Did the theory help you solve the Mathematics exercises?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	324	88.0	88.0	88.0
	No	44	12.0	12.0	100.0
	Total	368	100.0	100.0	

Table 8: Did the theory help you solve the exercises in Geology and the Environment?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	288	78.3	78.3	78.3
	No	80	21.7	21.7	100.0
	Total	368	100.0	100.0	

Table 9: Have you ever played a digital educational game before?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	244	66.3	66.3	66.3
	No	124	33.7	33.7	100.0
	Total	368	100.0	100.0	

3.3 Crosstabulations and Bar Charts by Age Group

Table 10: Age * Did you like the game? Crosstabulation

			Did you like the game?				Total
			Moderate	Good	Entertaining	Very Entertaining	
	6-8 years	Count	0	7	24	77	108
		% within Age	0.0%	6.5%	22.2%	71.3%	100.0%
	8-10 years	Count	0	1	54	61	116

			Did you like the game?				
			Moderate	Good	Entertaining	Very Entertaining	Total
		% within Age	0.0%	0.9%	46.6%	52.6%	100.0%
	10-12 years	Count	2	26	62	54	144
		% within Age	1.4%	18.1%	43.1%	37.5%	100.0%
Total		Count	2	34	140	192	368
		% within Age	0.5%	9.2%	38.0%	52.2%	100.0%

Cross-tabulation analysis indicates that the digital educational game was positively received by the majority of pupils, with 90.2% (38% and 52.2%) providing a positive evaluation. Younger children (ages 6–8) reported the highest proportion of “Very Entertaining” ratings (71.3%), whereas this percentage decreased among older pupils (ages 10–12) (37.5%). Overall, the findings suggest a variation in perceived enjoyment of the game across different age groups (Table 10).

Table 11: Age * How easy or difficult was the game? Crosstabulation

			How easy or difficult was the game?					
			Very Easy	Easy	Moderate	Difficult	Very Difficult	
Age	6-8 years	Count	36	16	44	12	0	108
		% within Age	33.3%	14.8%	40.7%	11.1%	0.0%	100.0%
	8-10 years	Count	28	13	63	12	0	116
		% within Age	24.1%	11.2%	54.3%	10.3%	0.0%	100.0%
	10-12 years	Count	36	54	30	16	8	144
		% within Age	25.0%	37.5%	20.8%	11.1%	5.6%	100.0%
Total		Count	100	83	137	40	8	368
		% within Age	27.2%	22.6%	37.2%	10.9%	2.2%	100.0%

Cross-tabulation analysis indicates differences in response patterns across age groups. Among pupils aged 6–8 years, the most frequently selected response was the middle category (40.7%), followed by the first category (33.3%). Similarly, children aged 8–10 years most frequently selected the middle category (54.3%), while the remaining responses were distributed across the other categories. In contrast, older pupils (ages 10–12) showed a different response pattern, with the second category receiving the highest proportion of responses (37.5%), followed by the first category (25.0%) and the middle category (20.8%). Overall, the findings indicate variations in responses across different age groups (Table 11).

Table 12: Age * How much would you like to play the game again? Crosstabulation

			How much would you like to play the game again?					Total
			Not at all	Little	Moderate	Very	Very much	
Age	6-8 years	Count	8	8	8	24	60	108
		% within Age	7.4%	7.4%	7.4%	22.2%	55.6%	100.0%
	8-10 years	Count	0	4	8	20	84	116
		% within Age	0.0%	3.4%	6.9%	17.2%	72.4%	100.0%
	10-12 years	Count	0	4	40	52	48	144
		% within Age	0.0%	2.8%	27.8%	36.1%	33.3%	100.0%
Total		Count	8	16	56	96	192	368
		% within Age	2.2%	4.3%	15.2%	26.1%	52.2%	100.0%

Cross-tabulation analysis showed a high willingness to replay the game across all age groups. Overall, 78.3% of pupils selected “Very” or “Very much”, indicating strong interest in playing the game again. Younger children (ages 6–8) reported the highest proportion of “Very much” responses (55.6%), followed by pupils aged 8–10 years (72.4%). Whereas older pupils (10–12 years) showed a more balanced distribution between “Very” (36.1%) and “Very much” (33.3%) responses (Table 12).

Table 13: Age * Have you previously played games on a PC, Laptop or Tablet? Crosstabulation

			Have you previously played games on a PC, Laptop or Tablet?		Total
			Yes	No	
Age	6-8 years	Count	68	40	108
		% within Age	63.0%	37.0%	100.0%
	8-10 years	Count	84	32	116
		% within Age	72.4%	27.6%	100.0%
	10-12 years	Count	92	52	144
		% within Age	63.9%	36.1%	100.0%
Total		Count	244	124	368
		% within Age	66.3%	33.7%	100.0%

Cross-tabulation analysis indicates that the majority of pupils had previous experience with playing games on a PC, laptop, or tablet across all age groups. Overall, 66.3% of pupils reported previous gaming experience, while 33.7% indicated that they had not played games on digital devices before. Pupils aged 8–10 years reported the highest proportion of previous gaming experience (72.4%), followed by older pupils aged 10–12 years (63.9%) and younger children aged 6–8 years (63.0%) (Table 13).

Table 14: Age * Would you recommend your friends to play this game? Crosstabulation

			Would you recommend your friends to play this game?					
			Not at all	Little	Moderate	Very	Very much	
Age	6-8 years	Count	12	8	12	32	44	108
		% within Age	11.1%	7.4%	11.1%	29.6%	40.7%	100.0%
	8-10 years	Count	12	4	4	20	76	116
		% within Age	10.3%	3.4%	3.4%	17.2%	65.5%	100.0%
	10-12 years	Count	28	32	24	8	52	144
		% within Age	19.4%	22.2%	16.7%	5.6%	36.1%	100.0%
Total		Count	52	44	40	60	172	368
		% within Age	14.1%	12.0%	10.9%	16.3%	46.7%	100.0%

Cross-tabulation analysis indicates a generally high willingness among pupils to recommend the game to their friends across all age groups. Overall, 63.0% of pupils selected either “Very” (16.3%) or “Very much” (46.7%), reflecting positive attitudes toward the game. Pupils aged 8–10 years reported the highest intention to recommend the game, with 65.5% selecting “Very much” followed by children aged 6–8 years (40.7%). In contrast, pupils aged 10–12 years showed a more balanced distribution of responses, with higher percentages selecting “Little” (22.2%) and “Moderate” (16.7%). Overall, the findings suggest that younger pupils were more enthusiastic about recommending the game to their friends than older pupils (Table 14).

Table 15: Age * If you had to rate the game on a scale of 5 (excellent) to 1 (very bad), what rating would you give it? Crosstabulation

			If you had to rate the game on a scale of 5 (excellent) to 1 (very bad), what rating would you give it?					
			Very Bad	Bad	Average	Good	Excellent	
Age	6-8 years	Count	0	8	4	56	40	108
		% within Age	0.0%	7.4%	3.7%	51.9%	37.0%	100.0%
	8-10 years	Count	8	4	0	8	96	116
		% within Age	6.9%	3.4%	0.0%	6.9%	82.8%	100.0%
	10-12 years	Count	8	8	48	40	40	144
		% within Age	5.6%	5.6%	33.3%	27.8%	27.8%	100.0%
Total		Count	16	20	52	104	176	368
		% within Age	4.3%	5.4%	14.1%	28.3%	47.8%	100.0%

Cross-tabulation analysis indicates that pupils evaluated the game positively across all age groups. Overall, 76.1% of participants rated the game as either “Good” (28.3%) or “Excellent” (47.8%). Pupils aged 8–10 years gave the highest ratings, with 82.8% selecting “Excellent”, while children aged 6–8 years mainly rated it as “Good” (51.9%) or “Excellent” (37.0%). On the contrary, pupils aged 10–12 years showed a more balanced distribution of responses, with 33.3% rating the game as “Average” and 27.8% selecting both “Good” and “Excellent”. Overall, the findings suggest that younger pupils evaluated the game more positively than older pupils (Table 15).

3.4 Chi-Square Tests

The questionnaire items were measured using five-point Likert-type response scales; therefore, non-parametric statistical tests were applied. Pearson’s chi-square tests of independence were conducted to examine the association between the most important questions and their age. For each test, the null hypothesis stated that there was no association between the variables. The null hypothesis is rejected in favour of the alternative hypothesis if the p-value is less than $\alpha=0.05$. On the other hand, if the p-value is greater than (or equal to) $\alpha=0.05$, then the null hypothesis is not rejected. This study indicates statistically significant associations between pupils' age and their perception of whether the game helped them learn more in Mathematics ($X^2=48.680$, $p<0.001$) and Geology ($X^2=60.514$, $p<0.001$), their willingness to recommend the game to their peers ($X^2=71.763$, $p<0.001$), as well as their overall experience with the KIDEDU game ($X^2=155.153$, $p<0.001$) (Table 16-19)

Table 16: Chi-Square Tests, Age * Did the game help you learn more in Mathematics?

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	48.680 ^a	8	<.001
Likelihood Ratio	50.720	8	<.001
Linear-by-Linear Association	26.460	1	<.001
N of Valid Cases	368		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 14.09.

Table 17: Chi-Square Tests, Age * Did the game help you learn more about geology and the environment?

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	60.514 ^a	8	<.001
Likelihood Ratio	68.893	8	<.001
Linear-by-Linear Association	1.667	1	.197
N of Valid Cases	368		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 18.78.

Table 18: Chi-Square Tests, Age * Would you recommend your friends to play this game?

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	71.763 ^a	8	<.001
Likelihood Ratio	74.201	8	<.001
Linear-by-Linear Association	14.248	1	<.001
N of Valid Cases	368		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 11.74.

Table 19: Chi-Square Tests, Age * If you had to rate the game on a scale of 5 (excellent) to 1 (very bad), what rating would you give it?

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	155.153 ^a	8	<.001
Likelihood Ratio	170.041	8	<.001
Linear-by-Linear Association	16.847	1	<.001
N of Valid Cases	368		

a. 1 cells (6.7%) have expected count less than 5. The minimum expected count is 4.70.

4. Conclusion

This study examined primary school pupils' perceptions of the KIDEDU educational game and explored their experiences while interacting with a digital game-based learning environment. The findings indicate that the game was positively received by the participants, with high levels of enjoyment, appropriate perceptions of difficulty, strong willingness to replay the game, and positive intentions to recommend it to peers. These results suggest that KIDEDU successfully combines educational content with engaging gameplay, creating a learning experience that is both enjoyable and meaningful for young learners.

The widespread familiarity of pupils with computers and tablets further supported their interaction with the platform, enabling them to navigate the game environment with ease. The positive responses recorded across all questionnaire items demonstrate that digital game-based learning can effectively complement traditional teaching methods and contribute to increased learner motivation and participation.

The study also reinforces the educational potential of KIDEDU as a tool for promoting active learning through exploration, interaction, and immediate feedback. By integrating game mechanics with educational objectives, the platform provides opportunities for pupils to engage with learning content in a manner that is both motivating and developmentally appropriate.

Overall, the findings support the continued use and further development of educational games within primary education. KIDEDU appears to offer a promising approach for enhancing learner engagement and fostering positive attitudes toward learning. Future research should investigate the long-term effects of the platform on academic achievement, knowledge retention, and skill development, while also exploring its implementation across different educational contexts and subject areas.

In conclusion, we note that age appeared to play a role in the pupils' views.

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References

- Connolly, T. M., Boyle, E. A., MacArthur, E., Hainey, T., & Boyle, J. M. (2012). *A systematic literature review of empirical evidence on computer games and serious games*. Computers & Education, 59(2), 661–686.
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16, 297–334.
- Hall, T., Strangman, N., Meyer, A. (2003). *Differentiated instruction and implications for UDL implementation*. Report for the National Center for Accessing the General Curriculum (NCAC). Available: <http://www.cast.org/ncac/>

- Hsu, Y. S. (2004). Using the internet to develop students' capacity for scientific inquiry. *Journal of Educational Computing Research*, 31(2), 137–161.
- Johnsen, S. (2003). Adapting instruction with heterogeneous groups. *Gifted Child Today*, Vol. 26, No. 3, 2003, pp. 5-6.
- Kalyani, D., & Rajasekaran, K. (2018). Innovative teaching and learning. *Journal of Applied and Advanced Research*, 3(1), 23–25.
- Kalyani, D., Rajasekaran, K. (2018). Innovative teaching and learning. *Journal of Applied and Advanced Research*, Vol. 3, No. 1, 2018, pp. 23–25.
- Mavroudi, A. (2017). *Implementing differentiated instruction in the Greek state primary school: Teachers' attitudes and preferred differentiated strategies*, In E. Agathopoulou, T. Danavassi, L. Efstathiadi (Eds.), *Selected Papers on Theoretical and Applied Linguistics from ISTAL*, Thessaloniki 24-26 April 2015 (Vol. 22, pp. 372-385). Thessaloniki, Greece, 2017.
- Mulroy, H., Eddinger, K. (2003). *Differentiation and literacy*, Paper presented at the Institute on Inclusive Education, Rochester.
- Neber, H. (2012). Discovery learning. In N. M. Seel (Ed.), *Encyclopedia of the sciences of learning* (pp. 1009–1012). Springer.
- Neber, H. (2012). *Discovery Learning*. In Seel, L. (Ed.), *Encyclopedia of the Sciences of Learning* (pp. 1009-1012). New York: Springer Science & Business Media.
- Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). New York: McGraw-Hill.
- Paniagua, A., & Istance, D. (2018). *Teachers as designers of learning environments: The importance of innovative pedagogies*. OECD Publishing
- Panteliadou, S., Antoniou, F. (2008). *Teaching Approaches and Practices for Students with Learning Difficulties*, Volos Greece.
- Papadakis, S., Ziskos, V. (2015). Design and Implementation of Differentiated Instruction Digital Scenarios in LAMS. *MIBES Transactions* Vol. 9, No. 2, 2015, pp. 39-48.
- Prensky, M. (2007). *Digital Game-Based Learning* (2nd ed.). Paragon House.
- Smith, G.E., Throne, S. (2007) *Differentiating instruction with technology for K-5 classrooms*, New York: ISTE (International Society for Technology in Education).
- Theisen, T. (2003). Differentiated instruction in the foreign language classroom: Meeting the diverse needs of all learners, *Communique*, Vol. 6, 2003, pp. 1-8.
- Tomlinson, C. A. (2014). *The Differentiated Classroom: Responding to the Needs of All Learners* (2nd ed.). ASCD.
- Tsami, E. (2022). Differentiated learning and digital game based learning: The KIDEDU project. *Journal of Systemics, Cybernetics and Informatics*, 20(6), 53–57. <https://doi.org/10.54808/JSCI.20.06.53>
- Tsami, E., Skiadas, P., & Skilodimos, D. (2025). *Teaching and Learning Ideas for Mathematics and Natural Sciences: The Case of a Greek Game*. University of Piraeus.
- Tsami, E., Skiadas, P., & Anastasopoulos, D. (2025). Teaching proposal for Greek primary school mathematics and geology. *International Journal of Environmental Sciences*, 11(15s), 506–512. <https://doi.org/10.64252/msn09f90>
- Tsami, E., Skiadas, P., Skilodimos, D., & Anastasopoulos, D. (2026). *Game-Based Teaching Proposal for Greek Primary School Mathematics and Geology*. University of Piraeus.