

RESEARCH ARTICLE

Students' Perceptions and Acceptance of Differentiated Learning Through Digital Pedagogical Design: A Descriptive Survey in Information Technology Education

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ABSTRACT

Student diversity poses a continuing challenge in higher education, particularly when common learning objectives must be maintained while providing flexibility in learning resources, activities, interaction, support, and assessment. This study examined students' perceptions and acceptance of digitally supported differentiated learning in Information Technology Education. A quantitative cross-sectional descriptive survey was conducted with 35 students at Universitas Lampung, Indonesia, after the learning experience. Data were collected using a 31-item questionnaire rated on a four-point Likert scale, with reported high internal consistency (Cronbach's $\alpha = 0.985$), and were analyzed using means, standard deviations, and normalized mean scores. Students rated the five implementation dimensions favorably ($M = 3.28$, 81.88%). Digital pedagogical design received the highest rating ($M = 3.34$, 83.45%), whereas product and assessment differentiation received the lowest ($M = 3.18$, 79.57%). Technology-supported collaboration was the highest-rated individual item ($M = 3.49$, 87.14%), whereas choices in presentation formats and the timeliness of digital feedback received lower ratings. The secondary acceptance summary was similarly favorable ($M = 3.31$, 82.74%), with increased learning motivation receiving the highest rating. These findings identify digital support and collaboration as perceived strengths of the learning design, while flexibility in student products and the timeliness of feedback warrant further attention. Given the single-cohort, post-only design and absence of objective learning-outcome measures, the findings should be interpreted as context-specific evidence of students' perceptions of implementation rather than evidence of causal effects on learning.

KEYWORDS

Differentiated learning; digital pedagogy; higher education; student perceptions; student acceptance; Information Technology Education

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1. INTRODUCTION

Student diversity is a central consideration in higher-education course design. Learners enter courses with different prior knowledge, interests, confidence, language resources, and access conditions; and a single instructional pathway can limit opportunities for participation. Differentiated instruction addresses these differences by varying content, learning processes, products, and support while maintaining meaningful learning goals. In blended and digitally mediated courses, instructors commonly use this principle through multiple resources, flexible activity routes, and alternative ways to demonstrate learning [1], [2], [3].

Evidence on differentiation is encouraging but not uniform. Reviews show that differentiation is a family of practices rather than a single intervention, and that effects depend on the practice used, alignment with objectives, and the support available to teachers and learners [4], [5]. Higher-education studies also report practical tensions: adapting materials and assessment takes time, students may experience options as inconsistent, and instructors need clear criteria to keep flexibility from becoming ambiguity [1], [2], [3]. These issues warrant examining how students experience differentiated course design in practice.

Digital tools can broaden instructional options, but the use of a platform does not itself constitute effective pedagogy. Technology has educational value when it is selected and orchestrated in relation to content, instructional practices, interaction, representation, and feedback. The TPACK framework positions technology, pedagogy, and content as interdependent knowledge domains [6]; a digital-pedagogy model similarly emphasizes the relationship between tools, learning activities, participants, and context [7]. Research mapping digital pedagogies in higher education and meta-analytic work on postsecondary technology use both indicate that benefits are contingent on pedagogical integration rather than on the presence of technology alone [8], [9].

Information Technology Education is a relevant context for this question. Students are expected to work with technical concepts and digital tools, yet familiarity with technology should not be assumed to mean that all students prefer the same resources, pace, interaction pattern, or assessment format. A tertiary study of digital differentiation linked the approach to achievement and self-regulation, while higher-education scholarship has also described the need to make differentiated choices explicit and manageable [10], [11]. Learner-reported evidence can complement instructor-centered accounts by identifying which design elements students find usable, motivating, and supportive.

Two analytical distinctions guide this study. First, perceptions refer to students' reports of how the learning design was implemented across content, process, products and assessment, digital support, and engagement. Second, acceptance refers here to students' evaluations of the approach—including motivation, participation, independence, willingness to use the model in other courses, and satisfaction. This operational definition is intentionally descriptive; it is not a test of technology-acceptance theory or a claim that any design feature caused an outcome.

Accordingly, this study addressed two questions: (RQ1) How do Information Technology Education students rate the implementation of differentiated learning through digital pedagogical design across the reported dimensions? (RQ2) How favorable is their acceptance of the approach based on the reported acceptance indicators? The study offers a context-specific account of perceived implementation strengths and priorities for improvement, especially the balance between choice and structure. The study does not

estimate effects on achievement, motivation, or engagement because it does not include a comparison group or objective outcome measures.

2. RESEARCH METHODS

2.1 Research design and setting

This study used a cross-sectional descriptive survey to examine students' perceptions of digitally supported differentiated learning. The study was conducted in the Information Technology Education Study Program, Faculty of Teacher Training and Education, Universitas Lampung, Bandar Lampung, Indonesia. Data were collected after students had completed the learning experience. The survey described students' perceptions and acceptance; it was not designed to establish causal effects.

2.2 Participants

The participants were 35 students enrolled in the Information Technology Education Study Program at Universitas Lampung. The cohort included 18 male students (51.4%) and 17 female students (48.6%) (Table 1). Participant characteristics were summarized descriptively; no subgroup comparisons were conducted.

Table 1. Participant characteristics and gender distribution

Characteristic	n (%)
Gender: Male	18 (51.4%)
Gender: Female	17 (48.6%)
Total participants	35 (100.0%)

2.3 Learning context and instrument

The questionnaire initially contained 50 statements, of which 31 were retained following item-validity screening. The available documentation did not specify the item-screening statistic, decision threshold, or validation sample; therefore, no broader claims regarding construct validity or factor structure were made. The retained items had a reported high internal-consistency coefficient (Cronbach's $\alpha = 0.985$) [12] and were rated on a four-point Likert scale from 1 (strongly disagree) to 4 (strongly agree). As summarized in Table 2, 26 items represented five implementation dimensions, while six overlapping evaluative indicators were reported separately as a secondary acceptance summary.

Table 2. Reporting structure of the retained questionnaire

Construct	Reporting role	Indicators represented	No.
Content differentiation	Implementation	Materials and learning resources	5
Process differentiation	Implementation	Methods, activities, and timing	5
Product and assessment differentiation	Implementation	Task formats, assessment forms, and products	5
Digital pedagogical design	Implementation	Platform access, media, support, feedback, and collaboration	6
Student engagement and motivation	Implementation	Activity, motivation, confidence, independence, and discussion	5
Acceptance and evaluation	Secondary summary	Motivation, independence, participation, reuse, and satisfaction	6*

** The available study documentation states that 31 statements were retained. The 26 implementation indicators and six acceptance indicators are reporting blocks, and some acceptance wording overlaps with the implementation table; acceptance is therefore treated as a secondary summary rather than six additional unique items.*

2.4 Data collection and ethics

The questionnaire was administered after the learning experience. Before data collection, participants were informed of the study purpose and procedures, the voluntary nature of participation, confidentiality of responses, and their right to withdraw. Informed consent was obtained before participation.

2.5 Data analysis

Responses were summarized using the mean (M), standard deviation (SD), and normalized mean score. The normalized mean score was computed using Equation (1), where 4 is the maximum score on the response scale. Percentages were calculated from the reported unrounded scores when available; consequently, calculations based on displayed, rounded means may differ slightly.

$$P = (M/4) \times 100 \quad (1)$$

The acceptance summary was calculated from the six evaluative indicators shown in Table 5. The item-level table contains 26 implementation indicators distributed across five dimensions (5, 5, 5, 6, and 5 indicators, respectively). Four acceptance indicators repeat statements in the implementation table. To avoid double-counting, acceptance is treated as a secondary reporting block rather than as six additional unique items.

Normalized mean scores were interpreted as very high (80.00–100.00%), high (60.00–79.99%), moderate (40.00–59.99%), low (20.00–39.99%), or very low (0.00–19.99%). These categories were reporting conventions rather than validated cutoffs. Because the minimum response was 1 on a four-point scale, normalized scores below 25% were not possible.

3. RESULTS

Responses from 35 students were summarized using the reported five implementation dimensions and the secondary acceptance block. Gender was summarized descriptively in Table 1; results are reported for the cohort as a whole because no demographic subgroup comparisons were performed.

3.1 Dimension-level perceptions

As shown in Table 3, across the five implementation dimensions, the overall mean was 3.28 (SD = 0.69), corresponding to 81.88% of the maximum score and a very-high interpretation. Dimension means ranged from 3.18 to 3.34, while normalized mean scores ranged from 79.57% to 83.45%. Digital pedagogical design was the highest-rated dimension (M = 3.34, SD = 0.75, 83.45%, very high). Product and assessment differentiation was the lowest-rated dimension (M = 3.18, SD = 0.63, 79.57%, high).

The dimension ratings were generally favorable. Digital pedagogical design was the highest-rated area, whereas product and assessment differentiation was the lowest-rated. Percentages were calculated from unrounded scores in the source analysis; small differences may therefore occur when readers recompute them from the displayed means.

Table 3. Dimension-level results for students' perceptions

Dimension	Mean (M)	SD	Normalized mean (%)	Interpretation
Content differentiation	3.29	0.65	82.29%	Very high
Process differentiation	3.26	0.68	81.57%	Very high
Product and assessment differentiation	3.18	0.63	79.57%	High
Digital pedagogical design	3.34	0.75	83.45%	Very high
Student engagement and motivation	3.29	0.70	82.14%	Very high
Average	3.28	0.69	81.88%	Very high

As shown in Table 4, at the item level, the 26 implementation indicators were also favorable: 24 fell in the very-high range and two in the high range under the study's 80.00% threshold. This distribution describes students' reports of the learning design and should not be read as evidence of measured learning gains.

Table 4. Item-level results for implementation indicators

Indicator	Mean (M)	SD	Normalized mean (%)	Interpretation
Materials available in various formats	3.37	0.73	84.29%	Very high
Students can choose learning resources	3.23	0.77	80.71%	Very high
Materials are adjusted to students' abilities	3.29	0.75	82.14%	Very high
Materials help students understand concepts	3.26	0.66	81.43%	Very high
A variety of materials improves understanding	3.31	0.80	82.86%	Very high
The lecturer uses various learning methods	3.23	0.88	80.71%	Very high
Activities provide opportunities suited to abilities	3.29	0.67	82.14%	Very high
Students can learn in a comfortable way	3.26	0.82	81.43%	Very high
Learning time is flexible	3.23	0.73	80.71%	Very high
The learning process encourages active participation	3.31	0.76	82.86%	Very high
Students can choose task formats	3.20	0.72	80.00%	Very high
Students can choose how to present their work	3.06	0.73	76.43%	High
Choice of tasks increases motivation	3.20	0.72	80.00%	Very high
Assessment forms are varied	3.26	0.74	81.43%	Very high
Students can demonstrate competence through products	3.20	0.80	80.00%	Very high
The digital platform is easy to use	3.34	0.87	83.57%	Very high
The digital platform is accessible at any time	3.29	0.89	82.14%	Very high

Indicator	Mean (M)	SD	Normalized mean (%)	Interpretation
Digital media help students understand the material	3.34	0.80	83.57%	Very high
Technology supports differentiated learning	3.40	0.81	85.00%	Very high
Digital feedback is provided in a timely manner	3.17	0.71	79.29%	High
Technology facilitates collaboration	3.49	0.82	87.14%	Very high
Students are more active during lectures	3.20	0.76	80.00%	Very high
Students are more motivated to learn	3.37	0.73	84.29%	Very high
Students are more confident expressing ideas	3.23	0.77	80.71%	Very high
The learning design encourages independent learning	3.29	0.79	82.14%	Very high
Students actively participate in discussions	3.34	0.80	83.57%	Very high

The highest-rated item concerned technology-facilitated collaboration ($M = 3.49$, $SD = 0.82$, 87.14%), followed by technology supporting differentiated learning ($M = 3.40$, $SD = 0.81$, 85.00%). The lowest-rated item concerned choice of presentation format ($M = 3.06$, $SD = 0.73$, 76.43%); timely digital feedback was also comparatively lower ($M = 3.17$, $SD = 0.71$, 79.29%).

3.2 Secondary acceptance summary

As shown in Table 5, the secondary acceptance summary was favorable. Its mean was 3.31 ($SD = 0.77$), equivalent to 82.74% of the maximum score and a very-high interpretation. This descriptive result reflects a favorable evaluation at the time of the survey; it does not establish future continued use or an effect on motivation.

Table 5. Secondary acceptance summary

Acceptance indicator	Mean (M)	SD	Normalized mean (%)	Interpretation
Choice of tasks increases motivation	3.20	0.72	80.00%	Very high
Students are more motivated to learn	3.37	0.73	84.29%	Very high
The learning design encourages independent learning	3.29	0.79	82.14%	Very high
Students actively participate in discussions	3.34	0.80	83.57%	Very high
Students want to use the model in other courses	3.31	0.72	82.86%	Very high
Overall satisfaction	3.34	0.84	83.57%	Very high
Average	3.31	0.77	82.74%	Very high

The strongest acceptance indicator was the perception that students were more motivated to learn ($M = 3.37$, $SD = 0.73$, 84.29%). The lowest was the statement that choice of tasks increased motivation ($M = 3.20$, $SD = 0.72$, 80.00%), which nevertheless remained in the very-high range. Willingness to use the model in other courses was 3.31 (82.86%), and overall satisfaction was 3.34 (83.57%).

Four acceptance indicators repeat statements presented in the item-level table. Table 5 is therefore presented as a secondary evaluative summary, not as an additional non-overlapping item pool. No inferential comparisons were conducted; these results support descriptive, not causal, conclusions.

4. DISCUSSION

The overall pattern was favorable, but it reflects students' perceptions of implementation rather than measured instructional effectiveness. Students rated implementation at 81.88% of the maximum score and the secondary acceptance summary at 82.74%. This is consistent with the purpose of differentiated instruction, coordinating variation in content, process, products, and support around shared learning goals, but neither a positive perception score nor a post-only survey demonstrates learning gains. Earlier systematic reviews show that outcomes depend on which components are differentiated and how coherently they are implemented [1], [4], [5]. A 2026 systematic review and meta-analysis likewise reported variation across learner groups and instructional contexts, reinforcing the need to treat differentiated instruction as a family of design practices rather than a uniform intervention [13].

Digital pedagogical design was the highest-rated dimension, and technology-facilitated collaboration was the strongest individual item. This pattern is consistent with higher-education evidence that technology is most productive when it structures interaction, active learning, access, and feedback rather than merely digitizing delivery [6], [7], [8], [9]. Recent studies provide additional context. International students have described technology-enhanced differentiated instruction as promising when choices are purposeful and pedagogically transparent, while also identifying pitfalls when technology or flexibility becomes burdensome [14]. Research on differentiated instruction through learning management systems similarly shows that autonomy, flexible access, tiered tasks, and collaborative practices are feasible but unevenly implemented [15]. Reviews of educational-technology engagement and higher-education digital pedagogy further emphasize structure, active participation, communication, and accessible learning activities [16], [17]. Accordingly, the present result supports an implementation interpretation rather than a platform-effect claim: students experienced the digital arrangement as enabling collaboration and access. By contrast, a vocational-school survey reported moderate student perceptions of generative AI as a learning aid [18], highlighting why learner views should be interpreted in relation to a particular technology and educational context.

The learner perspective is particularly useful because much of the higher-education literature on differentiated instruction has focused on instructor planning, workload, and implementation constraints [2], [3]. The cohort's responses identify which features students rated highly and which received lower ratings. However, the single-cohort, post-implementation survey cannot determine whether all students used the available options, whether particular subgroups benefited, or whether favorable perceptions translated into performance. The contribution is therefore descriptive and diagnostic rather than causal: the study identifies perceived design strengths and frictions that can guide iterative course refinement, not a benchmark for other programs.

Product and assessment differentiation was the lowest-scoring dimension, with choice of presentation format and timely digital feedback among the weaker items. Differentiation is incomplete when variation is offered in materials and activities but not in how students can demonstrate learning [4], [5]. A systematic

review of differentiated instruction through adaptive learning platforms similarly identifies personalization, accessibility, and timely feedback as recurring implementation requirements [19]. A separate heuristic evaluation of Universitas Lampung's VClass interface identified weak assignment-deadline visibility and demand for automated reminders [20]. Although platform notifications differ from instructional feedback, these findings point to the importance of accessible and timely learning information. UDL 3.0 frames learner variability through multiple means of engagement, representation, and action and expression [21], while feedback research emphasizes information that helps learners judge current performance and decide what to do next [22]. These ratings suggest a specific design priority: provide a small, clearly bounded set of product options aligned to common outcomes and rubrics, together with feedback that is timely, specific, and action-oriented.

Engagement and motivation scores were favorable, and the acceptance summary was strongest for the statement that students were more motivated. Self-Determination Theory offers a plausible interpretive lens: opportunities for meaningful autonomy, competence, and relatedness can support motivation [23]. Engagement scholarship similarly treats engagement as shaped by interactions between learners and their environments rather than as a fixed student trait [24], [25]. These theories help interpret why students might value differentiated opportunities; they do not establish mediation or causal relationships from these descriptive survey responses. Novelty, instructor enthusiasm, course climate, and response bias remain alternative explanations.

In this study, acceptance is an operational descriptive summary, not a test of the Technology Acceptance Model or UTAUT. The indicators ask whether students felt more motivated, more independent, more participatory, willing to use the model in other courses, and satisfied. Such responses combine affective evaluation, perceived usefulness, and intended continuation, so they should not be treated as a single validated technology-acceptance construct. The favorable summary nevertheless indicates that respondents evaluated the approach favorably at the time of measurement, which is relevant for iterative course design and is consistent with higher-education work emphasizing the role of instructional coherence, interaction, and support in learner satisfaction [26].

Responses concerning independence and discussion participation are also consistent with the broader importance of self-regulated learning in higher education. Meta-analytic evidence indicates that self-regulated-learning interventions can improve achievement and learning strategies, with effects that are not reducible to students' initial motivation [27], [28]. A 2026 meta-synthesis of open learner models and pedagogical strategies in higher education additionally highlights transparent learner-facing information, feedback, and reflective support as mechanisms that can scaffold self-regulation [29]. The present survey, however, did not measure self-regulated-learning skills, learning logs, or achievement; it measured perceived independence and participation. The appropriate interpretation is therefore that the design was perceived as supporting autonomy and involvement, not that it produced self-regulated learners.

The design of student choice warrants particular attention. The task-choice indicator was lower than the general motivation indicator, even though it remained in the very-high range. Research on learner-controlled instruction shows that choice can be beneficial but is sensitive to classroom conditions and the way options are structured [30], [31]. One practical implication is structured flexibility: offer a limited number of meaningful alternatives, state common learning outcomes and assessment criteria, provide examples, and allow students to select a route that matches their readiness without making them design the entire task.

Taken together, these findings suggest a practical design principle: digital differentiation is most defensible when variation is coordinated across resources, activity routes, interaction, products, and feedback. For

instructors, this means (i) offering accessible resources in more than one representation; (ii) using guided activity choices; (iii) aligning product alternatives to shared outcomes and rubrics; (iv) scheduling actionable digital feedback; and (v) checking whether students actually use the options. These recommendations follow from the observed weak points and from the evidence on differentiation, digital pedagogy, UDL, and feedback [1], [6], [21], [22].

Several limitations constrain the conclusions. The study used 35 students from one Information Technology Education program, with no reported probability-sampling frame and participant demographic information limited to gender. The study also lacked a comparison group, pretest, longitudinal follow-up, or objective learning measure. The available documentation does not specify the platform, intervention duration, survey date, item-screening rule, or validity statistic. All items were positively worded, which increases susceptibility to acquiescence and ceiling effects, and the overlap between implementation and acceptance indicators limits the distinctiveness of the acceptance summary. The very high alpha may indicate strong item coherence, but it may also reflect item redundancy; alpha alone does not establish validity [12]. These limitations do not negate the reported perceptions, but they restrict interpretation and generalizability. Future work should preregister a clearly documented instrument, report sampling and participant characteristics, test construct structure and discriminant validity, and combine pre/post or comparative designs with interviews, learning analytics, and objective performance outcomes.

5. CONCLUSION

This study found that 35 Information Technology Education students reported favorable perceptions of differentiated learning through digital pedagogical design and favorable acceptance of the approach. The overall implementation score was 3.28 (81.88%), and the secondary acceptance summary was 3.31 (82.74%). These values describe the cohort's reported experience at the time of measurement; they do not establish learning gains or causal effects. The highest ratings concerned digital pedagogical design and technology-supported collaboration. Product and assessment differentiation, especially presentation choice and timely digital feedback, were comparatively weaker. The principal practical implication is structured flexibility: offer a manageable set of meaningful options, align them with common outcomes and rubrics, and provide actionable feedback. Because the study was a single post-implementation survey of one cohort, the findings should be read as context-bound implementation feedback rather than as evidence that digital differentiation caused changes in motivation, engagement, self-regulation, or achievement. Larger multisite studies with documented instruments, comparative or longitudinal designs, and objective outcome measures are needed to test those possibilities.

DECLARATIONS

Author Contributions

Margaretha Karolina Sagala: Conceptualization; Methodology; Investigation; Writing – Original Draft. **Afif Rahman Riyanda:** Formal Analysis; Validation; Investigation; Writing – Original Draft; Writing – Review & Editing. **Daniel Rinaldi:** Investigation; Writing – Review & Editing. **Ghea Chandra Surawan:** Investigation; Methodology (instrument development); Writing – Review & Editing. All authors reviewed and approved the final manuscript and accepted responsibility for the work.

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Competing Interests

The authors declare no competing interests.

Ethics Approval

The study was conducted in accordance with the ethical principles and applicable institutional guidelines governing research involving human participants.

Informed Consent

Informed consent was obtained from all participants before participation. Participants were informed about the study purpose and procedures, the voluntary nature of participation, confidentiality, and their right to withdraw without consequence.

Consent for Publication

Not applicable. The study does not report identifiable participant data, images, or other information that could identify an individual.

Study or Protocol Registration

This descriptive survey was not prospectively registered in a study or protocol registry.

Data Availability

The data supporting the findings are not publicly available because of privacy and ethical considerations concerning the participants. They may be available from the corresponding author upon reasonable request, subject to applicable ethical and institutional requirements.

Generative AI and AI-Assisted Technologies

During manuscript preparation, the authors used ChatGPT solely for language editing, grammar correction, and readability. The authors reviewed and verified all AI-assisted suggestions, made the final substantive and scientific decisions, and take full responsibility for the content.

Preprint and Prior Dissemination

The authors declare that this manuscript has not been previously published or posted as a preprint, conference paper, conference abstract, working paper, thesis, dissertation, repository version, or other related publication.

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