Advances in Social Sciences Research Journal – Vol. 12, No. 12
Publication Date: January 03, 2026
DOI:10.14738/assrj.1212.19752.
Alqsairi, M. M. Q. & Ab Jalil, H. (2025). Stages of Concern, Professional Development, and Levels of Assistive Technology Use in Special Education: Evidence from Jordanian Special Education Teachers. *Advances in Social Sciences Research Journal*, *12(12).* 344-361.

Stages of Concern, Professional Development, and Levels of Assistive Technology Use in Special Education: Evidence from Jordanian Special Education Teachers

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ABSTRACT

The adoption of assistive technology (AT) in special education holds promise for improving teaching effectiveness and student learning, yet its adoption by teachers remains inconsistent. Guided by the Concerns-Based Adoption Model (CBAM), this study examined the relationship between teachers' stages of concern, professional development needs, and their levels of AT use (LoU) in public schools in Jordan. A descriptive and correlational quantitative design was employed, with 374 teachers selected through purposive sampling. Data were collected using validated instruments assessing Stages of Concern, professional development needs, and Levels of Use, and analyzed using descriptive statistics and Partial Least Squares Structural Equation Modeling (PLS-SEM). Results indicated that most teachers were in the early stages of AT adoption, with high concerns at Awareness, Informational, and Personal stages, and limited engagement at higher LoU levels such as Integration and Renewal. Both teachers' concerns and professional development needs were positively associated with LoU, highlighting the importance of addressing personal and professional factors to facilitate effective technology adoption. Findings underscore the need for targeted, sustained professional development, collaborative practices, and adequate institutional support to promote reflective, integrated, and sustainable use of AT in special education. This study contributes to theory by validating CBAM in the context of AT adoption and provides practical guidance for educators and policymakers to enhance teacher readiness, adoption behaviors, and learning outcomes.

Keywords: Professional Development, Teachers' Use of Assistive Technology, Special Education Classrooms, Jordanian, Levels of Use (LoU), Concern-Based Adoption Model (CBAM).

INTRODUCTION

Assistive technology (AT) has become a critical innovation in special education, offering tools that enhance learning, communication, and active participation for students with diverse needs [1]. Despite the well-documented benefits, the adoption of AT by special education teachers remains

uneven, influenced by individual, professional, and contextual factors. In this study, adoption is defined as the degree to which teachers accept, integrate, and sustain the use of AT in their instructional practices, encompassing both their readiness and actual engagement with the technology [2].

Teachers play a central role in AT adoption, acting as the primary agents who decide whether and how these technologies are implemented in classrooms. Previous research indicates that successful adoption is contingent upon teachers' concerns, perceptions of readiness, and access to professional development opportunities [3]. However, despite increasing availability of AT tools, adoption rates remain low in many settings due to insufficient support, lack of targeted training, and uncertainty about the applicability of AT for diverse learners [4].

The Concerns-Based Adoption Model (CBAM) provides a comprehensive framework for examining educational innovations by distinguishing between teachers' stages of concern and their observable levels of use (LoU) [5]. While prior studies have explored teachers' concerns and professional development needs individually, few have empirically investigated how these factors jointly predict levels of AT adoption. Positioning LoU as the primary outcome allows for a focused assessment of teachers' actual adoption behaviors, beyond attitudes or self-reported readiness [6].

Professional development (PD) is a critical mechanism for promoting adoption, equipping teachers with the knowledge, skills, and confidence necessary for effective AT use [7]. Generic or one-off PD programs often fail to address teachers' specific concerns or the stage of adoption they are experiencing, limiting their impact. By examining how teachers' stages of concern and perceived PD need influence Levels of Use, policymakers and teachers can design targeted interventions to support sustained and meaningful AT adoption[8, 9].

Moreover, teachers may exhibit heterogeneous adoption behaviors, forming distinct profiles based on their LoU, concerns, and PD needs. Identifying these profiles provides actionable insights into the types of support and interventions most effective for different groups, moving beyond one- size-fits-all approaches [10, 11].

This study seeks to advance understanding of AT adoption among special education teachers by applying the CBAM framework. The study is guided by three primary objectives: (1) To investigate current patterns and levels of AT adoption among teachers; (2) To examine how teachers' stages of concern and perceived professional development needs influence their LoU; and (3) To identify distinct adoption profiles based on LoU, stages of concern, and PD needs. By addressing these objectives, the study aims to inform evidence-based strategies to enhance teacher readiness, adoption behaviors, and ultimately, learning outcomes in special education classrooms.

LITERATURE REVIEW AND HYPOTHESES DEVELOPMENT

Stages of Concerns and Levels of Technology

The Concerns-Based Adoption Model (CBAM) provides a comprehensive framework for understanding how educators experience and implement educational innovations through two interrelated constructs: Stages of Concerns (SoC) and Levels of Use (LoU). While SoC captures the evolving perceptions, beliefs, and concerns of teachers toward an innovation, LoU reflects

URL: http://dx.doi.org/10.14738/assrj.1212.19752

their actual patterns of implementation in instructional practice. Together, these constructs offer complementary insights into both the psychological and behavioral dimensions of innovation adoption [12].

Research indicates that teachers' concerns tend to evolve systematically as they gain experience with an innovation, and these evolving concerns are closely associated with corresponding changes in levels of use. At the early stages of adoption, teachers often demonstrate heightened self-related concerns, such as limited awareness or uncertainty about personal competence, which are commonly associated with non-use, orientation, or preparation levels of use. Studies have shown that without targeted support, teachers experiencing dominant self and task concerns are less likely to move beyond initial or mechanical implementation stages [12-14].

As teachers become more familiar with an innovation, their concerns gradually shift from personal and managerial issues toward the perceived impact on student learning and instructional effectiveness. This transition is frequently accompanied by advancement from mechanical or routine use to more adaptive and reflective levels of implementation. Empirical evidence suggests that teachers demonstrating consequence- and collaboration-oriented concerns are more likely to refine their instructional practices, coordinate their efforts with colleagues, and integrate the innovation more systematically within the curriculum [14-17]. This progression reflects a deepening engagement with innovation and a growing emphasis on maximizing its educational value.

Furthermore, advanced stages of concern, particularly refocusing, are strongly associated with higher levels of use such as integration and renewal. Teachers operating at these stages critically evaluate the effectiveness of the innovation and actively seek improvements or alternative approaches to enhance outcomes. Research has shown that educators exhibiting impact-oriented concerns are more likely to modify instructional strategies, collaborate across professional communities, and sustain innovation use over time [18, 19]. These findings underscore the dynamic and reciprocal relationship between teachers' concerns and their implementation behaviors.

Overall, literature consistently supports the premise that progression through the stages of concern is closely linked to advancement across levels of use. Teachers' movement from self-oriented to impact-oriented concerns parallels their transition from initial exposure to sustained and sophisticated implementation of educational innovations. Understanding this relationship is particularly valuable in special education contexts, where the effective adoption of assistive technology requires both cognitive readiness and behavioral competence. Consequently, examining SoC alongside LoU provides a robust analytical lens for assessing teachers' adoption trajectories and identifying targeted interventions to support effective and sustainable technology use [20].

- **H1:** There is a significant relationship between Stages of Concerns and teachers' level of use of assistive technology in Jordanian special education classrooms.

Professional Development and Levels of Technology

Professional development (PD) is widely recognized as a pivotal factor in enhancing teachers' engagement with educational innovations and supporting their advancement across different

levels of technology utilization. Prior research indicates that PD initiatives tailored to teachers' professional needs significantly facilitate movement from non-use or limited use toward more advanced stages of implementation [21, 22]. When professional learning opportunities are aligned with instructional demands and contextual realities, they contribute to increased competence, confidence, and sustained technology adoption.

Several studies have highlighted that special education teachers often begin at lower levels of technology use due to limited knowledge and reduced self-efficacy in relation to assistive technology (AT). Schaaf [7] reported that many educators initially operate at early stages of use; however, PD programs emphasizing hands-on training, problem-solving activities, and systematic evaluation of AT tools enable teachers to progress toward Mechanical, Routine, and Refinement stages. These findings demonstrate that effective PD goes beyond exposure to technology and instead focuses on developing practical skills and pedagogical strategies for meaningful classroom integration.

Inquiry-oriented and practice-based PD approaches have also been shown to exert a strong influence on teachers' levels of use. Hollins [23] found that participation in extended inquiry-based PD programs allowed teachers to develop AT-related competencies while examining accessibility within curricular design, thereby facilitating a shift from initial experimentation to consistent instructional application. In a similar, Wittmann and Olivier [24] demonstrated that PD initiatives grounded in adult learning theory and reinforced through classroom-based practice supported teachers' progression from Orientation and Preparation stages to Routine and Refinement stages. These findings suggest that PD addressing both content knowledge and instructional practice is essential for sustained and effective technology use.

Furthermore, empirical evidence indicates that PD plays a critical role in minimizing implementation barriers and strengthening teachers' confidence-both of which are central to achieving higher levels of use. Studies by Lamond, Caccese [25], Almethen [26] revealed that teachers who participated in comprehensive AT training programs, including workshops and individualized coaching, reported higher levels of use as the training addressed technical challenges, practical constraints, and individual learning needs. Similarly, Matar [27], Dodge and Karam [28] emphasized that PD initiatives responding to teachers' concerns-ranging from personal efficacy to classroom management-encourage progression toward Integration and Renewal stages of use. Collectively, the literature consistently demonstrates that well-structured, needs-based professional development enhances teachers' knowledge and skills while facilitating advancement across levels of use, ultimately supporting the effective and sustainable adoption of educational innovations [2].

- **H2:** There is a significant relationship between professional development needs and teachers' level of use of assistive technology in Jordanian special education classrooms.

METHODOLOGY

Research Design

The present study employed a descriptive and correlational quantitative design to examine the adoption of assistive technology (AT) among special education teachers. Quantitative methodology was chosen because it enables precise measurement of variables and the identification of statistically significant relationships, particularly between teachers' Stages of Concern, Professional Development needs, and their Levels of Use (LoU) of AT. The correlational

URL: http://dx.doi.org/10.14738/assrj.1212.19752

approach was particularly appropriate for evaluating the strength and direction of relationships among the main study variables, while also providing insights into adoption patterns within real- world classroom settings [29-32].

Location of Study

The study was carried out in public schools in Jordan, where 875 special education teachers provide services across the country (Ministry of Education, 2021). The teaching staff predominantly hold bachelor's degrees in special education, with a proportion possessing advanced qualifications, reflecting a spectrum of expertise in addressing learning difficulties and implementing inclusive practices [33-36]. Conducting the research within this context provides an authentic understanding of assistive technology (AT) adoption in classrooms, where teachers encounter diverse challenges, varying levels of resources, and differential access to professional development opportunities. Utilizing the Concerns-Based Adoption Model (CBAM) enabled a nuanced examination of teachers' readiness, engagement behaviors, and adoption patterns, while offering insights into potential strategies and interventions to enhance the effective use of AT in educational practice [5, 37-39].

Population of the Study

The target population consisted of all special education teachers employed in public schools in Jordan. Participants were selected based on demographic characteristics, including age, gender, academic qualifications, teaching experience, prior professional development, and AT usage. By focusing on teachers actively involved in AT practices, the study ensured that the collected data accurately reflected authentic experiences and adoption behaviors. Examining teachers' concerns and professional development needs is essential for enhancing AT adoption and informing tailored interventions aimed at improving teaching practices and learning outcomes in special education settings [3, 40, 41].

Sampling

A purposive sampling technique was employed to select participants who met specific inclusion criteria, ensuring the relevance and quality of the responses [39, 42, 43]. Eligible teachers were required to be actively teaching in special education classrooms, currently using assistive technology (AT), demonstrating an interest in professional development, and willing to participate voluntarily. The target sample size was determined using Cochran [44] formula for estimating sample sizes in large populations, in line with recommendations from SEM literature [45-47]. Based on these calculations and allowing for potential non-response, a total of 374 teachers were recruited. This sample size ensured sufficient statistical power for structural equation modeling, providing a robust and representative depiction of the population.

Instrumentation

Data were collected through a structured, cross-sectional survey divided into four sections: Stages of Concern, Professional Development Needs, Levels of Use, and demographic information. The Stages of Concern Questionnaire (SoCQ) [48] measures teacher concerns across seven stages on a 0–7 Likert scale. The Levels of Use (LoU) instrument Hall [18] assess AT adoption from non-use to refinement. The Professional Development Needs scale evaluates teachers' perceived learning requirements, while demographic items were designed by the researcher. This combination of instruments ensured comprehensive assessment of teachers' adoption behaviors, concerns, and professional development priorities.

To ensure content validity, the survey was reviewed by three experts in educational technology and teacher development from Malaysia and Jordan, who provided feedback on clarity, relevance, and alignment with research objectives. A pilot study with 36 teachers in Amman confirmed clarity, consistency, and internal reliability of the instrument. Reliability testing indicated Cronbach's alpha values ranging from 0.900 to 0.943 and composite reliability values from 0.934 to 0.974. Confirmatory Factor Analysis (CFA) further confirmed convergent validity (AVE > 0.5) and discriminant validity, supporting the accuracy and independence of measured constructs. Items that did not meet factor loading criteria were removed, ensuring that the final instrument validly and reliably measured concerns, professional development needs, and Levels of use [47, 49-51].

DATA ANALYSIS AND RESULTS

The study used quantitative analysis to examine the relationships between teachers' concerns, professional development needs, and their level of use of assistive technology. Descriptive statistics summarized the participants' demographics and responses, while Partial Least Squares Structural Equation Modeling (PLS-SEM) was applied to test the hypothesized relationships and assess the predictive power of the model [52-54]. This approach provided a clear understanding of the factors influencing teachers' adoption and use of assistive technology.

Overview of Participants' Demographic Profiles

Based on the demographic information presented in Table 1, the sample consisted of 374 special education teachers. The gender distribution showed a slight predominance of females (56.4%) compared to males (43.6%). In terms of age, 17.9% were between 22–29 years, 45.7% were 30–39 years, and 36.4% were 40 years and above. The respondents' educational qualifications indicated that 51.6% held a bachelor's degree, 25.1% a master's degree, and 23.3% a doctoral degree. Teaching experience also varied, with 47.1% having 1–9 years of experience, 42.0% having 10–19 years, and 11.0% having 20 years or more. These demographic characteristics provide a comprehensive foundation for interpreting the subsequent analysis of AT adoption patterns.

Table 1: Summary of Participants' Demographic Profiles

Gender	**Frequency (n)**	**Percent (%)**
Male	163	43.6%
Female	211	56.4%
Age	**Frequency (n)**	**Percent (%)**
22-29	67	17.9%
30-39	171	45.7%
40-above	136	36.4%
Level of Education	**Frequency (n)**	**Percent (%)**
Bachelor	193	51.6%
Master	94	25.1%
Doctoral	87	23.3%
Years of Teaching Experience	**Frequency (n)**	**Percent (%)**
1-9	176	47.1%
10-19	157	42.0%
20-above	41	11.0%

N=374

Stages of Concern

Teachers' concerns regarding the adoption of assistive technology (AT) were assessed using the Stages of Concern Questionnaire (SoCQ) developed by the Southwest Educational Development Laboratory (SEDL) [48]. The 30-item instrument measures seven developmental stages of concern [55]. Raw scores were converted into percentile values following established scoring procedures, and scale-level means were computed to represent the intensity of concerns at each stage.

Interpretation of Stages of Concern Data:

Based on Table 2 and the corresponding profile illustrated in Figure 1, teachers demonstrated the highest level of concern at the Awareness (Stage 0) level (98%), indicating that many respondents were either not yet focused on assistive technology (AT) or were preoccupied with other instructional or administrative priorities. The Informational (Stage 1) stage showed the second-highest percentile score (90%), suggesting a strong interest among teachers in learning more about AT and its potential benefits. Personal (Stage 2) concerns (72%) also appeared at a relatively high level, reflecting teachers' uncertainty about how AT might affect their roles, responsibilities, and readiness to adopt it.

Additionally, Management (Stage 3) concerns were moderate (77%), implying that while some teachers had begun thinking about logistical or organizational aspects of AT adoption, many had not yet reached a point where daily-use challenges were central. In contrast, lower concern levels were observed in the Consequence (54%), Collaboration (48%), and Refocusing (65%) stages. This pattern indicates that most teachers have not progressed to more advanced reflections about student impact, collaborative implementation efforts, or alternative strategies for optimizing AT use.

The table 2 and figure 1 a classic "nonuser" SoC profile, as described by Hord, Stiegelbauer [56]. This profile is characterized by elevated concerns in the early stages (0, 1, 2) and markedly lower concerns in the later stages (4, 5). Such a pattern typically emerges when an innovation is newly introduced or has not yet been fully implemented within an educational context.

Furthermore, the slight tailing-up at Stage 6 (Refocusing) suggests that some teachers may already be considering alternative ideas or expressing reservations about the current AT solutions available. This upward shift, although modest, can indicate competing priorities or skepticism about existing implementation processes.

Table 2: Percentile Distribution of Teachers' Stages of Concern

Construct		Stage of Concern	Percentile
	Stage 0	Unconcerned	98%
	Stage 1	Informational	90%
	Stage 2	Personal	72%
Concern	Stage 3	Management	77%
	Stage 4	Consequence	54%
	Stage 5	Collaboration	48%
	Stage 6	Refocusing	65%

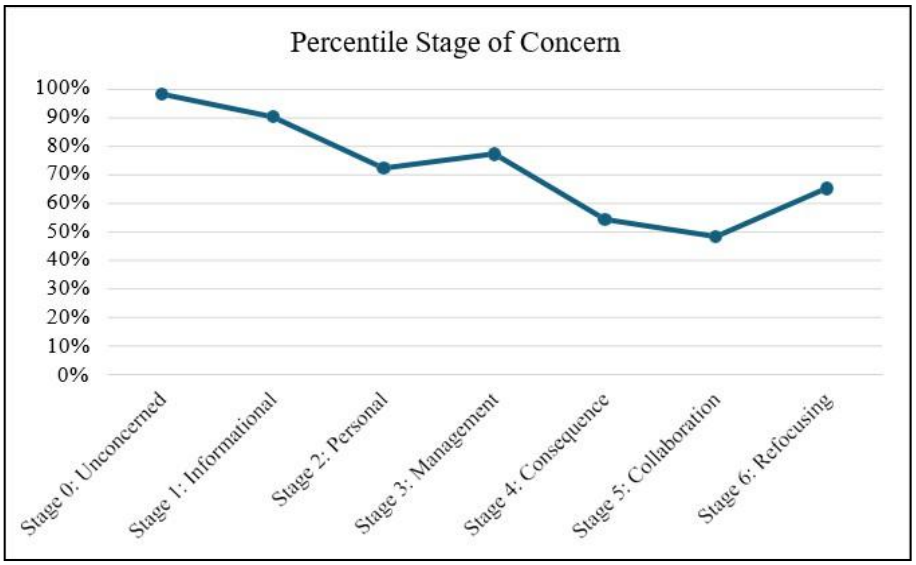

Figure 1: Stages of Concern Profile for the Respondents

Overall, the combined evidence from the table and figure suggests that AT adoption is still at an early developmental phase among teachers, with strong informational needs, emerging personal concerns, and limited engagement with advanced stages of reflective or collaborative use. These findings underscore the importance of targeted training, clear guidance, and structured support to help teachers progress toward more effective and sustained AT use.

Professional Development Needs:

Professional development needs related to assistive technology (AT) were assessed using ten items that examined teachers perceived requirements for training, resources, collaboration, and institutional support. The mean scores and standard deviations for these items are presented in Table 3, offering insight into teachers' readiness and capacity to adopt AT in their instructional practices.

Overall, teachers reported consistently high levels of need across all items, indicating a strong demand for targeted professional development. The highest mean scores were associated with the need for additional resources demonstrating how AT can be effectively integrated into the curriculum, as well as the need for training opportunities focused on pedagogical strategies that incorporate AT. These patterns suggest that teachers are seeking both foundational knowledge and practical, application-oriented support.

Teachers also expressed a need for clearer justifications and evidence regarding the instructional value of AT, indicating that motivational and conceptual clarity remain important. Moreover, respondents highlighted a lack of time to revise or adapt curriculum materials for AT integration, reflecting structural and workload-related barriers.

The results further show strong interest in ongoing workshops and seminars, with teachers emphasizing the need for regular, sustained professional development rather than one-time sessions. Additionally, many teachers indicated a desire to collaborate with colleagues on AT-related instructional challenges, suggesting that peer learning and professional communities could be valuable components of future training initiatives.

Table 3: Teachers' Professional Development Needs Related to Assistive Technology

No.	Item	Mean	SD
1	I have an immediate need for more training with a curriculum that integrates assistive technology.	4.9251	1.40842
2	I need more resources that illustrate how to integrate assistive technology.	5.0027	1.3512
3	I need more training opportunities with teaching strategies that integrate assistive technology.	5.0053	1.36402
4	I need more compelling reasons why I should incorporate assistive technology into teaching.	4.9198	1.29713
5	I need more time to change the curriculum to incorporate assistive technology.	4.9866	1.30675
6	Attending a few technology workshops and seminars is enough for me.	4.8717	1.34208
7	I need more regular assistive technology seminars/workshops.	4.8743	1.40765
8	I would like to collaborate with my colleagues on instructional planning related to assistive technology.	4.9278	1.35125
9	My effort is primarily directed toward mastering tasks required to use assistive technology effectively.	4.9171	1.35855
10	The technology professional development plan meets my technological needs.	4.9706	1.33088

These results underscore the importance of developing comprehensive, continuous, and practice-oriented professional development programs. Such initiatives should equip teachers not only with technical skills but also with pedagogical strategies, collaborative opportunities, and institutional support necessary for effective AT adoption.

Level of Use of Assistive Technology

Based on the results presented in Table 4 and Figure 2, the levels of use of Assistive Technology (AT) among the 374 respondents were examined, categorizing their engagement into eight distinct levels. The findings revealed substantial variation in teachers' adoption and implementation of AT within their classrooms.

Table 4: Teachers' Level of Use of Assistive Technology

Level of Use	Description	Freq	Percentile
Non-Use	I have little or no knowledge of Assistive Technology, no involvement with it, and I am doing nothing toward becoming involved.	118	31.4%
Orientation	I am seeking or acquiring information about Assistive Technology.	105	28.0%
Preparation	I am preparing for the first use of Assistive Technology.	65	17.3%
Mechanical Use	I focus most effort on the short-term, day-to-day use of Assistive technology with little time for reflection. My effort is primarily directed toward mastering tasks required to use Assistive Technology.	15	4.0%
Routine	I feel comfortable using Assistive Technology. However, I am putting in a little effort and thought to improve Assistive Technology or its consequences.	54	14.5%
Refinement	I vary the use of Assistive Technology to increase the expected benefits within the classroom. I am working on using Assistive Technology to maximize the effects with my students.	4	1.2%

Integration	I am combining my own efforts with related activities of other teachers and colleagues to achieve impact in the classroom.	8	2.2%
Renewal	I continually evaluate the quality of my use of Assistive Technology.	5	1.4%

The data indicated that the largest proportion of respondents, 118 teachers (31.4%), fell into the Non-Use category. These participants reported minimal or no knowledge of AT, were not actively involved, and had not taken steps toward engagement, suggesting that a considerable portion of teachers were in the earliest phase of AT awareness.

Following this, 105 respondents (28.0%) were at the Orientation level, actively seeking or acquiring information about AT, indicating potential for future engagement. Additionally, 65 respondents (17.3%) were at the Preparation stage, preparing for their initial use of AT, reflecting readiness to incorporate the technology into teaching practices but not yet engaging in regular implementation.

Only 15 respondents (4.0%) were classified as Mechanical Users, focusing primarily on short-term, daily use of AT with limited reflection, and directing their efforts toward mastering basic AT tasks. At the Routine level, 54 respondents (14.5%) reported comfort in using AT but exerted minimal effort to enhance its effectiveness or outcomes, indicating a steady yet unprogressive adoption pattern.

Higher levels of AT engagement were less common. Four respondents (1.2%) were in the Refinement category, actively varying AT use to maximize student outcomes. Eight respondents (2.2%) reached the Integration level, coordinating AT use with colleagues to increase instructional impact. Finally, five respondents (1.4%) were in the Renewal stage, continuously evaluating and improving the quality of AT implementation, demonstrating a commitment to sustainable and reflective technology use.

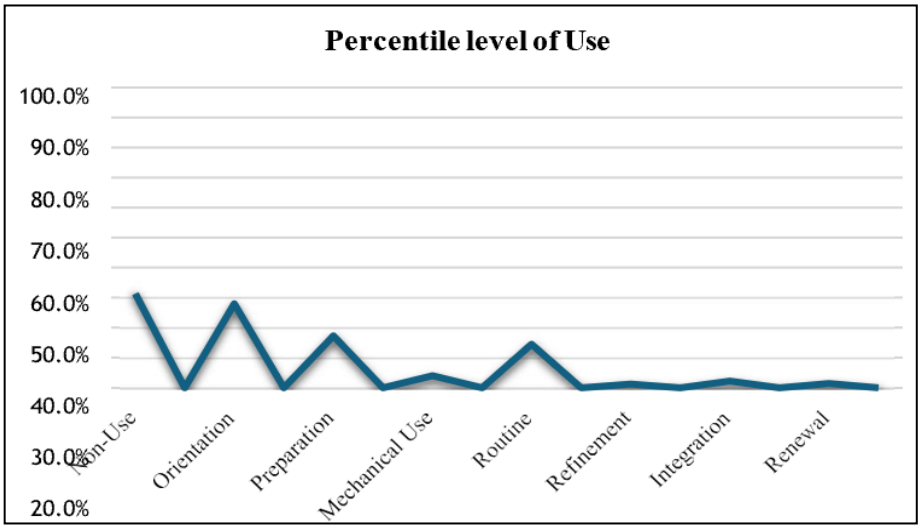

Figure 2: Teachers' Level of Use of Assistive Technology (Percentile Distribution)

The results demonstrated that the majority of teachers remained in the early stages of AT adoption (Non-Use, Orientation, and Preparation), whereas relatively few engaged in higher-

level, collaborative, or evaluative use (Integration and Renewal). These findings underscore the need for targeted professional development and structured interventions to support teachers in progressing from initial awareness to proficient and sustainable implementation of AT in educational contexts.

Relationships Between Stages of Concerns, Professional Development Needs, and Level of Use

This section presents the relationships between teachers' stages of concern, professional development (PD) needs, and their level of use (LoU) of assistive technology (AT) in special education classrooms. Path coefficient analysis was conducted to examine the strength and significance of these relationships.

Direct Effect of Stages of Concerns on Level of Use:

The results in Table 5 indicate a statistically significant positive relationship between teachers' concerns and their level of use of AT ($\beta = 0.773$, $t = 23.696$, $p < 0.001$). This suggests that teachers who report higher stages of concern are more likely to demonstrate greater engagement with AT in their classrooms. These findings support the hypothesis that teachers' concerns positively influence the level of use, emphasizing the importance of addressing these concerns to promote effective technology adoption.

Table 5: Significance of Path Coefficient

Path	Bata (β)	T Value	P value
Stages of Concern -> Level of Use	0.773	23.696	0.000

Direct Effect of Professional Development Needs on Level of Use:

The analysis also revealed a significant positive relationship between professional development needs and level of use of AT ($\beta = 0.194$, $t = 5.536$, $p < 0.001$), as shown in Table 6. Teachers identifying higher professional development needs tend to demonstrate increased engagement with AT. This finding supports the hypothesis that professional development needs positively influence the level of use, highlighting the role of training and resources in facilitating effective implementation.

Table 6: Significance of Path Coefficient

Path	Bata (β)	T Value	P value
Professional Development Needs -> Level of Use	0.194	5.536	0.000

Summary of the Results

This study examined teachers' concerns, professional development (PD) needs, and their influence on the level of use (LoU) of assistive technology (AT) in special needs education. The results revealed that most teachers exhibit a nonuser profile, with the highest concerns at Stages 0 (Awareness), 1 (Informational), and 2 (Personal), indicating limited familiarity with AT but a strong desire to learn about its functions and applications. Concerns were lower at Stages 3–5 (Management, Consequence, Collaboration), while a slight increase at Stage 6 (Refocusing) suggested minor resistance or alternative ideas regarding AT implementation.

The analysis showed a significant positive relationship between teachers' concerns and LoU ($\beta = 0.773$, $p < 0.001$), demonstrating that teachers who experience higher stages of concern are

more likely to adopt AT. Similarly, PD needs were positively associated with LoU ($\beta = 0.194$, $p < 0.001$), indicating that teachers who perceive a need for further training are more likely to increase their use of AT. These findings align with the Concerns-Based Adoption Model (CBAM), highlighting the importance of addressing personal concerns and providing targeted professional development to facilitate effective technology adoption.

Regarding levels of AT use, the majority of teachers were in the early stages: Non-Use (31.4%), Orientation (28.0%), and Preparation (17.3%). Higher levels of engagement, including Routine (14.5%), Refinement (1.2%), Integration (2.2%), and Renewal (1.4%), were less common, suggesting limited sustained, collaborative, or reflective use of AT. Key barriers included insufficient training, lack of technical skills, limited resources, and inadequate institutional support.

In conclusion, the findings emphasize that addressing teachers' concerns, providing structured professional development, ensuring access to resources, and promoting collaboration are essential for enhancing AT adoption. Interventions targeting these areas can enable teachers to progress from awareness and preparation to proficient, reflective, and sustainable use, ultimately improving teaching and learning outcomes in special needs education.

DISCUSSION

The study explored teachers' concerns, professional development (PD) needs, and their influence on the level of use (LoU) of assistive technology (AT) in special needs education. The analysis revealed that the majority of teachers exhibit a nonuser profile, with the highest concerns at Stages 0 (Awareness), 1 (Informational), and 2 (Personal). This pattern indicates a lack of familiarity with AT and a desire to acquire basic knowledge about its functions and requirements. Concerns decreased through Stage 3 (Management) and were lowest at Stages 4 (Consequence) and 5 (Collaboration), suggesting that practical management and collaborative aspects are not major barriers. A slight increase at Stage 6 (Refocusing) implies that some teachers may have alternative ideas or resistance toward full AT adoption.

The path coefficient analysis demonstrated a statistically significant positive relationship between teachers' concerns and their LoU ($\beta = 0.773$, $t = 23.696$, $p < 0.001$). Teachers who expressed higher stages of concern were more likely to adopt AT in their teaching practices. These findings align with the Concerns-Based Adoption Model (CBAM), which posits that teachers' stages of concern influence their readiness and willingness to implement innovations [21]. Previous research reinforces this relationship, emphasizing that teachers' attitudes and concerns predict technology adoption behaviors [15, 16]. Studies conducted in Jordan [48] and elsewhere further highlight that addressing personal concerns through professional development and institutional support is essential for effective technology integration.

Regarding professional development needs, the study found a strong positive correlation with LoU ($\beta = 0.194$, $t = 5.536$, $p < 0.001$). Teachers with higher PD needs were more likely to demonstrate increased use of AT. The findings suggest that targeted, continuous, and structured PD programs tailored to teachers' specific needs significantly enhance AT adoption. This aligns with prior research indicating that professional development that addresses teachers' skills, confidence, and concerns is critical for improving technology use [57, 58].

The distribution of teachers across the LoU levels further supports these conclusions. Most respondents were in the Non-Use (31.4%) and Orientation (28.0%) stages, actively seeking information about AT but not yet engaging in practical implementation. The Preparation stage (17.3%) reflects readiness to integrate AT, while higher levels, such as Routine (14.5%), Refinement (1.2%), Integration (2.2%), and Renewal (1.4%), were less common, indicating that sustained, collaborative, and reflective AT use is still limited.

Several challenges were identified as barriers to effective AT implementation. These include insufficient training and proficiency, lack of hands-on experience, limited resources and funding, technological barriers, and inadequate institutional support. Addressing these challenges requires comprehensive professional development, access to resources, collaboration among teachers and AT specialists, and ongoing institutional support to foster sustainable integration. Altogether, the study highlights that while teachers are interested in AT and eager to learn, the majority remain in the early stages of awareness and preparation. By addressing concerns and professional development needs, educational institutions can significantly improve AT adoption, thereby enhance teaching and learn outcomes in special needs education. These findings underscore the importance of systematic interventions, targeted training programs, and sustained support to move teachers from awareness to proficient and reflective use of AT.

LIMITATIONS OF THE STUDY

Despite providing valuable insights, this study has several limitations that should be acknowledged. First, cross-sectional design restricts data collection to a single point in time, limiting the ability to capture longitudinal trends in teachers' adoption and use of assistive technology (AT). Consequently, the findings may not fully reflect changes in teachers' practices or concerns over time.

Second, the study relied exclusively on quantitative data collected via self-administered questionnaires, which, while efficient for capturing large datasets, does not provide the depth of understanding achievable through qualitative methods such as interviews or observations. This limitation may have resulted in a partial understanding of teachers' experiences and perceptions regarding AT adoption [59, 60].

Third, the focus on public schools limits the generalizability of the findings to other educational contexts, particularly private or international schools, where resource availability, governance, and student demographics may differ significantly. Future research should consider comparative analyses across diverse school types to address this limitation. Additionally, administrative constraints and confidentiality concerns posed challenges in accessing schools and collecting data, potentially restricting the comprehensiveness of the findings [2]. The reliance on self-reported data also introduces potential biases, including social desirability and recall inaccuracies [46]. Future studies could employ mixed-method approaches, combining quantitative and qualitative data, to provide a more nuanced and holistic understanding of AT adoption in educational settings.

IMPLICATIONS OF THE STUDY

The findings of this study carry significant implications for both theory and practice in the field of special education, particularly regarding the adoption and use of assistive technology (AT).

The study confirms that teachers' stages of concern, as conceptualized in the Concerns-Based Adoption Model (CBAM), are strongly associated with their level of AT use. This validates CBAM as a robust framework for understanding technology adoption in educational contexts and highlights the importance of addressing teachers' concerns at various stages-from awareness to full integration-to promote effective and sustainable technology use. Understanding these stages allows policymakers and school leaders to identify critical points for intervention, such as the early awareness and informational stages, where targeted support may have the greatest impact.

Furthermore, the study underscores the essential role of professional development in enhancing teachers' engagement with AT. Teachers with higher professional development needs demonstrated greater levels of use, suggesting that providing tailored training programs, hands-on workshops, and ongoing mentorship can significantly improve technology adoption. These programs should be designed to address specific concerns and skill gaps, particularly for teachers at early stages of adoption. Additionally, the findings indicate that collaborative practices-such as sharing best practices with colleagues and engaging with AT specialists-can strengthen teachers' confidence and competence, supporting a more integrated and reflective approach to technology use in classrooms.

The results also highlight the necessity of differentiating support according to teachers' experience, age, and educational background. Tailoring interventions to accommodate varying levels of technological familiarity and comfort can enhance the effectiveness of professional development programs, ensuring that all teachers are equipped to implement AT successfully. Moreover, the study emphasizes the importance of adequate resources, technical support, and infrastructure, as limitations in these areas were identified as barriers to effective technology adoption.

Overall, these findings suggest that addressing teachers' concerns, providing sustained professional development, promoting collaboration, and ensuring adequate resources are critical to fostering the integration of AT in special education. By applying these insights, educational institutions can create a supportive environment that not only encourages AT adoption but also enhances teaching practices and learning outcomes for students with special needs.

CONCLUSION

This study provides empirical evidence highlighting the interplay between teachers' stages of concern, professional development needs, and the level of use of assistive technology in special education classrooms. Findings indicate that most teachers exhibit a nonuser profile, with heightened concern at early stages (Awareness, Informational, Personal) and relatively low engagement in higher-level practices (Integration, Renewal). There is a statistically significant positive relationship between teachers' concerns and AT use, confirming that addressing personal and professional concerns can facilitate higher adoption. Similarly, professional development needs are strongly correlated with AT use, reinforcing the necessity for tailored, continuous, and collaborative training programs. The study's theoretical contributions validate and extend the CBAM framework, providing insights into adoption dynamics, resistance, and professional development strategies. Practically, the findings offer actionable guidance for policymakers, educational leaders, and practitioners to design effective training, support, and

URL: http://dx.doi.org/10.14738/assrj.1212.19752

resource allocation that enhance AT integration and improve learning outcomes for students with special needs.

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