



Predicting Teaching Effectiveness Base on Technology Integrated Language Learning

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Abstract. This research explores the link between English teachers' acceptance of Instant Response Systems (IRSs) and their perceived teaching effectiveness. The study involved 151 English teachers who completed an online survey and participated in semi-structured interviews about their IRS acceptance and perceived teaching effectiveness. The findings reveal that teaching effectiveness is positively influenced by constructivist pedagogical beliefs, attitude toward IRS use, perceived IRS usefulness, and facilitating conditions. The integration of IRS-based tools has demonstrated benefits such as increased student motivation, engagement, and achievement. These tools also invigorate classroom dynamics and provide timely feedback, thereby enhancing teachers' ability to assess student learning progress.

Keywords: Teaching Effectiveness · Information Communication Technology Integration · Instant Response Systems

1 Introduction

Educators' adoption of information communication technologies (ICTs) has been widely discussed in recent decades. Numerous studies have applied the TAM (Technology Acceptance Model) [10, 11] and UTAUT (Unified Theory of Technology Acceptance and Use of Technology) [21] models to investigate teachers' intentions to use technology in teaching. These frameworks have identified multiple influencing factors [1, 3, 13, 15, 16].

Digital tools such as Instant Response Systems (IRSs) are commonly employed to facilitate effective classroom practices [2, 12]. IRS tools assist teachers in identifying knowledge gaps during instruction, enabling them to make necessary pedagogical adjustments to achieve their teaching objectives. Unlike previous studies that aimed to identify the influence of various factors on teachers' intentions to use technology, the current research not only considers pedagogical beliefs but also examines constructivist pedagogical beliefs alongside other technology acceptance factors. The study investigates the connections between teachers' acceptance of IRS and their teaching effectiveness. Additionally, it explores teachers' perceptions and attitudes regarding the use of IRS in language instruction.

2 Related Work

2.1 Teaching Effectiveness

Research indicates that teaching practices significantly impact students' motivation and learning outcomes [9, 20] with effective teaching enhancing the likelihood of achieving desired goals.

Calaguas (2012) conducted a literature review spanning 2000 to 2009, identifying six dimensions of teaching effectiveness: personality, subject matter expertise, relational competence with students, professional competence, teaching style, and classroom management. This research underscores the complexity of teaching effectiveness, which encompasses multiple dimensions. Recognizing that each teacher possesses a unique teaching style, self-evaluation has been suggested as a valuable tool for teachers to gain insights into their teaching practices. It enables teachers to assess their strengths and weaknesses and discover avenues for enhancing their effectiveness [5].

Buela and Joseph (2015) investigated how high school teachers' personalities relate to their self-evaluated teaching effectiveness. Teaching effectiveness was gauged across multiple dimensions, including classroom management, preparation, subject knowledge, interpersonal skills, and teacher attributes. They discovered a noteworthy link between extraverted personalities and proficiency in subject knowledge.

Similarly, Motallebzadeh et al. (2018) examined the connection between EFL (English as a Foreign Language) teachers' reflective practices and their perceived teaching effectiveness. Their findings showed a positive and substantial correlation between overall reflective practices and teaching effectiveness.

These studies underscore the multi-dimensional nature of teaching effectiveness, influenced by various factors. Some teacher-related attributes, like teaching style, personality traits, and reflective abilities, can best be assessed by the teacher themselves. As a result, the current research employs self-evaluation to measure teaching effectiveness.

2.2 Factoring Affecting Teachers' Intentions to Adopt Technology

The TAM and UTAUT models are built on certain assumptions. They posit that individuals' actual use of information technology is reflected in their intentions to use the technology, and their reactions to using technology impact these intentions [21]. Among the two models, reactions to information technology use are represented by core variables.

In TAM, core variables include perceived usefulness (PU), perceived ease of use (PEU), and attitude toward using (ATU). UTAUT, on the other hand, includes performance expectancy, effort expectancy, social factors (SF), and facilitating conditions (FC) as core variables. Notably, some of these core variables share conceptual similarities. For instance, perceived ease of use aligns with effort expectancy, while perceived usefulness corresponds to performance expectancy.

Previous research has highlighted that computer self-efficacy (CSE) plays a significant role in shaping PU and PEU for teachers [13, 17]. CSE not only mediates the relationship between perceived usefulness and perceived ease of use for teachers but also influences students' learning behaviors related to technology use [14].

Constructivist pedagogical beliefs (CPB) also contribute to PU and PEU. Teachers who embrace CPB prioritize encouraging students to construct meaning independently [4]. Studies have shown that EFL teachers' CPB significantly influence their perceptions of usefulness and ease of use [15]. Additionally, adopting constructivist-oriented teaching practices leads to higher perceptions of teaching effectiveness and increased learning satisfaction [20].

The remaining core variables are social factors (SF), facilitating conditions (FC), and attitude toward using (ATU). ATU is influenced by PU and PEU and determines users' intentions to use technology. SF positively impacts PU [17] and significantly affects university teachers' intentions to use technology [1, 16]. FC is a crucial factor influencing teachers' technology usage behaviors [16] and directly affects their intentions to use technology, explaining substantial variation in PEU [3, 17].

3 Methodology

A mixed-method research design was used to answer the following research questions:

- (1) What is the relationship between IRS acceptance factors and EFL teachers' perceived teaching effectiveness?
- (2) What are the determining factors that influence EFL teachers' perceived teaching effectiveness?
- (3) How do EFL teachers perceive the effectiveness of using IRS tools in teaching?

Quantitative data were collected from 151 EFL teachers in Taiwan on their perceptions of IRS in language teaching via a questionnaire. Participants have diverse educational backgrounds and have employed IRS in their teaching environments, which encompass elementary and junior high schools, senior high schools, universities, and language schools. The questionnaire includes three sections. Section one included demographic information. Demographic information contains teachers' personal background, which includes their gender, age, the level of education taught, as well as years of experience teaching and using IRS assessment tools. Section two dealt with the factors related

to IRS acceptance. Section three dealt with perceived teaching effectiveness. The measurement of IRS acceptance factors is comprised of 7 domains and 35 items. The measurement of teaching effectiveness includes four aspects and 27 items. The items were validated by previous studies. They were assessed using a 4-point Likert scale, ranging from “strongly disagree” (1) to “strongly agree” (4), with adjustments made to align with the specific context of this study. A semi-structured interview was adopted to probe EFL teachers’ attitude, thoughts, and perceptions about the use of IRS in teaching. The interview includes 8 questions, structured around the three key factors (PU, PEU, and ATU) in the TAM model. The questions can be found in Table 1.

Table 1. Interview questions and TAM factors

| Questions | TAM |
|--|-----|
| 1. How did you decide to use IRS tools? | PU |
| 2. Do you find IRS tools to be useful in your class? If so, why? | PU |
| 3. How do IRS tools impact teaching? | PU |
| 4. How easy is it to use IRS tools while you teach? | PEU |
| 5. How easy is it for you to integrate IRS tools in teaching? | PEU |
| 6. What perceived barriers prevent you from using IRS tools in teaching? | PEU |
| 7. What are your perceptions regarding the use of IRS tools to teach? | ATU |
| 8. What do you like or dislike about using IRS tools in teaching? | ATU |

4 Results

4.1 Quantitative Data

A moderate to strong positive correlation was found between most of the independent variables. As for the dependent variable, teaching effectiveness was found to significantly correlate with all independent variables except for PU.

The highest correlation was found between ATU and PEU with a correlation of 0.760 ($p < 0.01$), followed by ATU and PU with a correlation of 0.726 ($p < 0.01$). These were followed by PEU and CSE with a correlation of 0.701 ($p < 0.01$).

However, no significant relationship was found between CPB and SF, CPB and PU, CPB and PEU, CPB and ATU, and PU and TE. CPB only correlated significantly with FC ($r = 0.162$, $p < 0.05$), CSE ($r = 0.188$, $p < 0.05$), and TE ($r = 0.522$, $p < 0.01$) (Table 2).

Table 2. Pearson correlation coefficients for the study variables (n = 151).

| Variables | FC | SF | CSE | CPB | PU | PEU | ATU | TE |
|-----------|---------|---------|---------|---------|---------|---------|---------|----|
| FC | 1 | | | | | | | |
| SF | 0.558** | 1 | | | | | | |
| CSE | 0.378** | 0.300** | 1 | | | | | |
| CPB | 0.162* | 0.157 | 0.188* | 1 | | | | |
| PU | 0.387** | 0.437** | 0.592** | 0.093 | 1 | | | |
| PEU | 0.328** | 0.189* | 0.701** | 0.092 | 0.512** | 1 | | |
| ATU | 0.371** | 0.314** | 0.695** | 0.129 | 0.726** | 0.760** | 1 | |
| TE | 0.248** | 0.169* | 0.253** | 0.522** | 0.082 | 0.212** | 0.245** | 1 |

Note. * Correlation is significant at 0.05 level (2-tailed). ** Correlation is significant at 0.01 level (2-tailed). TE = teaching effectiveness, FC = facilitating conditions, SF = social factors, CSE = computer self-efficacy, CPB = constructivist pedagogical beliefs, PU = perceived usefulness of IRS, PEU = perceived ease of IRS use, ATU = attitude towards IRS use

A stepwise regression analysis was performed to determine the relationships among the variables. The stepwise regression analysis identified four key predictor variables for teaching effectiveness: CPB, ATU, PU, and FC. These variables significantly contribute to the variance in teaching effectiveness. In the initial step, CPB explained 27.2% of the variance. Subsequently, in the second step, ATU contributed an additional 3.2% to the explanation of teaching effectiveness. PU and FC accounted for 1.9% of the variance each in the third and fourth steps, respectively.

Notably, it's worth mentioning that PU exhibited a negative correlation with teaching effectiveness. This could be attributed to the lack of specificity regarding the particular IRS tools referred to in this study. While teachers generally perceive IRS tools as useful, their effectiveness may vary depending on the specific teaching context in which they are applied.

When ranked by their contribution to the variance, CPB emerged as the most influential predictor, followed by ATU, PU, and FC, in that order. Together, these four variables collectively explain approximately 34.2% of the variance in teaching effectiveness (Table 3).

Table 3. Stepwise regression analysis concerning the prediction of teaching effectiveness (n = 151).

| Step | Variable | Coefficient | SE | p | t | R ² | VIF |
|--------|----------|-------------|-------|-------|--------|----------------|-------|
| Step 1 | | | | | | 0.272 | |
| | CPB | 0.522** | 0.60 | 0.000 | 7.464 | 0.272 | 1.000 |
| Step 2 | | | | | | 0.304 | |
| | CPB | 0.498** | 0.60 | 0.000 | 7.206 | 0.272 | 1.017 |
| | ATU | 0.180* | 0.036 | 0.010 | 2.605 | 0.032 | 10.17 |
| Step 3 | | | | | | 0.323 | |
| | CPB | 0.498** | 0.059 | 0.000 | 7.279 | 0.272 | 10.17 |
| | ATU | 0.326* | 0.051 | 0.001 | 3.287 | 0.032 | 2.133 |
| | PU | -0.200* | 0.044 | 0.044 | -2.031 | 0.019 | 2.116 |
| Step 4 | | | | | | 0.342 | |
| | CPB | 0.481** | 0.059 | 0.000 | 7.039 | 0.272 | 1.034 |
| | ATU | 0.299* | 0.051 | 0.003 | 3.025 | 0.032 | 2.171 |
| | PU | -0.238* | 0.045 | 0.018 | -2.397 | 0.019 | 2.191 |
| | FC | 0.151* | 0.036 | 0.043 | 2.041 | 0.019 | 1.220 |

Note. ** p<0.001, * p<0.05

4.2 Qualitative Data: PU, PEU, and ATU

Teachers perceived that IRS tools had a positive impact on learners' motivation and engagement. These tools facilitated real-time assessment of students' comprehension, enabling teachers to promptly adjust their instruction and curriculum to meet students' needs. Some game-based learning platforms incorporated appealing audio and visual effects, enhancing the overall learning experience by making it more dynamic and engaging. Consequently, students became emotionally and cognitively involved in the classroom.

Regarding the perceived ease of using IRS tools, concerns were raised about the functionality of the IRS system, teachers' technical proficiency, and the stability of internet connections. However, the majority of teachers expressed a positive attitude toward IRS-based tools due to their easy accessibility and user-friendly interfaces. Nevertheless, a small number of interviewees had reservations about the functionality of the online platform.

In terms of attitude toward IRS use, all participants welcomed the adoption of this technology. They unanimously agreed that IRS technology had a positive impact on their teaching practices, primarily by helping identify knowledge gaps among students.

5 Discussion

The current study discovered significant correlations between constructivist pedagogical beliefs (CPB), attitude toward IRS use (ATU), facilitating conditions (FC), perceived usefulness of IRS (PU), and teaching effectiveness. CPB emerged as the strongest predictor of teaching effectiveness, followed by ATU, FC, and PU. The study also confirmed the positive association between constructivist pedagogical beliefs and teaching effectiveness. ATU, the second most influential predictor, was positively linked to teaching effectiveness. Additionally, PU proved to be a significant indicator of teaching effectiveness.

Consistent with prior research on IRS (Instant Response System) studies [8, 19], this study underscores the significance of integrating IRS-based tools in teaching. Furthermore, it aligns with [19] perspective by affirming that IRS-based tools strongly influence students' motivation and engagement. The inclusion of audio-visual effects, instant feedback, and gamification elements enhances students' engagement on cognitive, behavioral, and emotional levels, thereby increasing the likelihood that they will retain information as it is genuinely learned.

Despite the evident benefits, EFL teachers face challenges when using IRS tools in their classrooms. These challenges encompass a lack of technical expertise, difficulties in accessing a stable internet connection, and occasional glitches in the online platform, all of which hinder effective classroom implementation.

6 Conclusion

This research explored the impact of facilitating conditions, social factors, computer self-efficacy, constructivist pedagogical beliefs, perceived usefulness of IRS, perceived ease of IRS use, and attitude toward IRS use on teaching effectiveness among EFL teachers in Taiwan. It also delved into teachers' perceptions of the effectiveness of IRS-based tools in teaching.

The findings highlighted that constructivist pedagogical beliefs, attitude toward IRS use, and facilitating conditions positively and significantly influenced teaching effectiveness. In contrast, perceived usefulness of IRS had a significant negative impact.

Moreover, this study provided empirical evidence concerning the influence of IRS-based tools on language learning. Insights from interviews confirmed the driving factors and barriers to the adoption of IRS-based tools in the EFL teaching context. According to teachers' responses, IRS-based tools injected energy into the classroom and offered timely feedback for understanding students' learning progress. These perceptions influenced their teaching practices. Identified barriers to IRS adoption encompassed technical shortcomings, limitations in internet infrastructure, insufficient computer skills, and a related lack of technological knowledge. These factors hindered EFL teachers from effectively integrating IRS-based tools into their classes.

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