

# A Study on Educational Technology Acceptance of Special Education Teachers in Language Teaching Based on TAM Model

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**Abstract**—The application of educational technology in special education is mainly to provide more convenient learning conditions for special students, so that special students can receive more learning opportunities and convenience. At this point, special education teachers' acceptance of technology has become a crucial factor in improving the learning efficiency and effect of special students. Based on the Technology Acceptance Model (TAM), this study conducted a questionnaire survey of 112 special education teachers at different stages to investigate the level of special education educators' acceptance and continuous use trend of educational information technology by descriptive statistics. Besides, t-test and ANOVA will be adapted to discuss the impact of various factors on the technology acceptance model. The results manifest that special education teachers' educational technology acceptance was above average, but perception of the using easiness needs improvement. In addition, the educational technology acceptance levels of special education teachers are different in gender and teaching stages. Based on this, the article puts forward suggestions on the future of application of technology in special education from the three stages (identification & evaluation, training support and technical assistance) and two elements (family engagement and differentiated instruction).

**Index Terms**—Special education, TAM, educational technology, technology assistance

## I. INTRODUCTION

Special education is a particularly important part of the whole education system. Compared with other fields of education, special education needs to pay more energy and patience. *The Professional Standards for Teachers of Special Education (Trial)* issued by the Ministry of Education in 2015 proposed that special education teachers need to integrate and apply modern educational technology to support students' learning and promote effective communication with students [1]. In the field of language teaching, the combination of information technology and language teaching has had a significant impact on special children's language skills and teachers' professional development [2]. This requires special education teachers to have the corresponding professional ability of educational technology, improve the current teaching quality, and enable special students to better integrate into the school and society by using educational technology.

The Technology Acceptance Model (TAM) was first put

forward by Dimoka and Davis in 1989, which implied that users could predict and explain the possibility of accepting and using new technologies through their internal psychological factors such as beliefs, attitudes and intentions [3]. Teachers are considered to be the key role in the effective integration of technology in teaching. However, although the current situation is that the government has made a lot of investment in the field of educational technology in special education, the application of technology in teaching is still limited [4]. The main influencing factor is the acceptance of special education teachers for educational technology [5].

Educational technology means any tool or resource, that is incorporated to enhance learning or improve learning outcomes. This includes, but is not limited to, students' and teachers' use of computers and tablets, whiteboards and presentation tools, and Learning Management Systems (LMS). Special education refers to the use of specially designed courses, textbooks, teaching methods, teaching organization forms and teaching equipment to educate children with special needs to achieve general and special training objectives [6]. The purpose of special education is to meet the social requirements and the educational needs of special students to the greatest extent, including skills acquirement, personality development and social adaptability development.

The special education teachers at different stages, experience and gender are selected as participants for educational technology research and analysis, mainly because these factors may impact teachers' decision. Previously, these studies on TAM focused on compulsory and higher education teachers, while there was relatively seldom research on the technology acceptance attitude and application ability of special education teachers. Thus, this study applies TAM in comprehensively investigating the extent of technology acceptance of special education teachers and the factors that impact their use of technology. The improvement measures and suggestions can be proposed to meet students' needs, which will be beneficial to improve the special education teachers' professionalism in educational technology.

## II. LITERATURE REVIEW

### A. The Application of Technology in Education

With the development of teachers' abilities and the improvement of their technical level, scholars are increasingly paying attention to the utilization of technology by teachers in the field of special education. In addition, with the application of technologies such as artificial intelligence

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and virtual reality, special education teachers also have more opportunities and ways to personalized support students' learning. Boobekova [7] proposed in 2013 that technology are tools for solving problems encountered in daily life. For disabled students, these tools can help them to have some necessary skills to complete certain tasks [8]. Akpan and Beard *et al.* believe that current educational technology can serve as an auxiliary tool for special education, mainly used to help students with physical disabilities improve their language skills [9]. The technical training provided by foreign special education majors to teachers and students has clear training objectives, enriches the training content of practical and reasonable training methods, and all of these constitute a complete set of training strategies. However, at present, the application of educational technology in special schools in China is still at a shallow level and lacks a systematic stage.

*B. Factors Affecting TAM for Special Education Teachers*

At present, there are many studies on the influencing factors of teachers' acceptance of information technology both domestically and internationally, but different studies do have differences in the entry points and induction methods of influencing factors. In general, the factors that affect teachers' acceptance of information technology mainly include personal factors, teaching factors, and environmental factors. In terms of personal factors, factors such as age, gender, educational background, professional title, technical level, attitude, and experience of teachers can affect their acceptance of information technology [8–10]. As for teaching factors, such as teaching needs and objectives, course content and form, and teaching strategies can also influence teachers' willingness and ability to accept information technology [8, 11]. School management, technical support, social and cultural environment in school can be the factors [11, 12].

III. RESEARCH DESIGN

*A. Sample*

Data were collected by questionnaire. The participants are randomly selected as language teaching teachers in special education schools, because the language skill is a core skill in training special students. Before the questionnaire is distributed, the principal of special education school and special education teachers are contacted to explain the purpose of the survey. In this study, 150 special education teachers in language teaching were randomly selected as the samples for the questionnaire survey, and 148 valid questionnaires were finally collected at 98.67%. The demographic information of the participants is shown in Table I.

TABLE I: DEMOGRAPHIC INFORMATION (N=148)

| Demographic Variables |          | Frequency | Percentage |
|-----------------------|----------|-----------|------------|
| Gender                | Female   | 74        | 50%        |
|                       | Male     | 74        | 50%        |
| Age                   | 21 to 25 | 44        | 29.73%     |
|                       | 26 to 30 | 49        | 33.11%     |
|                       | 31 to 35 | 18        | 12.16%     |
|                       | 36 to 40 | 22        | 14.86%     |

|                |                |    |        |
|----------------|----------------|----|--------|
| Teaching Years | Above 40       | 15 | 10.14% |
|                | Under 1 year   | 40 | 27.03% |
|                | 1 to 3 years   | 36 | 24.32% |
|                | 4 to 7 years   | 39 | 26.35% |
|                | Above 7 years  | 33 | 22.3%  |
| Teaching Stage | Kindergarten   | 41 | 27.7%  |
|                | Primary school | 43 | 29.05% |
|                | Junior school  | 36 | 24.32% |
|                | High school    | 28 | 18.92% |

*B. Research Instrument*

This study investigates educational technology acceptance of special education teachers in language learning, referring to some dimensions and contents of the TAM evaluation scale developed by Teo Timothy [13]. The “An Investigation of Special Education Teachers’ Acceptance of Educational Technology” questionnaire is completed after consulting with experts and scholars and taking into account the characteristics of teacher education students and the actual situation of their training programs. The questionnaire was consisted with seven questions in basic information and 15 items in scale. The Cronbach coefficients of each factor in the questionnaire were ranged from 0.863 to 0.911 using SPSS 26.0.

The questionnaire included four dimensions: Perceived Ease of Use (PEOU, items 1–4), Perceived Usefulness (PU, items 5–8), Attitude Toward Using (ATU, items 9–12), and Intention to Use (ITU, items 13–15). According to Likter’s 7-point scale, the acceptance of educational technology is divided into “1. strongly disagree”, “2. disagree”, “3. somewhat disagree”, “4. neutral”, “5. somewhat agree”, “6. agree”, and “7. strongly agree” on a scale of 1 to 7. The higher the score, the greater the agreement of the questionnaire.

*C. Data Analysis*

SPSS 26.0 was used for data statistics and analysis of the questionnaire. The process of data analysis includes three steps. First, data screening is carried out to test the independence, normality and homogeneity of the data. Second, descriptive statistics is used to investigate the general level of special education teachers’ acceptance to educational technology in different dimensions. Thirdly, t-test and ANOVA are used to analyze whether there is significant difference of participants’ gender, age, teaching experience and teaching stages in the level of educational technology acceptance in special education.

IV. RESULT AND DISCUSSION

*A. Analysis of Educational Technology Acceptance of Special Education Teachers*

In Table II, the results of descriptive statistical analysis show that the overall mean value of educational technology acceptance of special education teachers is 4.72, and the order of the mean value of each dimension from high to low is: ITU (5.09)>ATU (4.98)>PEOU (4.92)>PU (4.85). It can be seen that the educational technology acceptance of special teachers generally above the average level (the median is 4.00). PU

scores are the lowest reflecting that special education teachers in language teaching are at a relatively low level of educational technology acceptance. As far as the dispersion of the standard deviation of educational technology is concerned, the dispersion of ITU ( $SD = 1.39$ ) and PEOU ( $SD = 1.27$ ) is relatively large.

TABLE II: DESCRIPTIVE STATISTICS IN EACH CONSTRUCT (N=148)

| Variables | Mean | Standard Deviation |
|-----------|------|--------------------|
| PEOU      | 4.92 | 1.27               |
| PU        | 4.85 | 1.28               |
| ATU       | 4.98 | 1.34               |
| ITU       | 5.09 | 1.39               |

According to Table III, most special education teachers adapted educational technology in language teaching, and even 33.78% of teachers use it as often as every class. No teacher has never used educational technology to assist his or her class. Obviously, educational technology plays a particularly important role in language teaching for special education teachers, which also confirms the results of the above descriptive statistics that they have a general high acceptance of educational technology by mean value. When it comes to the category of educational technology used, most teachers use video play (59.46%) and image processing software (55.41%) with high frequency, which may help special students give interpretation of abstract language. In addition, the communication platform (42.57%), such as QQ and WeChat, geometric sketchpad (39.86%) and office software (37.84%) also have relatively high frequency of use. In contrast, Learning Management System (LMS) and social media are used less frequently, only occupied 12.16% and 15.54% respectively.

TABLE III: THE FREQUENCY AND METHODS OF USING EDUCATIONAL TECHNOLOGY IN SPECIAL EDUCATION CLASS (N=148)

| Topic   | Frequency       | Percentage |        |
|---|-----------------|------------|--------|
| Frequency of Using Educational Technology (One answer)            | In every Class  | 50         | 33.78% |
|   | Always          | 72         | 48.65% |
|   | Occasionally    | 26         | 17.57% |
|   | Never           | 0          | 0%     |
| The Methods of Using Educational Technology (More answer choices) | Office Software | 56         | 37.84% |
|   | Photoshop       | 82         | 55.41% |
|   | Video Play      | 88         | 59.46% |
|   | Sketchpad       | 59         | 39.86% |
|   | QQ\WeChat       | 63         | 42.57% |
|   | LMS             | 18         | 12.16% |
|   | Social Media    | 23         | 15.54% |

According to the results, it can be seen that the educational technology acceptance of special education teachers is generally at a high level. Specifically, teachers' intention to use educational technology in the future (ITU) is higher than ATU, PEOU and PU. The results difference in teachers' perceived difficulty in using educational technology (PEOU) is the smallest, while the teachers' results of Intention to Use in the future (ITU) significantly differ from each other. Based on the results of descriptive statistics and the frequency, it can be seen that the acceptance of special education teachers to

use educational technology in language teaching is different, so it is necessary to carry out the following t-test and ANOVA to analyze the factors causing the differences.

*B. Analysis of Gender Difference in Educational Technology Acceptance of Special Education Teachers*

An independent samples t-test was run to examine if there was a significant difference in educational technology acceptance between male and female special education teachers. The Table IV demonstrated a remarkable difference in mean acceptance levels between male and female teachers, especially in the aspects of PU ( $t = 5.97, df = 146, p < 0.001$ ) and ATU ( $t = 17.67, df = 106, p < 0.001$ ). Also, there is a gender difference in PEOU ( $t = 7.04, df = 146, p < 0.05$ ). However, ITU is the only aspect has no difference between male and female teachers ( $p > 0.05$ ). The result implied that there was a significant difference in educational technology acceptance between male and female groups in all dimensions except for ITU. Generally, the male teachers have higher acceptance level than female teachers, especially in the aspects of the perceptions of usefulness and attitudes.

TABLE IV: INDEPENDENT SAMPLES T-TEST BETWEEN GROUP (N=148)

| Dimension | Group  | M±SD      | t        |
|-----------|--------|-----------|----------|
| PEOU      | Male   | 5.56±0.96 | 7.04*    |
|           | Female | 4.29±1.21 |          |
| PU        | Male   | 5.41±0.87 | 5.97***  |
|           | Female | 4.28±1.37 |          |
| ATU       | Male   | 6.08±0.52 | 17.67*** |
|           | Female | 3.87±0.94 |          |
| ITU       | Male   | 5.36±1.31 | 2.44     |
|           | Female | 4.81±1.42 |          |

\* $p < 0.05$ . \*\* $p < 0.01$ . \*\*\* $p < 0.001$

This result is in line with previous research. Padilla-Meléndez *et al.* mentioned in their research on the gender difference in technology acceptance in blended learning scenario that the male teachers show greater potentials and interests in applying educational technology in their classes [14]. Besides, Siyam's research illustrated that gender can be as a possible construct capable of predicting users' acceptance of technology [6]. The reason may be that female teachers have low professional computer skills and fail to master the use of educational technology. In reality, schools have recognized the fact that some teachers' technical ability is relatively limited, and have conducted relevant training to better understand the basic knowledge and use methods of educational technology [4]. From the mean value and standard deviation of female teachers in all dimensions in this study, it can be showed that their technical ability has been greatly improved.

*C. Analysis of Educational Technology Acceptance Difference in Teaching Stages*

One-Way Analyses of Variance were conducted to examine the effect of teaching stage on Educational Technology Acceptance (Table V). Comparisons were made among kindergarten, primary school, junior high school and high school groups. There was an extremely high significant difference in PEOU among teaching stages,  $F(3,144) = 10.54$ ,

$p < 0.001$ . Table VI LSD post hoc test results revealed that kindergarten teachers had significantly higher PEOU scores than the other three groups ( $p < 0.001$ ), meanwhile, there was no significant difference in any other pairwise comparisons (primary school and junior high school, primary school and high school, junior high school and high school).

There was an extremely high significant difference in PU among teaching stages,  $F(3,144) = 10.20, p < 0.001$  (Table V). LSD post hoc test results revealed that kindergarten teachers had significantly higher PU scores than junior high school ( $p < 0.05$ ), and high school teachers ( $p < 0.001$ ); primary school teachers had significantly higher PU scores than high school ( $p < 0.001$ ); junior high teachers had significantly higher PU scores than high school ( $p < 0.01$ ). There was no difference between primary school and any other group (Table VI).

TABLE V: ONE-WAY ANALYSES OF VARIANCE IN EDUCATIONAL TECHNOLOGY ACCEPTANCE BETWEEN TEACHING STAGES (N=148)

| Measure | Kindergarten (N=41) | Primary School (N=43) | Junior School (N=36) | High School (N=28) | F         |
|---------|---------------------|-----------------------|----------------------|--------------------|-----------|
| PEOU    | 5.74±0.80           | 4.88±1.49             | 4.44±0.74            | 4.44±1.43          | 10.54***  |
| PU      | 5.35±1.05           | 5.08±1.35             | 4.81±0.86            | 3.82±1.37          | 10.20***  |
| ATU     | 6.40±0.43           | 5.53±0.40             | 4.33±0.40            | 2.88±0.64          | 366.26*** |
| ITU     | 5.58±1.36           | 4.97±1.21             | 5.04±1.24            | 4.61±1.70          | 3.04*     |

\* $p < 0.05$ . \*\* $p < 0.01$ . \*\*\* $p < 0.001$

TABLE VI: LSD POST HOC TEST RESULTS

| Pairwise Comparisons | PEOU Mean Difference | PU Mean Difference | ATU Mean Difference | ITU Mean Difference |
|----------------------|----------------------|--------------------|---------------------|---------------------|
| 1 VS 2               | 0.86***              | 0.27               | 0.86***             | 0.61*               |
| 1 VS 3               | 1.29***              | 0.54*              | 2.06***             | 0.54                |
| 1 VS 4               | 1.30***              | 1.53***            | 3.52***             | 0.97**              |
| 2 VS 3               | 0.43                 | 0.27               | 1.20***             | -0.07               |
| 2 VS 4               | 0.44                 | 1.25***            | 2.65***             | 0.36                |
| 3 VS 4               | 0.01                 | 0.98**             | 1.46***             | 0.43                |

Note. 1 = Kindergarten, 2 = Primary School, 3 = Junior School, 4 = High School; \* $p < 0.05$ . \*\* $p < 0.01$ . \*\*\* $p < 0.001$

There was an extremely high significant difference in ATU among teaching stages,  $F(3,144) = 366.26, p < 0.001$  (Table V). LSD post hoc test results revealed that kindergarten teachers had significantly higher ATU scores than the other three groups ( $p < 0.001$ ); primary school teachers had significantly higher ATU scores than junior school and high school teachers ( $p < 0.001$ ); junior high school teachers had significantly higher ATU scores than high school teachers ( $p < 0.001$ ). To conclude, the higher the teaching stage a teacher is at, the lower ATU score will be achieved (Table VI).

There was an extremely high significant difference in ITU among teaching stages,  $F(3,144) = 3.04, p < 0.05$  (Table V). LSD post hoc test results revealed that kindergarten teachers had significantly higher ITU scores than primary school ( $p < 0.05$ ) and high school teachers ( $p < 0.01$ ); meanwhile, there was no significant difference in any other pairwise comparisons (kindergarten and junior high school, primary school and junior high school, primary school and high school, junior school and high school) (Table VI).

It can be seen that the special education teachers in different teaching stages have the different feelings toward educational technology in language teaching, especially in the aspects of their attitudes, perceptions of easiness and

usefulness. With regard to the differences in ease-of-use perception at the teaching stage, this study is of innovative significance because few previous studies have focused on special education teachers in this aspect. There is a related study by Venkatesh and Davis showed that ease of use awareness has an impact on the educational technology acceptance level at the beginning of the adoption. However, with the deepening of use and the increase of user experience, this impact will gradually disappear [15].

Regarding PU and ATU, they are similar. Basically, recognized by users, but the technology acceptance of middle school teachers is far lower than that of kindergarten and primary school teachers. This may be attributed to the fact that middle school teachers are more inclined to traditional teaching methods when teaching language to students with high cognitive level, while young children’s cognitive level is limited, and these teachers are reasonable to use educational technology to help students understand [6]. Obviously, the special education teachers in kindergarten and primary school have more positive attitude to educational technology.

Compared with the previous factors, there is not very high significant difference in the intention of special teachers to use educational technology in the future at the teaching stage. It is understandable because the overall trend should be to adapt to the changes of the times with the development of education information era. In addition, various educational technology training conducted by schools and society is also gradually improving teachers’ skills and attention. These factors can reasonably explain that the education stage will not have a particularly significant impact on teachers’ acceptance of educational technology.

## V. CONCLUSION

Through empirical analysis, this study analyzes the educational technology acceptance level of special education teachers in language learning, thereby assisting teachers in accepting the technology in their class. Also, this study found that special education’s educational technology acceptance level has difference in their gender and teaching stages. In the future, school administrations should focus on assessing teachers’ technology skills and providing related technology assistance. Regarding to gender, the male teachers have higher acceptance level than female teachers. As for the difference in teaching stages, the higher the teaching stage a teacher is at, the higher ATU score will be achieved. With high attention to special education, future research can incorporate other potentially influential factors, such as TPACK, and construct a more comprehensive model of the educational technology acceptance mechanism.

## VI. SUGGESTIONS

The study found that in language special education, the teacher’s educational acceptance level is generally high, but there is a difference in their teaching stages. In order to improve special education teacher’s educational technology acceptance in language teaching (Fig. 1), this study puts forward the following suggestions for the future development

of technology acceptance for different stage teachers in terms of identification, technical assistance, and training support.

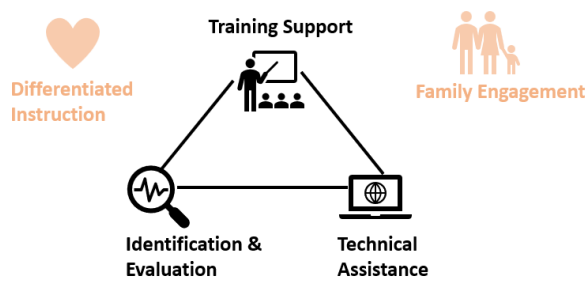


Fig. 1. Elements of improving educational technology acceptance.

#### A. Identification and Evaluation

There are studies have confirmed that teachers' acceptance of educational technology is related to their own technical ability [16, 17]. Specifically, if some teachers' technical ability is relatively low or even some teachers are not clear about their abilities, it is more difficult to accept the use of educational technology to assist teaching in the class. Therefore, it is necessary for the administrators of special schools to organize teachers to evaluate their technical skills. For example, the items in the National Educational Technology Standards for Teachers (NETS-T) can be used as measures of teachers' proficiency of technology integration [18]. The evaluated aspect could be technology concepts, technological learning environment construction, and ethical issues. This evaluation can not only enable special education teachers to generate self-identification, but also help school administrators understand the overall level of teachers, so as to provide relevant training.

#### B. Technical Assistance

Providing a good environment for teachers to accept technology is a necessary condition for teachers to accept technology. Although the level of software and hardware facilities in the school has been improved, technical support is still limited. Problems such as equipment failure and technical difficulties can only be solved with help of technicians. The lack of technical services such as use management makes some new technologies stranded in the introduction stage. Based on teachers' certain knowledge of educational technology, the language teaching platform needs further construction to meet the needs of special students. The language learning platform needs to expand the system functions that can bring greater language input and output, reinforce the understanding and practice of language functions of special students under the strengthening role [19], such as audio and video output, and expand the communication channels between teacher-learner and learner-learner. From the perspective of school administration, it is suggested to establish a professional educational technology department to regularly check the equipment in the classroom and solve the problems encountered by teachers in the use of educational technology.

#### C. Training Support

Leaders, experts, teachers and researchers, and colleagues

may have an impact on teachers' teaching [19]. For the reason that long-term working company provides conditions for building trust. Besides, relying on rich technical experience can give more referential suggestions, especially the opinions and views on the introduction of new technologies. Therefore, the school can organize educators of various identities to carry out lectures and reports to convey the frontier of educational technology. In addition to organizing collective training for teachers, it is suggested that the teacher group should be built into a learning community with technology acceptance, so that teachers can complete specific training tasks in cooperation. In addition, teachers can also establish interpersonal relationships that encourage each other in the learning process, so as to enhance the resources sharing and peers support to promote teachers' acceptance of technology.

#### D. Differentiated Instruction and Family Engagement

In special education, differentiated instruction is particularly important because students with disabilities may require different approaches to learning than their typically developing peers. Teachers can use educational technology to assess students' needs and adapt to the learning environment. Although educational technology can improve the efficiency of teachers' teaching and students' learning, it can never become a tool for "mass production" of student development. Because every special student has individual characteristics and needs, which requires teachers to have enough patience and love to meet. Because special education is faced with a group of students with special needs, their progress and development need not only the help of school teachers, but also the support and participation of families.

#### CONFLICT OF INTEREST

The authors declare no conflict of interest.

#### AUTHOR CONTRIBUTIONS

Yunqi Jing conducted the research; Boyu Chen collected the data; Xue Xia and Min Feng analyzed the data and wrote the paper; all authors had approved the final version.

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