# Essential Components Of Effective Reading Instruction: Major Investigation Of Special Education Teachers' Erudition

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*Abstract*

The National Reading Panel has identified phonemic awareness, phonics, fluency, vocabulary, and reading comprehension as the five essential components for initiating reading instruction. Teachers' knowledge of these components can influence teaching approaches and contribute to students' learning outcomes at the beginning of reading stage. This study examined the knowledge of the five Essential Components of Effective Reading Instruction (ECERI) with 184 Special Education Teachers (SET) who handle diverse students from different special education categories. The results indicated that the level of performance of SET in the ECERI scale was low, with a relatively high score in the reading comprehension and vocabulary component. The results also showed statistically significant correlations with the score of phonemic awareness and fluency with a high level of SET knowledge. The phonics, vocabulary, and reading comprehension component showed no statistically significant correlations with a high level of SET knowledge. The results revealed that a higher score of knowledge was more correlated with teachers who teach autism, while no statistical significance was observed in the results of SET on the scale of the categories of teaching disabilities. Moreover, the variable of gender and teaching experience had negative correlations with high scores of SET knowledge. Therefore, no statistically significant differences emerged. In SET, lack of knowledge concerning the components of reading specifies the urgent need for training programs on those topics to boost their teachers' cognitive and teaching skills.

Keywords Fluency, Phonemic awareness, Phonics, Reading comprehension, Special education teachers, Vocabulary

## Introduction

The field of reading instruction is one of the most important fields of

education, as reading is an important means of acquiring other skills. Knowledge of the components of reading by Special Education Teachers (SET) is an important prerequisite for teaching reading skills to students with disabilities. Without this knowledge, educators who teach people with disabilities are not expected to develop the reading abilities of struggling students. According to the National Reading Panel, of the National Institute of Child Health and Human Development (2000), effective basic reading instruction requires multiple components of reading (e.g., phonemic awareness, phonics, fluency, vocabulary, and reading comprehension). Struggling readers vary in their reading difficulties depending on their personal qualities and abilities. Moats (2009) stated that educators need to understand themselves to be able to teach students. Reading weaknesses in students with disabilities cannot be identified as impairments in phonemic awareness or any of the other components of reading if educators are not familiar with these components. Moreover, educators' knowledge may have a role in influencing teaching performance and may affect student learning outcomes (Arrow et al., 2019). Inspirational educators are those who know how to incorporate the components of reading appropriately to address the individual needs of each child (Point, 2004). Spear-Swerling and Zibulsky (2014) discovered that educators' knowledge revolves around the components of fluency, vocabulary, and reading comprehension, while educators achieve lower scores in the phonics and phonemic awareness components. Therefore, SET need to have a thorough knowledge of methods to teach the multiple components of reading fully and methods to establish appropriate interventions for each component (Spear-Swerling & Cheesman, 2012).

The laws and regulations of the Ministry of Education in the Kingdom of Saudi Arabia state that no child with a disability shall remain without provision of special education services in an idea educational environment. Having these services ensures that the child receives the most suitable educational opportunities available, as students with disabilities evidently face educational challenges in learning to read and other basic academic skills. Therefore, all children with disabilities should be given the best opportunities to teach reading. Educators of people with disabilities must be competent in their knowledge and ability to teach reading development to students of varying abilities and aptitude for learning. SET must be able to consider the individual differences among people with disabilities in their reading instruction.

In this study, we investigated the extent to which SET know the Essential Components of Effective Reading Instruction (ECERI) by conducting a standardized Arabic language scale on content knowledge and application of knowledge for each component of reading. Undoubtedly educators' knowledge produces significant contributions to the concepts of early reading education for children with special needs, including children with severe reading impairments or children who

struggle with comprehending texts, as well as poor reading fluency in accurate, spontaneous, and appropriately expressive texts. In addition, educators' knowledge of reading components assists in the treatment of readers who have difficulty in noticing and distinguishing sounds, difficulties in knowing how words are derived, and difficulties in transferring knowledge of the sounds of the spoken word to the written word. Therefore, our focus was on SET knowledge of the roles of the five essential components in effective reading instruction from different backgrounds and on the diversity in teaching disability groups, including educators of institutes and inclusive classes.

**Teachers knowledge of the ECERI**

Some studies have indicated large gaps in general education educators' knowledge of the ECERI, including phonemic awareness, phonics, and fluency, which have a significant link in teaching and developing reading among students (e.g., Brady et al., 2009; Cunningham et al., 2004; Podhajski et al., 2009). These studies concluded that effective professional development increases educators' knowledge of reading instructions and helps struggling children develop their reading to become competent readers. Stark et al. (2016) found that most educators assessed themselves as having efficiency in teaching skills such as spelling, phonemic awareness, phonics, fluency, comprehension, word identification, and vocabulary as either average or very good. Meanwhile, researchers revealed that these teachers had limited knowledge in the areas of reading instruction. As such, participating educators overestimated their knowledge of the phonics component of early literacy education (Al-Hazza et al., 2008).

In contrast, several studies have addressed the knowledge of SET about some of the ECERI (e.g., Cheesman et al., 2009; Jakobson et al., 2022; Spear-Swerling & Cheesman, 2012). Prior studies have shown that SET have limited knowledge of the concept of reading components and a lack of skills to provide effective instruction within educationally successful reading instruction contexts. Meanwhile, some local studies dealt with the knowledge of the SET about some of the ECERI, such as phonemic awareness. For instance, Al Zamili and Ghareeb (2021) found that learning disabilities teachers' level of knowledge in concepts, teaching, measurement, and the relationship to phonemic awareness have a medium score on the total score of the test. Meanwhile, the results in Alseraye (2015) demonstrated that teachers' appreciation of the importance of phonemic awareness activities in first-grade students' acquisition of reading skills ranged between important and very important, Alseraye pointed out the possibility of confusion among teachers in the process of understanding the concept of phonemic awareness and teaching reading by the phonics method. A local study revealed another component related to the development of effective reading. A Alarfaj and Alomair (2020) showed that the level of knowledge of phonological awareness

skills is generally average among female teachers of students with learning disabilities. Female teachers' knowledge in teaching reading is general and is not focused on how the five components of reading work together to contribute to students' reading instruction.

Disparity exists between educators' knowledge and how it does or does not contribute to students' reading gains. The question on how educators employ this knowledge to achieve effective instructional practices and effective teaching within the primary classroom has also emerged. Studies indicated that SET had knowledge of the ECERI and played a role in the achievement of students with disabilities (e.g., Park et al., 2019; Peltier et al., 2020). Carlisle et al. (2009) indicated that teachers' knowledge does not contribute to improving students' reading in word analysis and students' achievement in word reading and reading comprehension, nor does it contribute to students' reading achievement tests. Scientific evidence demonstrated that reading difficulties arise with a high proportion of difficulties in the ECERI, which including phoneme awareness, phonics, reading fluency, vocabulary, and reading comprehension techniques (Lyon & Weiser, 2009). The difficulties that readers face in basic reading, specifically in decoding text reading, may cause impaired fluency, weak vocabulary, and restricted knowledge, and these limitations contribute to imperfect reading comprehension (Stanovich, 1986). Therefore, as Reid Lyon and Weiser (2009) summarized, knowing what is meant by the processes of the ECERI is not enough for teachers. Teachers must know how all these components work together to participate in improving reading as well as how to utilize integrated and advanced teaching methods.

**Teaching reading in special education classes**

Reading is one of the most important educational tasks that students learn. Moreover, it is one of the basic skills to attain student success academically. Alkhafaji (2016) mentioned that reading is a complex mental process, as it is linked to mental and physiological activities. Thus, reading serves as a foundation for learning skills such as expanding vocabulary, developing writing and mathematics, improving communication and language skills, and gaining other skills needed for students with disabilities. Students with reading difficulties struggle to gain knowledge and excel academically (Ngwenya, 2010; Rose, 2004). A study conducted by Bohlmann and Pretorius (2002) manifested a powerful connection between reading capacity and academic accomplishment in mathematics. Moreover, poor reading capacity decreases effectual mathematics performance. Therefore, successful SET with struggling readers are those who blend knowledge of the instructing field for reading with their understanding of clear, active, and generalist teaching (Brownell et al., 2009). Leading and effective teaching requirements in special education classes are not very different from the requirements of effective teaching in general education classes. However, educators of students with

disabilities utilize a variety of different and intensive strategies to teach one of the skills of teaching reading. In addition, SET care a lot about individual education and spend more time teaching reading. Williams and Dikes (2015) referenced that SET face greater responsibilities at work and spend more time teaching students with disabilities to meet the academic and behavioral needs of students with disabilities. The researchers added that SET must know what skills are required and how to teach them correctly, as well as how to make the necessary interventions when students with disabilities face academic difficulty. Special education research has confirmed methods for promoting perseverance in educational requirements by enhancing external stimulus, internal stimulus, and improving peer interaction rates concerning educational issues (Gersten et al., 2001).

## Measuring teacher knowledge

### A practical way to measure a teacher's knowledge

Measuring teacher knowledge is very important because it shows the teacher's level of knowledge of the pedagogical content being taught. Shulman (1987) emphasized that one of the seven areas of teacher knowledge is the pedagogical content knowledge, which is of particular importance because it determines the precise, deep, and distinctive knowledge of teachers in their field of teaching. Pedagogical content knowledge is a combination of content and pedagogy into an understanding how specific topics and issues are formed, shaped, and adapted to the different abilities and needs of students. According to Hunt (2003), the individual utilizes knowledge to perform certain tasks, such as implement some function, resolve a problem, grasp concept, or answer cognitive questions. Knowledge is invisible, difficult to access, and not directly observable. However, knowledge can be elicited by observing the performance of individuals in a test, and the effect of test performance may be overwhelming. According to Fabiano (1999), standardized measures of teacher ability may be a key point for evaluating teacher qualifications. However, standardized measures supply insufficient information about a teacher's knowledge of content in a particular domain such as reading. Measuring the teacher's knowledge of the content is accurate in relation to time, as the teacher's knowledge of the content has a certain default age. Measuring the content knowledge of novice teachers instead of that of teachers with teaching experience is more appropriate. Shulman (1986) stated that the theoretical analysis of teacher knowledge should be based on a structure for classifying the categories and areas of teacher knowledge as well as the shapes of portraying such knowledge. Accordingly, the current study contains a scale to measure SET content knowledge and the depth of this knowledge about the ECERI using the survey tool.

### The present study

This study was conducted in the Kingdom of Saudi Arabia. The main goal of the research was to measure the knowledge of SET on the ECERI in the primary grades (i.e., phonemic awareness, phonics, fluency, vocabulary, and reading comprehension). To evaluate teacher knowledge, a survey was developed to measure SET knowledge about components that were previously identified as significant for teaching fundamental reading skills. SET in Saudi Arabia hold a university degree in special education with different tracks to practice the teaching profession with one of the special education categories. Teachers were expected to have been taught about language and literacy and several courses to teach and train people with special needs in various fields such as reading. Al-Yahya and Sharif (2012) noted that special education departments at universities prepare, educate, and train student teachers to be academically, culturally, and professionally qualified to work in teaching tasks in the field of special education with a variety of tracks.

In Saudi Arabia, the study system for special education categories is applied in two forms: partial mainstreaming and full mainstreaming, in addition to the forms available in private institutions. According to El Moussa (2010), partial mainstreaming involves stand-alone classes in regular public schools for students with special educational needs. This type is limited to the integration of disabled persons with their non-disabled companions in some educational programs and school activities. Full mainstreaming entails integrated support programs for special education in regular schools. These programs are composed of resource room programs, itinerant teacher programs, and teacher counseling programs, as well as integrated education with non-disabled classmates for a large part of the school day. In general, mainstreaming facilitates is easier for teachers to teach reading to people with disabilities, as these students interact with their non-disabled peers using a variety of teaching strategies such as peer teaching. Consequently, the researchers in this study investigated SET knowledge of the ECERI, which contributes to teaching reading through concentrating on three research questions:

1. What is the level of knowledge about the ECERI of primary-grade SET?

2 .Will differences emerge in the knowledge about phonemic awareness, phonics, fluency, vocabulary, and reading comprehension among primary-grade SET?

3. Does the knowledge of SET about ECERI differ according to demographic characteristics?

## Method

### Participants

A total of 184 SET in the primary grades participated in this study. All teachers had a university degree and a license to practice teaching in

special education classes. The sample of participants consisted of (n = 95, 51.6%) females and (n = 89, 48.4%) males in their various subspecialties. The sample of teachers belonging to teaching the category of people with intellectual disabilities consisted of participants (n = 108, 58.7%). The sample consisted of other teachers specializing in teaching the categories of visual impairment (n = 15, 8.2%), hearing impairment (n = 30, 16.3%), learning disabilities (n = 12, 6.5%), autism (n = 7, 3.8%) and others various specialties (n = 12, 6.5%). The sample of teachers included (n = 31, 16.8%) participants with 1 to 5 years of teaching experience in reading, (n = 42, 22.8%) participants with 6-10 years of experience, (n = 85, 46.2%) participants with11-20 years of experience, (n = 26, 14.1%) participants with more than 20 years of experience. All teachers are Arabic speakers. Most of the teachers work in public schools within classrooms to integrate people with disabilities, some work in special institutes for people with disabilities, and some work in private schools for people with disabilities.

**Measures**

**Materials and procedure**

After clarifying the desired objectives of this study and the administration of the procedures approval from the administration departments of education was first acquired to conduct the research on SET who work in schools. Second, informed consent was obtained from the participants to participate in the study. The measure of the knowledge of the ECERI was electronically sent to the participants phones via the survey package. Participants received a link explained the title, objectives of the study, the option to agree to participation, and direct communication with researchers to answer participants' questions, if needed. The participants informed that the time required to complete the knowledge scale is approximately 10 minutes.

**Teacher Knowledge Survey**

In this study, the teacher knowledge scale was designed after reviewing a set of scientific literature (e.g., Alabyad, 2020; Abu-Lhassan, 2015; Abulbida, 2020; Al-Suwaifi, 2022; Carlisle et al., 2009; Hassan, 2019; Imran, 2019; Saleh, 1994; Shehata, & Samman, 2012). The items of the teacher knowledge survey (TKS) were formed from the literature that discussed the methods of teaching reading to children by employing the five ECERI (i.e., phonemic awareness, phonics, fluency, vocabulary, and reading comprehension). The TKS questions consisted of 28 items. The items had a maximum score of 28 points with 7 points for the items that assess the concept of phonemic awareness, 5 points for the concept of phonics, 5 points for the concept of fluency, 6 points for the concept of vocabulary, and 5 points for the concept of reading comprehension. All TKS questions were presented with four specific answer choices. Each question had only one correct answer. The questions included both content knowledge (about 54% of items) and application of knowledge (about 46%

of items) in teaching reading. Content knowledge items assessed participants on whether they had information about understanding the structure, relationship, and function of each component of the reading instruction process (e.g., What are phonics? Why is vocabulary important to reading comprehension? Why does thinking aloud during reading promote active construction of reading comprehension?). The application of knowledge items assessed the participants whether they had an understanding about answering educational situations or problems facing students (e.g., Which of the following words have the same morphological weight? If a student understands the text but reads slowly, he/she needs to be taught.). Furthermore, three demographic characteristics were developed in the TKS to determine the participants' background, gender, teaching experience in reading, and the category of disability that teachers teach in the primary grades. These characteristics were used to determine the differences and correlations between the participants.

Giving that the number of individual scale items were relatively small, the individual item reliability of each base reading component was less than 58. Thus, based on scientific and theoretical discussions and patterns of associations (Spear-Swerling & Cheesman, 2012) between some components, the items of the scale were grouped into two categories: phonemic awareness and phonics scale amounted to 12 multiple-choice items with a Cronbach's alpha of .69. The fluency, vocabulary, and reading comprehension scale amounted to 16 items with a Cronbach's alpha of .65. All 28 items for the entire TKS achieved an internal reliability with a Cronbach's of alpha .78.

## Results

### Statistical analysis

The overall knowledge of the teachers toward the ECERI was extracted from the 28-item survey, where the correct answers were identified and coded with 1. Meanwhile, incorrect answers were coded with 0. The total knowledge score was obtained by adding all 28 items, and a total score ranging from 0 to 28 was generated, which generally meant that a higher score entailed higher knowledge of the ECERI. By using cutoff points of 50% and 75% of the total score to determine the level of knowledge, participants were considered to be at the low level if the score was below 50% of the total score points. In addition, 50% to 75% were considered moderate level, and above 75% was considered high knowledge level.

Continuous variables were presented using mean ± standard deviation, while categorical variables were presented using numbers and percentages. The knowledge score was compared with the socio-demographic characteristics by using the Mann Whitney Z-test as well as the Kruskal Wallis H-test. Normality tests were conducted using the Shapiro Wilk test as well as the Smirnov-Kolmogorov test. The data

follow the non-normal distribution. Thus, non-parametric tests were applied. P-value <0.05 was considered statistically significant. All statistical analyses were performed using Statistical Packages for Software Sciences (SPSS) version 26 Armonk, New York, IBM Corporation.

The TKS involved 184 teachers. As described in Table 1, slightly more than half of the participants were female. Females dominated the males (51.6% vs. 48.4%). In addition, teachers with 11 to 20 years of experience in teaching reading make up the highest percentage, comprising 46.2% of teachers. Then, it was followed by teachers who have 6 to10 years of teaching experience, which constituted 22.8%. The most common subject related to disability teaching was intellectual disability (58.7%), followed by hearing impairment (16.3%) and visual impairment (8.2%). Meanwhile, teachers who teach other groups of people with disabilities were few.

**Table 1 Socio-demographic characteristics of the teachers (n=184)**

| Study Variables | N (%) |
|---|---|
| Gender | |
| • Male | 89 (48.4%) |
| • Female | 95 (51.6%) |
| Teaching experience in reading | |
| • 1 – 5 years | 31 (16.8%) |
| • 6 – 10 years | 42 (22.8%) |
| • 11 – 20 years | 85 (46.2%) |
| • >20 years | 26 (14.1%) |
| Which category of disability do you teach? | |
| • Intellectual disability | 108 (58.7%) |
| • Visual Impairment | 15 (08.2%) |
| • Hearing Impairment | 30 (16.3%) |
| • Learning disability | 12 (06.5%) |
| • Autism | 07 (03.8%) |
| • Other | 12 (06.5%) |

**Teachers' knowledge about ECERI**

The content analysis of SET replies concerning the ECERI in children receiving special education has been categorized harmoniously and well into five principal categories: phonemic awareness, phonics, fluency, vocabulary, and reading comprehension. Descriptive statistics for SET knowledge of those essential components are presented in Table 2. Regarding the knowledge domains, the mean score was the highest in phonemic awareness (mean 3.99; SD 1.79), followed by vocabulary (mean 2.74; SD 1.27), reading comprehension (mean 2.43; SD 1.30), and phonics (mean 2.24; SD 1.10). Meanwhile, the domain with the lowest knowledge score was the fluency domain (mean 1.57; SD 1.01). The total mean knowledge score was 12.9 (SD 3.69) with low, moderate, and high

knowledge levels detected among 57.1%, 41.8%, and 1.1%, respectively.

The performance level of the participants in the scale was low, as a higher percentage of the participants could not answer the scale questions. The reading comprehension component questions achieved the highest percentage of correct answers (48.6%) among the other components, followed by the vocabulary component questions (45.7%). Participants were given an average of the correct answers on the total of the five components scale, which consisted of 28 standard questions on how to teach and develop reading among children with disabilities, at a rate of 46.1%.

**Table 2 Descriptive statistics of knowledge about ECERI (n=184)**

| Parameters | Max. score | Score Mean ± SD | % Of correct answer |
|---|---|---|---|
| Phonemic awareness | 7 | 3.99 ± 1.79 | 39.9% |
| Phonics | 5 | 2.24 ± 1.10 | 44.8% |
| Fluency | 5 | 1.57 ± 1.01 | 31.2% |
| Vocabulary | 6 | 2.74 ± 1.27 | 45.7% |
| Reading comprehension | 5 | 2.43 ± 1.30 | 48.6% |
| Total TKS | 28 | | 46.1% |
| Total knowledge | | 12.9 ± 3.69 | |
| Level of knowledge | | N (%) | |
| • Low | | 105 (57.1%) | |
| • Moderate | | 77 (41.8%) | |
| • High | | 02 (01.1%) | |

Most of the participants confirmed a unified understanding about the concept or meaning of phonemic awareness. However, in the remaining phonemic awareness questions (i.e., content knowledge and application of knowledge) the participants showed varied and invalid answers. Two-thirds of the participants mentioned a clear concept of the meaning of phonics and its role in teaching students how to transfer knowledge of the sounds of the spoken word into the written word. In addition, two thirds of the participants were able to distinguish the voiceless letters that were presented to them. The rest of the scale questions (i.e., content knowledge and application of knowledge) received low scores in determining the correct answers to this component by the participants. The highest percentage of participants on the scale questions related to the fluency component had low scores and incorrect answers, except in the question of "if a student understands the text but reads slowly, he/she needs to be taught," where two-thirds of the participants answered correctly. One-third of the participants reported accurate answers to the questions: "how to achieve vocabulary instruction," "student's ability to use the appropriate word in the appropriate context is one of the learning objectives of vocabulary", and "identification of non-target vocabulary in

Arabic language education." Meanwhile, two-thirds of the participants indicated certain answers about their understanding of the concept of the vocabulary component of the language, as well as the knowledge of the needs of the student struggling with vocabulary. The participants showed a clear deficiency in defining the meaning and role of reading comprehension. Two-thirds of the participants were able to know the problem of the student who was not able to answer "the text questions despite his ability to read aloud with accuracy and speed." Half of the participants pointed correct answers to the reading comprehension questions, "determining aspects of student reading comprehension," and "the role of thinking aloud during reading in promoting the active construction of reading comprehension."

Furthermore, the knowledge scale consisted of two types of questions, the content of knowledge (CK), and the application of knowledge (AK). We examined the participants' performance in these two sub-scales and checked whether a statically significant difference exists between their performance on CK and AK (see table 3). The findings showed that SET had higher mean scores in CK questions (mean 4.45; SD 1.58) compared with the mean scores of AK questions (mean 3.70; SD 1.34). The level of knowledge of SET on the overall score of CK is significantly higher than the overall score of AK and have statistical significance on the overall score of CK.

**Table 3 Differences in score of CK and AK (n=184)**

| Parameters | Score Mean ± SD | P-value § |
|---|---|---|
| CK Questions | 4.45 ± 1.58 | **.000 **** |
| AK Questions | 3.70 ± 1.34 | |

§ P-value has been calculated using independent t-test.
** Significant at p<0.05 level.

**Correlation of teachers' knowledge with ECERI**

Analyses were performed to examine the correlations between the level of knowledge and each of the ECERI among SET. The correlations between the level of knowledge and these components were calculated using the Kruskal Wallis H-test. In Table 4, the level of knowledge was statistically correlated with a higher phonemic awareness score (p=0.019), and the fluency score (p=0.027) was more correlated with a high level of knowledge. Phonemic awareness and fluency component questions were more likely among SET to not support the teaching and development of reading. In contrast, the differences in the scores for phonics (p=0.067), vocabulary (p=0.119), and reading comprehension (p=0.771) did not reach statistical significance. Although no significant correlation was observed between the phonics, vocabulary, and reading comprehension components with a high level of knowledge, the teachers' responses were correct and

amounted to 45% or more in the scale of these components. They gave positive indicators compared with the phonemic awareness and fluency component.

**Table 4 Correlations between the level of knowledge in relation to phonemic awareness, phonics, fluency, vocabulary, and reading comprehension (n=184)**

| Parameters | Level of knowledge | | | P-value § |
|---|---|---|---|---|
| | Low | Moderate | High | |
| | Mean ± SD | Mean ± SD | Mean ± SD | |
| Phonemic awareness | 3.09 ± 1.30 | 5.08 ± 1.56 | 9.00 ± 1.41 | **0.019 **** |
| Phonics | 1.81 ± 0.98 | 2.78 ± 0.98 | 4.00 ± 0.00 | 0.067 |
| Fluency | 1.41 ± 1.03 | 1.73 ± 0.91 | 3.50 ± 0.71 | **0.027 **** |
| Vocabulary | 2.24 ± 1.16 | 3.39 ± 1.07 | 4.50 ± 0.71 | 0.119 |
| Reading comprehension | 1.82 ± 1.06 | 3.25 ± 1.15 | 3.50 ± 0.71 | 0.771 |

§ P-value has been calculated using Kruskal Wallis H-test.

** Significant at p<0.05 level.

**Correlation of knowledge toward socio-demographic characteristics**

Analyses were performed to examine the correlations between knowledge scores with demographic variables by calculating correlations using the Mann Whitney Z-test and the Kruskal Wallis H-test. When measuring the differences in the score of knowledge according to the socio-demographic characteristics of the SET (Table 5), a higher knowledge score was significantly more correlated among teachers who teach autism (H=12.757; p=0.013). Meanwhile, no statistical significance was achieved in the results of SET on the scale of the categories of teaching disabilities. Furthermore, gender was not significantly correlated with knowledge score (Z=0.996; p=0.319). Although neither gender was higher than the other, both had lower knowledge about the five components, and their support for teaching and reading development were poor. In addition, a significant negative correlation existed between teaching experiences with knowledge scores (H=0.035; p=0.983). Therefore, no significant statistical differences emerged. SET with higher teaching experience did not have more knowledge of ECERI than teachers with less experience in performing the scale survey.

**Table 5 Differences in knowledge score in relation to the socio-demographic characteristics of participants (n=184)**

| Factor | Knowledge Total Score (28) Mean ± SD | Z/H-Test | P-value § |
|---|---|---|---|
| Gender [a] | | | |
| • Male | 12.7 ± 3.76 | Z=0.996 | 0.319 |

| | | | |
|---|---|---|---|
| • Female | 13.2 ± 3.64 | | |
| Teaching experience [b] | | | |
| • 1 – 5 years | 12.8 ± 3.30 | H=0.035 | 0.983 |
| • 6 – 10 years | 13.1 ± 4.01 | | |
| • 11 – 20 years | 12.9 ± 3.90 | | |
| • >20 years | 13.0 ± 3.06 | | |
| Which category of disability do you teach? | | | |
| • Intellectual disability | 12.6 ± 3.59 | H=12.757 | **0.013 **** |
| • Visual Impairment | 12.2 ± 2.65 | | |
| • Hearing Impairment | 14.1 ± 4.22 | | |
| • Learning disability | 12.7 ± 3.89 | | |
| • Autism | 16.9 ± 2.73 | | |
| • Other | 12.7 ± 3.26 | | |

[a] P-value has been calculated using Mann Whitney Z-test.

[b] P-value has been calculated using Kruskal Wallis H-test.

** Significant at $p<0.05$ level.

**Discussion**

The main goal of the study was to examine the knowledge of SET of the ECERI (i.e., phonemic awareness, phonics, fluency, vocabulary, and reading comprehension) by conducting a standardized Arabic language scale on content knowledge and application of knowledge for each reading component. The scale was shortened to avoid dropouts due to the length of the scale, to encourage greater opportunity for participants to participate, and to give general perceptions of the SET background in content knowledge and applications of knowledge of the five components of reading.

Regarding the third question discussed at the beginning of the study, our findings propose the following interpretations. For the first question, the findings were unexpected from a survey of SET knowledge of the ECERI. The findings of the study showed that the level of knowledge of SET was low, with an average total knowledge score of 12.9. The highest percentage (57.1%) of the participants had poor knowledge perceptions of the components of reading and their importance in teaching and reading development for students with disabilities. The performance of the participants on the reading components survey varied in each component separately, as they displayed knowledge to some extent in the ECERI phonics, vocabulary, and reading comprehension. Meanwhile, the component of phonemic awareness and fluency indicated a sharp weakness in understanding the meanings, structures, and construction of these components in children's reading skills. The results of this study converge with those of other findings in limited impairment of phonemic awareness and phonics (i.e., Cheesman et al., 2009; Spear-Swerling & Cheesman, 2012; Spear-Swerling and Zibulsky 2014). By contrast, some

studies showed generally average findings for the phonemic awareness component of teachers (i.e., Al Zamili & Ghareeb, 2021; A Alarfaj & Alomair, 2020). Furthermore, the findings of Jakobson, Soodla, and Aro (2022) were consistent with our findings, as teachers evidently lack knowledge about reading comprehension and its role in improving students' reading skills. Meanwhile, the findings of Spear-Swerling and Cheesman (2012) were highly rated in the components of fluency, vocabulary, and reading comprehension compared with the current study, which showed a low level of teachers in those components. Brownell et al. (2009) obtained results that SET concentrate on general instruction knowledge much more than knowledge of specific areas of teaching reading.

In the current study, the phonemic awareness component measured SET on their knowledge of phonemic skills, the performance of phonemic units, and ways of identifying sounds. The average score was 39.9% on phonemic awareness knowledge, which gives an uncertain indication about teachers' ability to perform phonemic awareness teaching for children with disabilities. The phonics component measured SET through a survey on their knowledge of actual ability in the role of applying the principles of phonics. The average score was 44.8% on phonics knowledge, which raises the question about the teachers' capacities to teach and train phonics materials for children with disabilities. The fluency component measured SET knowledge of their ability to build a bridge for students to recognize and understand words and to make links between what they read and their background knowledge. The average score was 31.2% on fluency knowledge, which raises doubts about teachers' ability to guide children with disabilities to learn fluency. The reading comprehension component measured the SET knowledge of the actual abilities to read, decode, and symbolize words, as well as to understand and integrate the meaning of words and sentences into a meaningful entire. The average score was 48.6% on reading comprehension knowledge, which suggests that teachers were not familiar enough with how to train children with disabilities to reading comprehension. The vocabulary component measured the SET knowledge of their ability to build word skills and how to achieve vocabulary learning. The average score was 45.7% on vocabulary knowledge, which calls into question teachers' abilities to teach children with disabilities vocabulary. The results of the current study assist the need to expand the knowledge of SET of the ECERI. Furthermore, our findings are consistent with Spear-Swerling and Cheesman's (2012) study regarding SET levels on the CK items, where the error rates were lower than the AK items. The differences raise the suspicion that SET knowledge about the ECERI lies around certain notions of the meanings, definitions, and structures of those components. Meanwhile, the methods of the actual application of these components to the reality of teaching students how to identify concepts, such as syllables, words that have the same morphological weight, voiced letters, and voiceless letters, are almost unknown to SET.

Briefly, our findings hinted that many participants had somewhat relative strengths in the areas of reading comprehension, vocabulary, and phonics compared with phonemic awareness and fluency. The results referenced that relative weakness involves not knowing the meaning and purpose of these components in supporting and developing reading. Therefore, these results may necessitate improving teachers' levels of knowledge about the ECERI, in addition to preparing developmental programs for SET in the field of reading teaching (Cunningham et al., 2004). Furthermore, supportive professional development for SET should be provided through a well-defined, clearly instructed approach to teaching reading to young children with disabilities (Brady et al., 2009; Podhajski et al., 2009).

Regarding the second question, the level of teachers' knowledge had positive relationships in the performance of participants in the survey, where the correlations between the level of knowledge of SET and the component of phonemic awareness and fluency were more statistically related to a high level of knowledge of those components. This indicator provides the differences and indications between the SET performance in knowing the structures of those components. High levels of knowledge must be correlated with the methods of teaching reading. Although our study did not measure the level of teaching effectiveness, some studies proved the necessity of the correlation between knowledge and teaching effectiveness (e.g., Arrow et al., 2019; Brownell et al., 2009; Point, 2004; Spear-Swerling & Cheesman, 2012; Williams & Dikes, 2015). Some studies also confirmed that the development of teachers in the ECERI occurs after professional training, such as Brady et al. (2009). Moreover, receiving professional development for teachers increased their knowledge of phonemic awareness and fluency, and their performance differed after receiving training in understanding the components and their impact on teaching reading to children. Initial scores before training were significantly associated with scores for change after receiving training. Thus, teachers' assessment that they have knowledge of the components of reading is not sufficient. If such knowledge is not coupled with the insight on the actual situation regarding children's reading skills, then that knowledge will not be beneficial (Al-Hazza et al., 2008; Moats, 2009; Stark et al., 2016). Moreover, the current study showed non-significant correlations in SET knowledge levels on phonics, vocabulary, and reading comprehension components. This observation indicated that SET have no differences in their performance levels in the knowledge test of those components. These non-statistical correlations achieved convergence with Arrow et al.'s (2019) study on teachers' self-knowledge in the component of reading comprehension, vocabulary, phonics, phonemic awareness, and fluency. However, the current study achieved a statistical correlation in the component of phonemic awareness and fluency only, compared with what Arrow et al. found. Meanwhile, Spear-Swerling and Zibulsky (2014) found that teachers have knowledge and a statistically close correlation between the subscales of phonemic awareness and phonics with fluency,

vocabulary, and reading comprehension.

Regarding the third question, the knowledge level of SET had no correlational evidence and difference in knowledge increase for one gender. This outcome gives gender moderation in understanding ECERI. It may be due to the return of the two genders to the same local school system, as it is unified in all regions and cities of Saudi Arabia. Carlisle et al. (2009) described that no relationship exists between gender and different years of teaching experience in developing students' reading despite their belief that these variables have stable effects on the reading model. In the current study, the knowledge of teachers who teach people with autism was statistically more correlated with higher knowledge scores than the rest of the teachers who teach other categories of people with disabilities. In fact, we were unable to determine the reason behind this correlation. The only justification may be of interest to academics, those interested in the field of disability, and decision makers in studying the prevalence of autism in Saudi society. It may also be of interest to those diagnosing cases and providing cognitive and teaching support, which affects the knowledge class of teachers in many educational aspects. In addition, the higher level of SET knowledge was not statistically associated with teachers with more teaching experience in the field of reading and with students of disabilities. SET results revealed negative correlations with the variable of teaching experience, and the more experienced teachers were no longer superior to the less experienced teachers in the knowledge of the ECERI and teaching among students. The educational experience variable is considered an influential factor in building SET perceptions and giving them a more knowledgeable belief about a phenomenon or knowledge of educational and teaching aspects. However, the results of our study converge with other findings such as that of Stark et al. (2016), who determined that no strong statistically significant correlations exist between the general performance of teachers in the knowledge scale and years of teaching experience about any area of reading development. In addition, Al-Hazza et al. (2008) did not detect a statistically significant correlation between years of experience and knowledge of phonics. Moreover, Brady et al. (2009) observed that teaching experience was not correlated with better performance on the TKS in phonemic awareness, fluency, and vocabulary. The results of the analysis showed that the teachers' responses did not differ according to their experiences in teaching reading and developing phonemic awareness (Alseraye, 2015). While the findings of Spear-Swerling and Zibulsky (2014), more experienced teachers tend to have lower levels of knowledge in fluency, vocabulary, and reading comprehension. They asserted that teachers are not exposed to modern professional development in the areas of reading. In contrast to the current study, Spear-Swerling and Cheesman (2012) found statistical correlations between years of teaching experience and the performance of participants in the knowledge survey about the components of reading. They found a high level of knowledge in the components of phonemic awareness and phonics, and an average level in

the components of fluency, vocabulary, and reading comprehension among more experienced teachers. The current study and previous studies demonstrate that teachers' knowledge about teaching reading is limited by some beliefs in the application of teaching strategies specific to a curriculum and a guideline. Arrow et al. (2019) denoted that experienced teachers are affected by curricular contexts in teaching and prevent the use of precise instructions in supporting students' phonemic awareness and phonics even if they have the knowledge to employ those instructions. Brady et al. (2009) asserted the difficulty in finding teachers who have knowledge and skills to provide guidance in the ECERI to enhance informed ideas about methods of reading development. Hence, high quality preparatory and mentoring programs for teachers should be established.

**Limitations of the study and future directions**

Some important limitations should be considered for this study. The reliability scores of the TKS were not high on the subscales of phonemic awareness and phonics, as well as fluency, vocabulary, and reading comprehension. However, the survey's overall score was acceptable. TKS focused on assessing the knowledge of the ECERI of SET only and did not focus on the writing and spelling aspects or even the classroom practices of these components. Another limitation is that the sample size was relatively small in some categories of teachers who teach special education students. The disparity between the numbers of participants caused difficulty in determining the similarity and convergence between groups on their performance in the survey.

Moreover, the results of our study presented that teachers lack knowledge of the ECERI and perform poorly on both the content knowledge items and the application of knowledge items for those five components. This finding suggested that SET need more pre-service and in-service knowledge and training to promote their reading abilities and teaching skills. Attaining scientific and literary aspirations that serve groups of people with disabilities in phonemic awareness, phonics, fluency, vocabulary, and reading comprehension are fundamental to students' academic success. We are fully aware that increased knowledge gives teachers the professional ability to face educational difficulties and problems and to practice and evaluate the ideal pedagogical methods through which students learn to read. According to Carlisle et al. (2009), teachers' ability to apply content knowledge in their teaching practices effectively may be extremely difficult to discern. Therefore, the researchers suggested the existence of a structural equation model to distinguish the extent to which teachers' knowledge assists in instructional practices, and the extent to which knowledge and instructional practices support students' reading acquisition. In future research and studies, the interest may be on interventions that include SET training strategies for the understanding and instructional practice of the ECERI and work to

implement such knowledge and practice within the classroom. Such interventions can improve and expand the understanding of reading processes and instruction for students with special needs.

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**Data availability** Data are available from the authors upon request.

**Declarations**

**Conflicts of interest** The authors state that no potential conflict of interest exists regarding the research, authorship, or publication of the article.

**Ethical approval** This study was approved by the committee of research ethics of the Deanship of Scientific Research at Qassim University. This study included a review of ethical criteria such as research data, research community, data collection methods, educational institutions, potential research benefits, potential research risks if applicable, privacy and confidentiality of participants, and researcher's insight into study procedures. It abided by the rules regulating research ethics included in the "Regulations and Ethics of Scientific Research of the Deanship of Scientific Research at Qassim University" and "Regulating Rules."

**Consent to participate** Participants were informed of the purpose, methods, and procedures of this study. Consent to participate was obtained from special education teachers prior to the start of the study. Participants were informed that they had the right to withdraw from the study at any time without explaining the cause.

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