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Full Length Research Paper

The influence of physical education teachers' perceived organization support on innovation behavior: The mediating role of learning goal orientation

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Physical education teachers are the practitioners of physical education curriculum reform who work at the front line of teaching, and their innovation behavior play a crucial role in promoting the smooth implementation of physical education curriculum reform. This study uses goal orientation theory as a theoretical basis to explore the mediation effect of learning goal orientation in the influence of perceived organization support on physical education teachers' innovation behavior. A total of 402 valid questionnaires were collected from physical education teachers in 40 schools at the basic education level in China, and the relationship between the variables was tested using structural equation modeling. The findings showed that physical education teachers' perceived organizational support had a positive effect on learning goal orientation and innovation behavior. Physical education teachers' learning goal orientation significantly influenced their innovation behavior. Additionally, learning goal orientation partially mediated the relationship between perceived organizational support and innovation behavior.

Key words: Physical education teachers, perceived organization support, learning goal orientation, innovation behavior.

INTRODUCTION

Physical education in schools is an important part of teaching and learning in basic education, and quality classroom teaching and learning are key to the overall development of quality education and core literacy for young people (Xiong et al., 2020). In the face of the frequent occurrence of mental health problems and the decline in physical fitness levels among Chinese adolescents, it is important to focus on the development

of physical education in schools in order to effectively address this challenge (Hasanovna, 2023). Only by paying sufficient attention to the teaching of physical education in schools will it be possible to play a better nurturing role and fundamentally reverse the overall poor physical health of students (Kholmiraevich, 2022). Physical education teacher are the implementer of physical education activities in schools, and their

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qualifications, teaching behavior and innovation abilities are direct factors affecting the quality of school education (Behzad et al., 2018). Physical education teacher should make up for the shortcomings of students' physical health, through innovation teaching behavior, break with the existing way of teaching physical education in the physical education curriculum, and redesign the way physical education activities are carried out in schools with reference to the new requirements of "teaching, practicing and competing" (Expert Group, 2021). As the main subject of teaching activities, physical education teachers can only continue to meet the needs of teaching by changing their educational philosophy, improving their creative abilities and stimulating innovation behavior, thus stimulating students' interest in physical education, cultivating good exercise habits and promoting their healthy and harmonious physical and psychological development (Huang et al., 2019).

Teachers' innovation behavior is influenced by both personal and organizational factors, and the perceived organization support is an important environmental factor influencing teachers' innovation behavior (Abid et al., 2015; Nazir et al., 2019). Perceived organization support refers to teachers' perceived support for their work, interest in the school as an organisation, and agreement with their values, and has a positive impact on the development of teachers' innovation behaviour (Abid et al., 2015). When teachers feel supported in their work by the organisation, they will reciprocate by giving back to the organisation what they can do and what they have achieved, based on the principle of reciprocity (Bogler and Nir, 2012). Hosseini and Haghighi (2021) confirm that a perceived organization support has a direct impact on teachers' innovation behaviour, and that the stronger the perceived perceived organization support, the more committed teachers are to their work goals and the more likely they are to be motivated to innovate.

Innovation often arises from goal-directed behavioural processes and organisational factors can only be translated into positive behavioural outputs if teachers are motivated to learn by setting personal goals (Stephanie et al., 2007).

Goal orientation theory mainly explains the relationship between behaviour and goals, where teachers' innovation behaviour is influenced by personal goals and learning goal orientation plays an important role in influencing individual innovation behaviour (Kwon and Kim, 2020). Teachers with a learning goal orientation, who wish to acquire knowledge and skills that will inspire new behaviour to change outcomes, are more motivated to learn when faced with difficulties and see the problem to be solved as a challenge with the ultimate goal of solving it and promoting innovation behaviour (Chai et al., 2021). Therefore, teachers with a higher orientation towards learning goals are more likely to develop innovation behaviour (Runhaar et al., 2016).

Chen et al. (2018) linked the generation of innovation

behaviour to goal-oriented theory, suggesting that the understanding of organizational environment and goal setting may be related to individuals' innovation behaviour.

Thurlings et al. (2015) noted that the supportive organisational environment helps teachers to develop learning goals, and that learning goal orientation helps teachers to be motivated, take risks and continuously gaining work experience to promote innovation behaviour. Chen et al. (2018) also confirmed that the emergence of learning goal orientation is influenced by the organisational environment, and that learning goal orientation mediates between the perceived organization support and innovation behaviour. Therefore, learning goal orientation can enhance teachers' innovation behavior through the perceived organization support.

Innovation behavior is an essential skill that contemporary teachers should possess, and not enough attention has been paid to the innovation behavior surrounding physical education teachers and the mechanisms of innovation within the innovation process (Hasanovna, 2023). This study explores the impact of physical education teachers' perceived organization support on innovation behavior based on goal-oriented theory, with a focus on learning goal orientation as a mediator. The aim of this study is to explore suggestions and measures to enhance PE teachers' innovation behavior, so as to further explore how to promote the production of PE teachers' innovation behavior through effective organizational management practices and provide suggestions for organizational innovation management.

LITERATURE REVIEW AND RESEARCH HYPOTHESES

Perceived organization support and innovation behavior

In a review of the literature on perceptions of organisational support and innovation behavior, it was found that as perceptions of organisational support increased, individuals performed better overall in terms of innovation (Amabile et al., 2004). Although many variables in the organization may have an impact on individual creativity and innovative behavior, the creative support, technical support and interpersonal support provided by the organization will increase the motivation of individuals to produce creative activities, and individuals with a high sense of organizational support are more likely to stimulate creativity (Mumford et al., 2002).

A perceived organization support is one of the most important factors in fostering good school-teacher relationships and plays an important role in increasing individual teachers' effectiveness and developing positive

organisational behaviour (Nazir et al., 2019). Qi et al. (2019) found that individuals with a high level of organisational support showed high levels of higher levels of ownership and responsibility and high levels of self-worth. Supervisory support can stimulate innovative and transformative behaviour through intrinsic motivation. When organisations value the contributions of staff and meet their needs, it will increase the perceived organization support and organisations must increase their support for staff to enhance their perception of support and increase their potential for creative work (Akgunduz et al., 2018). Balkar (2015) through a study of teachers concluded that the stronger the organisational support felt by teachers is stronger, the more likely it is to stimulate teachers' decision-making participation and performance and promote innovation behavior. It was inferred that the generation of innovation behavior is influenced by organisational factors and that the perception of organisational support positively influences teachers' innovation behavior. Thus, this study proposed Hypothesis 1 (H1) as follows:

H1: perceived organization support has a significant positive effect on physical education teachers' academic innovation behavior.

Perceived organization support and learning goal orientation

Learning goal orientation is a stable trait of individuals and the organisational environment has a direct effect on individual motivation (Wang and Takeuchi, 2007). The motivational structure within the organisation and the support for work can influence individual learning goal-directed behaviour, and a perceived organization support can have a positive effect on reinforcing learning goal orientation (Nederveen et al., 2013).

In a supportive environment, individuals' perceived organization support can positively influence individual learning goal orientation, which in turn promotes positive behavioural outcomes (Chen et al., 2018). Clement and Kamau (2018) stated that the satisfaction of individual needs is the core driver of intrinsic motivation of individuals, while organisational support is a prerequisite for the satisfaction of teachers' needs, and only when needs are satisfied will individual goal-orientation be motivated to emerge. Thus, this study proposed Hypothesis 2 (H2) as follows:

H2: There is a significant positive effect of perceived organization support on PE teachers' learning goal orientation.

Learning goal orientation and innovation behavior

Learning goal orientation influences knowledge

acquisition and skill acquisition, innovation involves development and change within existing knowledge systems, and in order to be able to generate effective innovative ideas, individuals must continuously engage in learning processes to expand their knowledge to facilitate innovative ideas (Alexander and Knippenberg, 2014). Learning goal orientation, in which the goal is to acquire knowledge and skills and to improve one's ability to motivate new behavioural changes as a result of effort, plays an important role in influencing individuals' innovation behavior and performance (Cerasoli and Ford, 2014). When faced with difficulties, goal-oriented individuals are more motivated to learn and see the problem to be solved as a challenge, with the ultimate goal of solving it and promoting the target behaviour (Chai et al., 2021).

Innovation behavior is most likely to occur when individuals are motivated by all three internal factors of both process, skill and motivation, Runhaar et al. (2016) conducted a study on the effect of goal orientation on innovation behavior among 342 teachers at the Institute of Vocational Education and Training and suggested that learning goal orientation significantly influences teachers' innovation behavior and the stronger the motivation to learn, the more likely it is to motivate teachers' innovation behavior. Thus, this study proposed Hypothesis 3 (H3) as follows:

H3: Learning goal orientation has a significant positive effect on physical education teachers' innovation behavior.

Perceived organization support, learning goal orientation and innovation behavior

Goal orientation theory explains the relationship between perceived organization support, learning goal orientation and innovation behavior (Chen et al., 2018). In the process of goal orientation, individuals always want to receive valuable support from the organisational context in order to respond effectively to problems at work (Abid et al., 2015). According to Halbesleben et al. (2014), when individuals have more resources to support them, they are more inclined to engage in work in order to be more motivated to behave, and a higher perceived organization support means that individuals receive more support from the organization. This leads individuals to set challenging goals and to aspire to improve their abilities through learning in the process of challenging the unknown, which promotes motivation (Cerasoli and Ford, 2014). Therefore, a perceived organization support can positively contribute to an individual's orientation towards learning goals.

According to Stephanie et al. (2007), human behaviour is a continuous process of working towards a predicted goal; when we foresee the possibility of something, we desire to see it realized and act in a way that is consistent

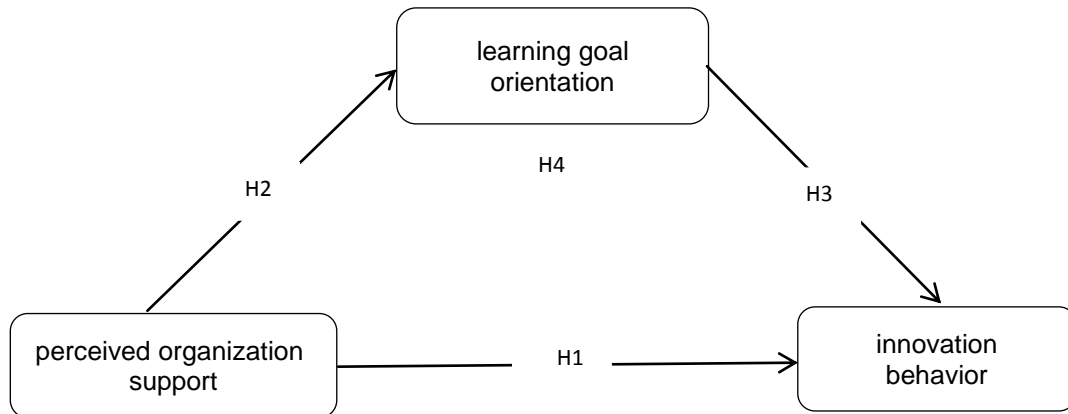


Figure 1. Research framework.
Source: Authors

with my desire to direct the course of events. According to Mesut (2012), teachers with a high goal orientation for learning usually set high goals, enjoy acquiring new knowledge, experience and skills in challenging tasks, are willing to experiment and make mistakes, and are able to think deeply and consistently, which promotes innovation behavior in individuals. Thus learning goal orientation is significantly and positively related to innovation behavior.

Based on the above discussion, this study proposes that learning goal orientation mediates the relationship between perceived organization support and innovation behavior, an idea that is not only consistent with the process of goal behaviour generation, but also with the logic of innovation behavior generation (Thurlings et al., 2015). The study by Chen et al. (2018) also confirmed that learning goal orientation partially mediates the effect between perceived organization support and innovation behavior. Thus, this study proposed Hypothesis 4 (H4) as follows:

H4: Physical education teachers' learning goal orientation produces a mediation effect in the effect of perceived organization support on innovation behavior.

MATERIALS AND METHODS

Research framework

Based on goal orientation theory, this study aims to explore the impact of perceived organization support on physical education teachers' innovation behavior and the mediation effect of learning goal orientation between perceived organization support and innovation behavior. The framework is shown in Figure 1.

Participants

The study was conducted with physical education teachers at the basic education level in China. The physical education teachers

were selected from primary and secondary schools. In the pre-test stage, 200 questionnaires were distributed and 151 valid questionnaires were returned. The scale used in this study was tested to have good reliability and validity.

During the formal administration, a sample of 40 schools from Beijing, Shenyang, Shanghai, and Zhengzhou was selected for questionnaire distribution. In total, 440 teachers were surveyed, and 402 questionnaires were retrieved, resulting in a valid return rate of 91.36%. Among them, 183 were male teachers and 219 were female teachers; 147 were teachers with postgraduate degrees and 255 were teachers with undergraduate degrees or below.

Instruments

The current study adopted the perceived organization support developed by Tang and Hu (2017). The scale comprises of 27 items distributed across three dimensions, namely value identification, interest concern, and job support, using a 5-point Likert scale. In terms of the reliability analysis of the pre-testing scale, the Cronbach's alpha was 0.974, which showed good reliability. Moreover, confirmatory factor analysis (CFA) was conducted to test the returned questionnaires. The factor loading for all questions in the survey recorded between 0.676 and 0.913. The construct reliability (CR) value of the scale between 0.870 and 0.937, exceeding the evaluative criteria of 0.60. The average variance extracted (AVE) value of the scale was 0.627, exceeding the evaluative criteria of 0.50. This indicates that the scale had a high level of construct validity and discrimination. As for the scale's goodness of fit test, the results were as follows: $\chi^2/df = 2.280$, RMSEA=0.043, SRMR=0.034, GFI=0.932, AGFI=0.930, NNFI=0.958, IFI=0.962, NFI=0.934, CFI=0.962, which shows that the scale had a satisfactory goodness of fit (Watkins, 2018).

The learning goal orientation scale, comprising of 5 items, proposed by Leugn et al. (2012), was adopted for estimating learning goal orientation, using a 6-point Likert scale. The reliability analysis shows that Cronbach's alpha was 0.878. In terms of CFA, the factor loadings of all questions were recorded between 0.704 and 0.835, with a CR of 0.876 and an AVE of 0.587. This indicates that the scale had a high level of construct validity and discrimination. The results were as follows: $\chi^2/df = 4.295$, RMSEA = 0.069, SRMR=0.019, GFI=0.988, AGFI=0.964, NNFI=0.980, IFI=0.990, NFI=0.987, CFI=0.990, which shows that the scale had a satisfactory goodness of fit.

This study adopted the innovation behavior scale developed by Scott and Bruce (1994), which comprises 6 items and uses a 5-

Table 1. The AVE and correlation coefficients of all variables (N = 402).

Path	M	SD	POS	LGO	IB
POS	3.711	0.748	0.792 ^a		
LGO	4.831	0.948	0.502***	0.766 ^a	
IB	3.934	0.726	0.547***	0.491***	0.766 ^a

POS=perceived organization support; LGO=learning goal orientation; IB=innovation behavior

^aSquare root of AVE (average variance extracted).

*** $p < 0.001$.

Source: Authors

Table 2. Path coefficients for structural equation models.

Path	β	SE	C.R.
POS→IB	0.506***	0.068	6.599
POS→LGO	0.603***	0.081	9.280
LGO→IB	0.261***	0.047	3.967

POS=perceived organization support; LGO=learning goal orientation; IB=innovation behavior.

*** $p < 0.001$.

Source: Authors

point Likert scale. The reliability analysis shows that the Cronbach's alpha was 0.877. In terms of CFA, the factor loadings of all questions recorded between 0.672 and 0.856, with a CR of 0.894 and an AVE of 0.586, this indicates that the scale had a high level of construct validity and discrimination. The results were as follows: $\chi^2/df = 4.866$, RMSEA = 0.075, SRMR=0.023, GFI=0.978, AGFI=0.948, NNFI=0.973, IFI=0.984, NFI=0.980, CFI=0.984, which shows that the scale had a satisfactory goodness of fit.

RESULTS

In terms of study results, the data were first tested for severe common method variance (CMV), followed by differential validity and correlation analysis, and finally an overall path model analysis.

Common method variance

This study used Harman's single-factor test to examine the CMV. In this study, an unrotated principal component analysis of the data for all variable measure items yielded five factors with eigenvalues greater than one in the unrotated case, explaining a total of 58.855% of the variance; and the first factor explained 35.751% of the total variance, which did not exceed the 50% threshold, so it is presumed that the sample data did not have a serious CMV problem (Aulakh and Geneturk, 2000).

Relevant analysis and discriminant validity

In this study, correlation analysis and differential validity

tests were conducted on the variables, and Pearson correlation coefficients were used to indicate the correlations between a total of three items: perceived organization support and learning goal orientation and innovation behavior, and the results are shown in Table 1. The correlation coefficients were 0.491 to 0.547, reaching a significance level of $p < 0.001$. The variables were moderately correlated and there was no co-linearity. The diagonal line is the square root of each factor AVE, whose values are all greater than the standardised correlation coefficients outside the diagonal line, so this study has good differential validity and is suitable for the next step of structural equation model testing and analysis.

Path analysis of the overall model

Firstly, a goodness-of-fit test of the overall model was performed, followed by a path analysis of the overall model for perceived organizational support, learning goal orientation, and innovation behavior. In terms of measures of absolute fit, the results are as follows: $\chi^2/df = 1.514$, RMSEA = 0.036, SRMR = 0.032, GFI = 0.961, AGFI = 0.945, NNFI = 0.982, IFI = 0.986, NFI = 0.959, CFI = 0.985. These results indicate that the model had a satisfactory goodness of fit (Watkins, 2018). As shown in Table 2 and Figure 2, physical education teachers perceived organization support can significantly and positively influence their innovation behavior ($\beta=0.506$, $p<0.001$), indicating that the stronger the physical education teachers perceived organization support, the

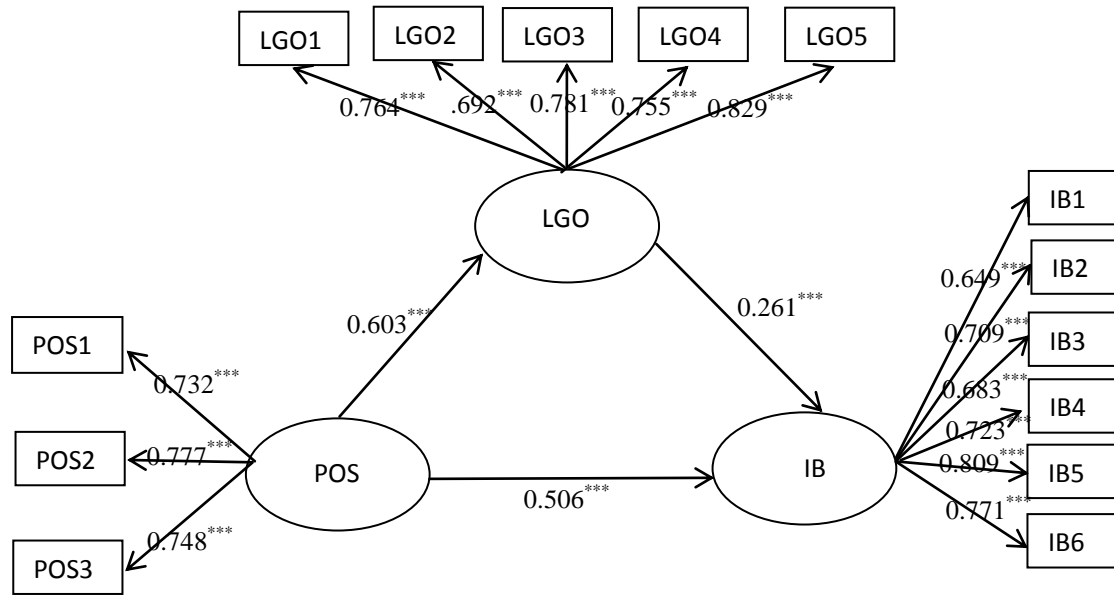


Figure 2. SEM path analysis. POS=perceived organization support; LGO=learning goal orientation; IB=innovation behavior. *** $p < 0.001$. Source: Authors

Table 3. Bootstrap SEM analysis of total, direct, and indirect effects.

Effect	Estimate	Bootstrap 95%		
		LLCI	ULCI	P
Direct effects POS→IB	0.506***	0.378	0.619	$p < 0.001$
Indirect effects POS→LGO→IB	0.158***	0.085	0.252	$p < 0.001$
Total effects	0.664***	0.583	0.730	$p < 0.001$

POS=perceived organization support; LGO=learning goal orientation; IB=innovation behavior. *** $p < 0.001$. Source: Authors

higher innovation behavior will be. Thus, H1 was supported.

Physical education teachers perceived organization support can significantly and positively influence their learning goal orientation ($\beta=0.603$ $p < 0.001$), indicating that the stronger the physical education teachers perceived organization support, the higher learning goal orientation will be. Thus, H2 was supported.

Physical education teachers learning goal orientation can significantly and positively influence their innovation behavior ($\beta=0.261$, $p < 0.001$), indicating that the stronger the physical education teachers learning goal orientation, the higher innovation behavior will be. Thus, H3 was supported.

Mediating effect

Based on Shrout and Bolger (2002) recommendations, a

Bootstrap sampling method with 5,000 replications was used to test the impact of learning goal orientation in the perceived organization support on innovation behaviour. The procedure involves resampling which results in the mean value and the 95% confidence interval of the mediation effect. If the 95% confidence interval of the mediation effect does not include 0, it indicates that the mediation effect reaches the significance level of $p < 0.05$.

As shown in Table 3, Among the indirect effects, the indirect effect of learning goal orientation between perceived organization support and innovation behaviour was 0.158, while the confidence interval, with the 95% confidence interval (0.085, 0.252) did not include 0, indicating a significant indirect effect ($p < 0.05$). In other words, physical education teachers' perceived organization support can promote innovation behaviour by enhancing learning goal orientation, validating the partial mediation effect of learning goal orientation

between perceived organization support and innovation behaviour. Therefore, H4 was supported.

DISCUSSION

The results of this study found that perceived organization support has a significant positive effect on creative behaviour, which is consistent with the findings of previous studies by Nazir et al. (2019) and Choi et al. (2021). It suggests that when organizations provide more job support and need satisfaction to staff, it increases individuals' perceptions of organisational support, and based on the organisational exchange principle, the perceived job support increases the motivation to generate creative activities, thus stimulating innovation behavior through support (Qi et al., 2019). In their study on the mechanism of the role of innovation behavior of sports coaches, Qiu and Liu (2018) pointed out that the stronger the organisational support felt by coaches, the more likely they are to stimulate a sense of individual ownership and enhance their learning ability, thus promoting innovation behavior.

A perceived organization support has a significant positive effect on learning goal orientation, in line with previous research (Nederveen et al., 2013; Cai and Wen, 2018). Clement and Kamau (2018) state that the organisation's satisfaction of individual needs at work is a core driver of intrinsic motivation for individuals, and that organisational support is a prerequisite for meeting teachers' needs. Only when needs are met will individuals be motivated to be goal-oriented. Learning goal orientation is a stable trait for individuals to develop their abilities, and a perceived organization support has a positive effect on strengthening learning goal orientation (Halbesleben et al., 2014). It suggests that individuals with a strong perceived organization support tend to have a higher learning goal orientation, and that the support of these material and social resources can stimulate intrinsic motivation to learn and improve their abilities in the process of constantly challenging the unknown (Chen et al., 2018).

Learning goal orientation has a significant positive effect on innovation behavior, in line with previous research (Shabbir and Malik, 2021). Individuals with a learning goal orientation aim at self-development, and when faced with difficulties, individuals with a higher learning goal orientation are more motivated to learn, see the problem to be solved as a challenge, and ultimately aim to promote the target behaviour (Chai et al., 2021). In the process of innovation, individuals who hold a higher learning goal orientation are more motivated to learn and want to improve their abilities in order to promote innovation behavior (Zhou, 2021). The findings illustrate that an individual's orientation towards learning goals, a process that integrates individual affective behaviour and individual cognition, is an important factor influencing

individual creative behaviour (Shabbir and Malik, 2021).

The results of this study found that learning goal orientation partially mediation effect between perceived organization support and innovative behavior, similar to the results of previous studies (Thurlings et al. 2015; Chen et al. 2018). Research findings confirm that individuals with a high learning goal orientation like to make bold breakthroughs, usually set high goals, enjoy the constant acquisition of new knowledge, experience and skills in challenging tasks, they are willing to try and make mistakes, and are able to think deeply and consistently, and these traits promote innovation behavior (Thurlings et al., 2015). The emergence of innovative outcomes for teachers is necessarily influenced by autonomous cognitive processes, and positive behavioural outputs can only be obtained if the environmental support provided by the organisation is translated into personal goals (Qi et al., 2019). Cai and Wen (2018) confirmed that when teachers who hold a learning goal orientation receive effective feedback, value affirmation and job support from the organisation, they are clearly motivated to achieve their goals and thus put more effort into achieving their task goals and promote innovation behavior. Therefore, organisational factors can be used to meet the autonomy needs of physical education teachers and stimulate intrinsic motivation to improve their abilities through learning, which in turn translates into innovation behavior (Kholmiraevich, 2022), the mediation effect of learning goal orientation between perceived organization support and innovation behavior.

Conclusion

This study developed a mediation model to explore the effect of physical education teachers' sense of organizational support on their innovation behavior. The results showed that PE teachers' perceived organization support had a significant positive effect on their innovation behavior, and that learning goal orientation partially mediated the relationship between PE teachers' perceived organization support and their innovation behavior. Specifically, PE teachers' perceived organization support had a positive influence on their learning goal orientation and innovation behavior, learning goal orientation could indirectly influence their innovation behavior through their perceived organization support, and the partial mediation effect of PE teachers' learning goal orientation between their perceived organization support and innovation behavior was confirmed.

In order to stimulate the innovation behavior of PE teachers, schools should actively explore the organizational support needs of PE teachers, build a working environment of innovation support, clarify the development goals and core culture of the school, improve the spiritual motivation of teachers and mobilise

innovation. In the management process, leaders are not only concerned with the performance of PE teachers, but also need to help teachers in their lives and emotionally, giving them a good working environment so that they can experience that the organisation is always concerned with their emotional needs and the realization of their personal values, thus creating a sense of belonging to the organisation and a sense of identity with their profession, which in turn stimulates learning goal orientation, promotes innovation behavior.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Full Length Research Paper

Perceived school support and online learning outcomes among Chinese college students: The serial mediating role of academic self-efficacy and online learning engagement

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The purpose of this study is to investigate the factors that influence the online learning outcomes of Chinese college students. The study was guided by Bandura's social cognitive theory. This study collected 959 valid questionnaires from college students in Hainan Province of China and used 4 scales to evaluate perceived school support, ASE online learning engagement, and online learning outcomes. The results of the study found that college students' perceived school support had a significant positive effect on online learning outcomes; ASE partially mediated the relationship between college students' perceived school support and online learning outcomes; online learning engagement partially mediated the relationship between college students' perceived school support and online learning outcomes; there was a serial mediation between college students' perceived school support and online learning outcomes with the mediators of ASE and online learning engagement. The findings suggest theoretical and practical implications. Suggestions are also made for colleges and universities on how to improve online learning outcomes for college students and ideas for future research.

Key words: Perceived school support, online learning outcomes, academic self-efficacy, online learning engagement, college students.

INTRODUCTION

Amidst globalization, the internet, and advanced technology, online education has emerged as a means to provide up-to-date educational content to a broader cross-border audience (Kim and Park, 2021). The popularity of online learning is surging in higher education settings (Mubarak et al., 2022) and experiencing rapid

growth (Hsu et al., 2019; Martin et al., 2019). China's online education is expanding (Ting et al., 2018). Online learning became the new educational model (Zuo et al., 2021). However, whether the outcomes of online learning are identical to those of traditional learning remains unclear (Pye et al., 2015). The success of online learning

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can be determined by the quality of students' learning outcomes (Panigrahi et al., 2018; Pinto et al., 2018), with learning outcomes referring to the specific knowledge, values or attitudes, skills, or behaviours that students are expected to exhibit after a period of learning (World Bank, 2011).

Achieving such outcomes is the ultimate goal of education (Kim and Park, 2021). Thus, online learning outcomes can be considered to be the objective of online education evaluation. A growing number of scholars are focusing on the study of online learning outcomes (Kim and Park, 2021; Wang et al., 2021; Xing and Saghaian, 2022; Yu, 2021).

Evaluation of learning outcomes is indispensable for determining the efficacy of teaching practices and student learning (Clark, 2002). Moreover, evaluating learning outcomes can enable identification of the factors affecting college students' online learning.

Factors such as education level, distance e-learning satisfaction, and students' perceptions regarding the instructor's role can affect online learning outcomes (Kim and Park, 2021; Wang et al., 2021; Yu, 2021). Kumar et al. (2023) found that perceived school support was effective in promoting online learning among college students. Other studies have identified students' perceived school support as a substantial factor affecting student achievement (Niehaus and Adelson, 2014). In addition to family support, school support serves as an essential source of social support, and upon school entry, teachers and classmates become significant others in the students' lives. School support may include teacher and classmate support (Day et al., 2020; Guo et al., 2020). Students' perceived teacher–student and classmate relationships are positively associated with their learning outcomes (Bradley et al., 2021). Teacher support exerts a significant positive effect on learning outcomes (Košir and Tement, 2014; Wentzel, 2002). Classmates can share academically relevant information, provide knowledge- and skill-based guidance and judge the rightness or wrongness of particular answers to questions (Ryan and Shim, 2012). The aforementioned findings suggest that college students' perceived school support significantly affects online learning outcomes. Therefore, this study explores the impact of college students' perceived school support on online learning outcomes in hopes of obtaining more empirical evidence.

Bandura et al. (1999) identified self-efficacy as an individual's prediction of his or her ability to complete a task successfully. Several researchers have explored the fact that ASE is very important in the field of education (Chen et al., 2021; Gutiérrez and Tomás, 2019; Zeinalipour, 2022). Robbins et al. (2004) indicated that ASE is a positive predictor of college students' learning outcomes. Students who perceive more teacher support in an online learning environment have higher self-efficacy (Han et al., 2021). Furthermore, ASE significantly and positively affects learning outcomes in an

online learning environment (Hanham et al., 2021). Therefore, we hypothesized that college students' perceived school support would affect online learning outcomes by influencing their ASE.

Learning engagement refers to a student being in a positive, fulfilling, and learning-related psychological state (Schaufeli et al., 2002). Online learning engagement refers to a student's psychological state during online learning activities (Chen et al., 2010). Teacher support can enhance students' learning engagement (Doll et al., 2014). Students tend to demonstrate greater learning engagement when they perceive greater teacher support (Fredricks et al., 2004; Jin and Wang, 2019; Strati et al., 2017). Furthermore, in an online learning environment, learning engagement is a significant predictor of learning outcomes (Northey et al., 2018; Zhang, 2021). Online learning engagement contributes to learning outcomes (Lu and Cutumisu, 2022). Therefore, college students' perceived school support is likely to indirectly affect the online learning outcomes of college students through online learning engagement. ASE has a significant positive impact on learning engagement in online learning activities (Alamri, 2022). Moreover, self-efficacy can indirectly affect online learning outcomes through online learning engagement (Zapata-Cuervo et al., 2023).

Therefore, this study infers that ASE and online learning engagement are important mediating variables between perceived school support and online learning outcomes.

Past research has found that teacher support and peer support can increase students' ASE (Burke et al., 2019; Gutiérrez and Tomás, 2019; Liu et al., 2018) and online learning engagement (Luan et al., 2020). ASE, online learning engagement improves online learning outcomes (Hanham et al., 2021; Lu and Cutumisu, 2022). And self-efficacy can enhance learning engagement (Alemayehu and Chen, 2021; Heo et al., 2021). However, fewer studies have explored the mediating role of ASE and online learning engagement in the relationship between perceived school support and online learning outcomes, as well as the serial mediation between the two. Therefore, this study investigates the mediating roles of ASE and online learning engagement in the relationship between college students' perceived school support and online learning outcomes, respectively, as well as the serial mediating roles of ASE and online learning engagement to fill this gap. This study will lead to a greater understanding of the important factors that influence online learning outcomes, thereby improving our knowledge of the mechanisms that potentially influence this process and providing new directions for how college teachers can improve online learning outcomes more effectively. Therefore, the objectives of this study include:

(1) Exploring the relationship between college students' perceived school support on online learning outcomes;

- (2) Exploring the mediating role of college students' ASE between perceived school supports and online learning outcomes;
- (3) Exploring the mediating role of college students' online learning engagement between perceived school supports and online learning outcomes;
- (4) Exploring the serial mediating role of college students' ASE and online learning engagement between perceived school support and online learning outcomes.

Theoretical background and hypotheses

Social cognitive theory (SCT)

Bandura's (1986) Social Cognitive Theory (SCT) posits that both environmental and individual factors influence individual behavior. This theory has found extensive application in studies examining learning outcomes (Li et al., 2022; Wang and Zhang, 2020; Zysberg and Schwartzberg, 2021). In alignment with social cognitive theory, Wang and Zhang (2020) classified perceived teacher feedback as an environmental factor and learning engagement as an individual factor. Their findings demonstrated that both perceived teacher feedback and learning engagement positively and significantly influenced learning outcomes. Li et al. (2022) applied social cognitive theory and reported parent-child relationships to be an environmental factor and gratitude and psychological capital to be personal factors. The authors determined that all three variables were significant predictors of learning outcomes. On the basis of social cognitive theory, Zysberg and Schwabsky (2021) viewed school climate as an environmental factor and ASE as a personal factor; the results of their study indicated that school climate and ASE could significantly influence academic achievement. In the present study, we considered college students' perceived school support to be environmental factors, ASE and online learning engagement to be a personal factor. The study explores the relationship between the direct impact of perceived school support on online learning outcomes and the mediating role of ASE and online learning engagement in this impact.

College students' perceived school support and online learning outcomes

School support involves support from teachers and classmates which serve as the two dimensions of such support (Moreira and Lee, 2020; Torsheim and Wold, 2001). Teachers are the primary agents who provide various forms of support within the school (Lei et al., 2018), whereas classmates represent individuals with similar experiences and are crucial others in an individual's school life. Thoits (2011) reported that

teachers and classmates offer students emotional support and positive coping assistance. Learning support provided by teachers and classmates significantly positively affects students' learning processes and outcomes (Rumberger and Rotermund, 2012). With appropriate assistance and direction from teachers, students feel comfortable with online learning (Reimers and Schleicher, 2020).

School support for learning can affect learning outcomes (Moreira et al., 2018). Students' learning outcomes are generally proportional to their perceived teacher support (Košir and Tement, 2014; Midgley et al., 1989; Wentzel, 2002).

Kashy-Rosenbaum et al. (2018) conducted an empirical study that included 1641 students and determined that teacher support significantly positively affected learning outcomes. Bradley et al. (2021) conducted an empirical study involving 754 students and determined that classmate support significantly positively affected learning outcomes. In their study that included 2328 students, Fang et al. (2020) revealed that both teacher and classmate support significantly positively affected learning outcomes. Therefore, the following hypotheses were formulated for this study:

Hypothesis 1: College students' perceived school support significantly and positively predicts online learning outcomes.

Mediation of ASE

ASE refers to an individual's self-efficacy beliefs in specific academic domains (Bong and Skaalvik, 2003). Liang (2004) developed a specialized scale to assess Chinese students' ASE, which has been widely used in empirical studies (Chen et al., 2020; Luo et al., 2021; Zhang, 2022). Research has shown that teacher support can enhance ASE. (Bai and Gu, 2022; Eakman et al., 2019; Gutiérrez and Tomás, 2019; Liu et al., 2018). Therefore, college students' perceived school support can significantly and positively predict ASE. Zysberg and Schwabsky (2021) surveyed 1641 students by using a questionnaire and determined that the higher ASE is, the greater academic achievement. Shoval et al. (2021) conducted a questionnaire survey on 491 students and the results showed that ASE enhances academic achievement. The results of another study on online learning also found that the higher the ASE, the better the learning outcomes (Hanham et al., 2021).

A study demonstrated that teacher autonomy support indirectly affects learning outcomes through ASE (Gutiérrez and Tomás, 2019). The above findings suggest that perceived school support may indirectly influence online learning outcomes through ASE. Therefore, the following hypotheses were formulated for this study:

Hypothesis 2: ASE mediates between college students' perceived school support and online learning outcomes

Mediation of online learning engagement

In education research, online learning engagement has become a topic of substantial interest (Park and Yun, 2018). Teacher and classmate support significantly and positively affect the three dimensions of online English learning engagement (Luan et al., 2020). Yoon et al. (2020) surveyed 121 students in flipped classrooms and determined that teacher autonomy support was a significant predictor of learning engagement. Therefore, this study infers that college students' perceived school support might positively affect online learning engagement. The results of a questionnaire survey conducted by Zapata-Cuervo et al. (2023) among 523 college students revealed that learning engagement can significantly and positively predict learning outcomes. Bayoumy and Alsayed (2021) conducted an empirical study with 425 college students and showed that learning engagement significantly predicted learning outcomes.

Past research has pointed out that social networking site addiction can indirectly affect learning outcomes through learning engagement (Li et al., 2019). The above findings suggest that perceived school support may increase engagement in online learning, which in turn has an impact on online learning outcomes. Thus, the following hypotheses were formulated for this study:

Hypothesis 3: Online learning engagement mediates between college students' perceived school support and online learning outcomes

Serial mediation effects of ASE and online learning engagement

ASE can positively predict learning engagement (Sökmen, 2021). Similar findings have been obtained for online learning. For example, Heo et al. (2021) surveyed 1205 college students who participated in online learning and discovered that self-efficacy in an online learning environment significantly and positively affected learning engagement.

Alemayehu and Chen (2021) conducted a questionnaire survey among 354 college students who participated in online learning and reported that higher self-efficacy was associated with greater learning engagement. Another study found that students with higher ASE were more able to actively and effectively participate in online courses (Bates and Khasawneh, 2007). In addition, a study indicated that students' self-efficacy significantly affected their online learning engagement and thus their online learning outcomes (Zapata-Cuervo et al., 2023). The aforementioned findings provide an empirical foundation for investigating

the serial mediation effects of ASE and online learning engagement. Thus, the following hypotheses were formulated for this study:

Hypothesis 4: ASE and online learning engagement serially mediate the relationship between college students' perceived school support and online learning outcomes.

METHODS

Participants and procedures

This cross-sectional study employed the convenience sampling method to collect data. Pretest samples were collected from a university in the Hainan Province of China from March 7 to 9, 2022. A total of 150 valid questionnaires were received from 109 males (72.67%) and 41 females (27.33%) participants. In the formal test, college students from five universities in Hainan were recruited. A total of 1169 formal questionnaires were distributed and recovered from May 16 to 20, 2022. A total of 959 valid questionnaires were received from 314 males (32.74.67%) and 645 females (67.26%) participants.

Two batches of electronic questionnaires were distributed with the help of college counsellors through the Questionnaire Star platform (www.wjx.cn). First, the college counsellors who distributed the electronic questionnaire were provided with professional training; the criteria for participation (that is, being a college student interested in the study and willing to volunteer to participate) and questionnaire items were explained in detail. Second, participants completed the questionnaire under the supervision of college counsellors. Before completing the questionnaire, students were informed that it would be collected and analysed anonymously. After the participants provided informed consent, the questionnaires were distributed and collected through Questionnaire Star.

Measures

Scale for perceived school support

Perceived school support was scaled using Torsheim et al. (2000). This scale consists of two dimensions with a total of 8 items. The item analysis results of the pre-test sample revealed that the correlation coefficients between the items after correction and the total score were >0.4 ; therefore, all 8 items could be retained. The EFA results indicated that the $KMO = 0.836$ ($P < 0.001$). Subsequently, the varimax rotation method for analysis was used. The results showed that 2 factors with an eigenvalue of >1.0 were generated, and the factor loadings of these 2 factors were between 0.657 and 0.807, which met the requirement of a factor loading being >0.4 (Guadagnoli and Velicer, 1988). The Cronbach's alpha values for teacher and classmate support were 0.742 and 0.809, respectively; both exceeded the threshold of 0.7 (Nunnally, 1978). Therefore, the scale's validity and reliability were favourable.

Scale for ASE

This study used a scale developed by Liang (2004) to measure ASE. The scale consists of two dimensions with 22 items. The item analysis results showed that four items on the scale had correlation coefficients with a total score of <0.4 after correction; thus, these four items were deleted from the formally distributed questionnaires, and 18 items were retained. The EFA results indicated that one item was loaded in another dimension, which is inconsistent with the rule that variables loaded in the same dimension should have

the same conceptual construct. Thus, the item was deleted (Hatcher, 1994; Schönrock-Adema et al., 2009). Finally, 17 items were retained. The EFA results revealed that the KMO = 0.905 ($P < 0.001$). Subsequently, this study employed the varimax rotation method for analysis. The results showed that two factors with an eigenvalue of >1.0 were generated, and their factor loadings were between 0.411 and 0.823, which met the standard that factor loadings should be >0.4 . The Cronbach's alpha values for the two dimensions of the scale were 0.866 and 0.831, respectively. Therefore, the scale had high reliability and validity.

Scale for online learning engagement

The student engagement in distance education scale revised by Sun and Rueda (2012) was used. The scale consists of three dimensions and 15 items. The results of the item analysis of the pretest samples revealed that one item on the scale had a correlation coefficient with a total score of <0.40 after correction; therefore, this item was eliminated. Finally, 14 items were retained. The EFA results revealed that the KMO = 0.869 ($P < 0.001$). Subsequently, the varimax rotation method for analysis was used. The results showed that three factors with an eigenvalue of >1.0 were generated, and their factor loadings were between 0.422 and 0.901, which met the requirement that factor loadings should be >0.4 . The Cronbach's alpha values for behavioural, cognitive, and emotional engagement were 0.861, 0.912, and 0.879, respectively. Therefore, the scale has high validity and reliability.

Scale for online learning outcomes

The online learning outcomes use scales developed by Li et al. (2016) were employed in this study. The scale consists of four dimensions and 19 items. The item analysis results showed that one item had a correlation coefficient with a total score of <0.4 after correction; therefore, this item was eliminated. Furthermore, the EFA results indicated that three items were loaded in another dimension and thus could be deleted (Hatcher, 1994; Schönrock-Adema et al., 2009).

Finally, four items were eliminated from this study, and 14 items were retained. After the deletion, the EFA results revealed that the KMO = 0.820 ($P < 0.001$). Subsequently, the varimax rotation method for analysis was performed. The results showed that four factors with an eigenvalue of >1.0 were generated, with factor loadings between 0.427 and 0.852, which met the requirement that factor loadings should be >0.4 . The Cronbach's alpha values for learning cognitive, communicative, self-management, and interpersonal abilities were 0.694, 0.618, 0.776, and 0.842, respectively; all exceeded the threshold of 0.6 (Nunnally and Bernstein, 1994; Styliadis et al., 2014). Therefore, the scale had high validity and reliability.

CMV test

Since all four scales used in this study relied on self-report measures, there was a potential risk of common method variance (CMV) in the survey. To assess the severity of CMV, we conducted Harman's one-factor test, and the results indicated that the first factor accounted for 31.515% of the variance. Consequently, the level of CMV in this study was determined to be not severe (Harris et al., 2009).

Data analysis

First, we used SPSS 22.0 to conduct a pre-test analysis of the

instruments, to modify or eliminate scale items to ensure each scale item achieved a qualified factor loading, and to evaluate the reliability (Cronbach's alpha) of each scale in the pre-test samples. Second, the CMV problem was investigated using Harman's one-factor test. Third, SPSS 22.0 and Amos 23.0 were used to test Cronbach's alpha and conduct CFA to assess the reliability and validity of the 4 scales in the formal test samples. Fourth, for each variable, descriptive statistics and correlation analysis were performed; the descriptive statistics were used to determine the means and standard deviations for each variable, and Pearson's correlation coefficients were calculated to analyse the correlation between variable dimensions. Fifth, Amos 23.0 was used to test the hypothetical model. Finally, the Bootstrap method (repeated samples set at 5000) was used to test the mediation effect of the hypothesis model.

RESULTS

Descriptive statistics and correlation analysis

The dimensions of teacher support, peer support, and self-efficacy for learning ability were positively correlated. Their correlation coefficients were between 0.154 and 0.745 (Table 1), indicating the absence of collinearity in this study.

Measurement model

The CFA results of the perceived school support scale revealed that the value of χ^2/df was 8.045. This value was high, which was possibly because of the large size of the sample; in such cases, other fitting indices should be calculated (Hu and Bentler, 1998). RMR = 0.026, CFI = 0.952, IFI = 0.952, and PGFI = 0.506. The average variance extracted (AVE) values of teacher and classmate support was 0.420 and 0.570, respectively, and their construct reliability (CR) values were 0.743 and 0.843, respectively. If a scale's AVE value is <0.5 and CR value is >0.6 , the scale's convergent validity is acceptable (Fornell and Larcker, 1981). The Cronbach's alpha values for teacher and classmate support were 0.734 and 0.839.

The CFA results of the ASE scale revealed that the χ^2/df value was 8.573; this value was high because of the large sample size. RMR = 0.039, CFI = 0.907, IFI = 0.907, and PGFI=0.682. The AVE values of the learning ability and learning behaviour self-efficacy dimensions were 0.543 and 0.503, respectively, and their CR values were 0.922 and 0.875, respectively, indicating that all dimensions of the scale had satisfactory convergent validity. The Cronbach's alpha values for the learning ability and learning behaviour self-efficacy dimensions were 0.920 and 0.872.

The CFA results of the online learning engagement scale revealed that the χ^2/df value was 6.442, which may have been high because of the large sample size. RMR = 0.044, CFI = 0.956, IFI = 0.956, and PGFI = 0.658. The AVE values of behavioural, cognitive, and emotional

Table 1. Descriptive statistics and correlations.

	TS	CS	LA	LB	BE	EE	CE	LCA	CA	SA	IA
TS	1										
CS	0.573***	1									
LA	0.374***	0.332***	1								
LB	0.350***	0.333***	0.745***	1							
BE	0.251***	0.283***	0.413***	0.478***	1						
EE	0.207***	0.204***	0.287***	0.324***	0.324***	1					
CE	0.280***	0.298***	0.519***	0.588***	0.510***	0.532***	1				
LAC	0.352***	0.279***	0.698***	0.613***	0.433***	0.358***	0.561***	1			
CA	0.264***	0.254***	0.428***	0.463***	0.361***	0.232***	0.389***	0.489***	1		
SA	0.187***	0.154***	0.366***	0.427***	0.318***	0.190***	0.354***	0.377***	0.450***	1	
IA	0.273***	0.329***	0.476***	0.516***	0.475***	0.292***	0.455***	0.528***	0.586***	0.339***	1
M	3.917	3.736	3.326	3.454	4.096	3.391	3.561	3.437	3.779	3.227	3.923
SD	0.599	0.613	0.676	0.654	0.557	0.848	0.651	0.698	0.642	0.902	0.566

***p < 0.001. TS=teacher support; CS=classmate support; LA=learning ability self-efficacy; LB=learning behaviour self-efficacy; BE=behavioural engagement; EE=emotional engagement; CE=cognitive engagement; LCA=learning cognitive ability; CA=communicative ability; SA=self-management ability; IA=interpersonal ability.

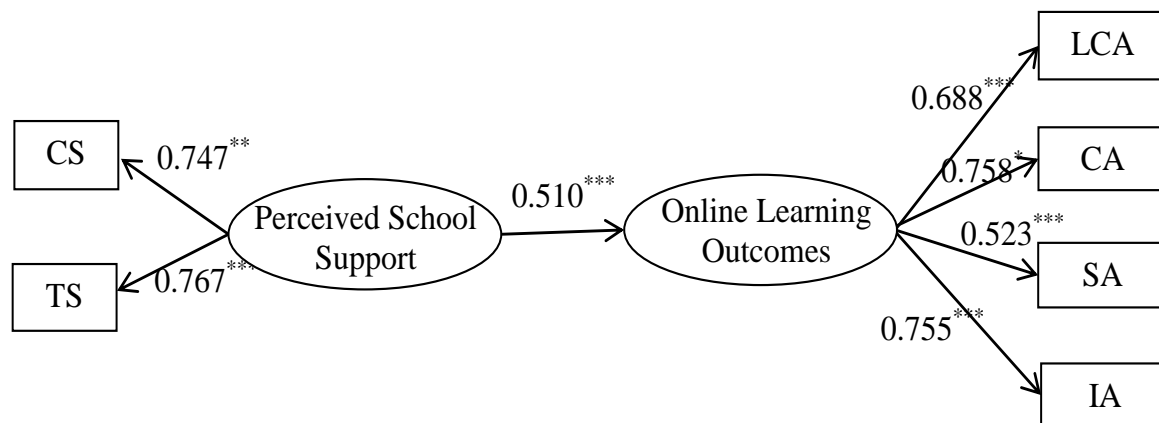


Figure 1. Main effect of the school support on academic achievement. **p<0.01, ***p<0.001; TS=teacher support; CS=classmate support; LCA=learning cognitive ability; CA=communicative ability; SA=self-management ability; IA=interpersonal ability.

engagement were 0.539, 0.723, and 0.570, respectively, and their CR values were 0.778, 0.939, and 0.869. The Cronbach's alpha values for behavioural, cognitive, and emotional engagement were 0.776, 0.935, and 0.868.

The CFA results of the online learning outcome scale revealed that the χ^2/df value was 7.084, which may have been high because of the large sample size. RMR = 0.048, CFI = 0.932, IFI = 0.932, and PGFI=0.629. The AVE values of learning cognitive ability, communicative ability, self-management ability, and interpersonal ability were 0.647, 0.383, 0.608, and 0.585, respectively, and their CR values were 0.846, 0.644, 0.821, and 0.876. The Cronbach's alpha values for the learning cognitive ability, communicative ability, self-management ability, and

interpersonal ability dimensions were 0.842, 0.609, 0.814, and 0.875.

Structural model

First, a structural equation model was used to test the main effect of college students' perceived school support on online learning outcomes (Figure 1). The model fit indices were as follows: $\chi^2 = 60.177$, $df = 8$, $\chi^2/df = 7.522$, GFI = 0.980, NFI = 0.963, RMR = 0.015, SRMR = 0.032, and PNFI = 0.513. The results indicate that college students' perceived school support significantly and positively predicted the online learning outcomes of

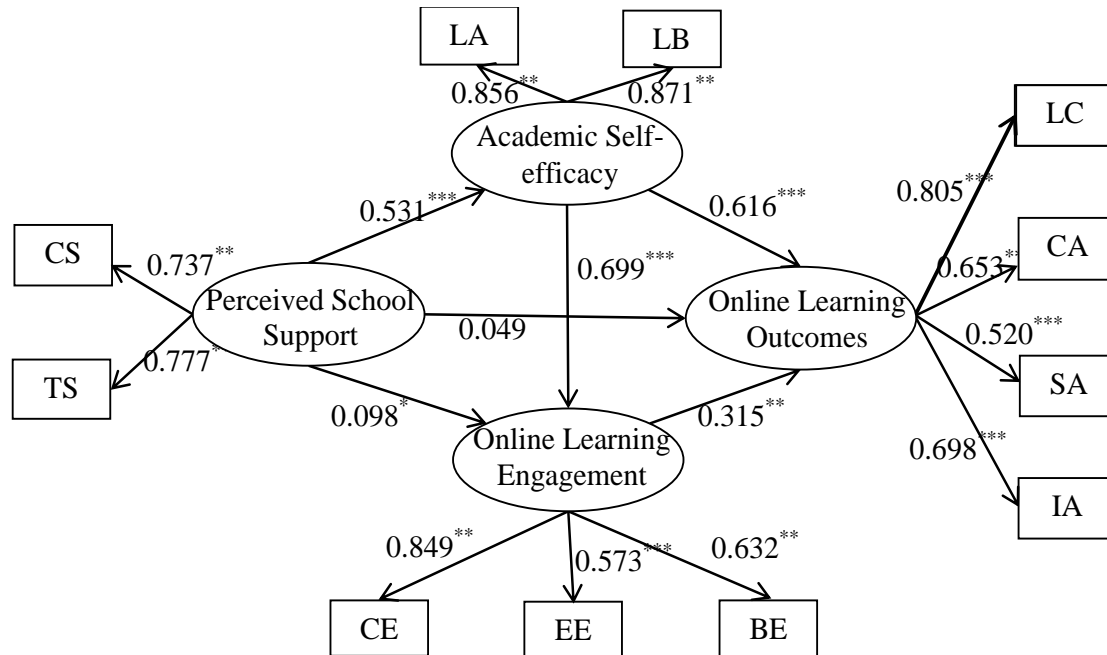


Figure 2. The final standardized parameter estimation value of the model. * $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$. TS=teacher support; CS=classmate support; LA=learning ability self-efficacy; LB=learning behaviour self-efficacy; BE=behavioural engagement; EE=emotional engagement; CE=cognitive engagement; LCA=learning cognitive ability; CA=communicative ability; SA=self-management ability; IA=interpersonal ability.

college students ($\gamma = 0.510$, $p < 0.001$), thus supporting H1.

Second, ASE and online learning engagement were included as mediation variables to test the serial mediation model (Figure 2). The model fit was good: $\chi^2 = 330.420$, $df = 38$, $\chi^2/df = 8.774$, $GFI = 0.939$, $NFI = 0.927$, $RMR = 0.019$, $SRMR = 0.042$, and $PNFI = 0.640$. ASE partially mediated the relationship between college students' perceived school support and online learning outcomes ($\beta = 0.327$, $P < 0.001$), supporting H2. Online learning engagement partially mediated the relationship between college students' perceived school support and online learning outcomes ($\beta = 0.031$, $P < 0.05$), supporting H3. ASE and online learning engagement exerted a serial mediation effect on college students' perceived school support and online learning outcomes ($\beta = 0.117$, $P < 0.01$), supporting H4. College students' perceived school support had no significant effect on online learning outcomes when ASE and online learning engagement were included as mediators ($\beta = 0.049$, $P > 0.05$). Therefore, there was a complete serial mediation relationship between college students' perceived school support and online learning outcomes with the mediation of ASE and online learning engagement.

According to Preacher and Hayes (2008), the bootstrapping method can be utilized to test the stability of a model. The total mediating effect was 0.475, and the total indirect effect was manifested through three pathways (Table 2):

Indirect effect path 1: College students' perceived school support \rightarrow ASE \rightarrow online learning outcomes (indirect effect 1 = 0.327, LLCI=0.233, and ULCI=0.436).

Indirect effect path 2: College students' perceived school support \rightarrow online learning engagement \rightarrow online learning outcomes (indirect effect 2 = 0.031, LLCI = 0.003, and ULCI = 0.073).

Indirect effect path 3: College students' perceived school support \rightarrow ASE \rightarrow online learning engagement \rightarrow online learning outcomes (indirect effect 3 = 0.117, LLCI = 0.051, and ULCI = 0.201).

The 95% CI value of the indirect effects did not contain 0, indicating that all the three indirect effect paths were significant. The 95% CI value of the direct effect of college students' perceived school support on online learning outcomes contained 0, indicating that the direct effect path was not significant (direct effect = 0.049, LLCI = -0.026, and ULCI = 0.117). Therefore, ASE and online learning engagement independently and partially mediated the effect of college students' perceived school support on online learning outcomes, and school support exerted a complete mediation effect on online learning outcomes through ASE and online learning engagement. The findings of this study supported H2, H3, and H4.

DISCUSSION

First, college students' perceived school support

Table 2. Path effects.

Indirect effects	Effect	95% LLCI	95% ULCI
Direct effect	0.049	-0.026	0.117
Total indirect effect	0.475***	0.408	0.548
Indirect effect 1	0.327***	0.233	0.436
Indirect effect 2	0.031*	0.003	0.073
Indirect effect 3	0.117***	0.051	0.201

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$; Bootstrapping random sampling 5,000 times; Indirect effect 1=college students' perceived school support→ASE→online learning outcomes; Indirect effect 2=college students' perceived school support→online learning engagement→online learning outcomes; Indirect effect 3=college students' perceived school support→ASE→online learning engagement→online learning outcomes.

significantly and positively affects online learning outcomes, similar to previous findings (Bradley et al., 2021). Thus, the more college students' perceived school support students perceive, the better are their online learning outcomes. Teacher support is an essential indicator of the closeness of teacher–student interactions (Hughes and Im, 2016; Lei et al., 2016), which is among the most crucial factors affecting individual development (Hughes et al., 2014).

The closer students perceive teacher–student and classmate relationships to be, the more support they perceive and the better are their learning outcomes (Konishi et al., 2010). When individuals receive support from their social network or perceive supportive behaviour, they receive a general benefit that promotes their mental health and growth (Berkman and Syme, 1979). In addition, support provided by teachers and classmates significantly affects students' learning process and outcomes (Rumberger and Rotermund, 2012). Furthermore, a supportive learning environment is crucial for enhancing learning outcomes (Wang and Holcombe, 2010). Therefore, when students receive more school support, their online learning outcomes improve.

Second, Academic Self-Efficacy (ASE) partially mediates the relationship between college students' perceived school support and online learning outcomes, consistent with prior research findings (Boahene et al., 2019; Eakman et al., 2019; Gutiérrez and Tomás, 2019). Given that ASE plays a critical role in achieving elevated levels of learning outcomes (Schunk et al., 2010; Yokoyama, 2019), students with higher ASE levels exhibit greater confidence and a heightened likelihood to persevere when confronted with academic challenges (Bandura et al., 1996; Gore, 2006). Research shows that the more school support students receive, the higher their self-efficacy (Werner et al., 2021), and the higher their ASE, the better their learning outcomes (Shoval et al., 2021; Travis et al., 2020). Therefore, the more perceived

school support, the higher students' ASE and the better their online learning outcomes will be.

Third, our findings suggest that perceived school support can indirectly influence online learning outcomes through online learning engagement, similar to previous findings (Wang and Zhang, 2020; Wu et al., 2020). Teacher support is the most crucial factor for increasing online learning engagement (O'Shea et al., 2015). Teachers providing behavioural and strategy support to students enhances their sense of social existence and promotes their learning engagement (Shea and Bidjerano, 2009). In addition, learning engagement is associated with student retention and satisfaction in online courses (Choo et al., 2020) as well as affects learning outcomes (Fisher et al., 2021). The higher the perceived support from teachers and peers students perceive in online educational activities, the higher the learning engagement (Luan et al., 2020). Moreover, learning engagement helps to improve students' online learning outcomes (Northey et al., 2018). Thus, perceived school support can influence online learning engagement, which in turn enhances online learning outcomes.

Fourth, our findings indicate that Academic Self-Efficacy (ASE) and online learning engagement serially mediate the relationship between college students' perceived school support and online learning outcomes. In line with social cognitive theory, our study highlights the impact of both individual and environmental factors on online learning outcomes (Li et al., 2022; Wang and Zhang, 2020; Zysberg and Schwartzberg, 2021). These findings align with previous research results (Wu et al., 2020; Zapata-Cuervo et al., 2023). A student's sense of self-efficacy influences their decisions, the amount of psychological effort they exert, and the length of time they persist with a task (Schunk and Pajares, 2005). This study extends previous research on online learning outcomes.

This study has some practical implications. First,

perceived school support significantly and positively affects online learning outcomes. Therefore, colleges and universities should increase college students' perceived school support for college students, ensure that students feel they have received fair treatment in educational activities, and instruct students on how they can have harmonious relationships with and be helpful to their classmates. Second, college students' perceived school support can affect online learning outcomes through the serial mediation effects of ASE and online learning engagement. Therefore, college teachers can encourage positive student development by communicating adequate expectations and assisting students in facing academic challenges. Furthermore, methods for implementing online learning engagement training and consistently enhancing the emotional, cognitive, and behavioural factors that affect college students should be explored.

Limitations and future research

There are certain limitations to this study, which provide suggestions for future research. First, this study used a cross-sectional study and all causal explanations can only be hypothesized on the basis of previous studies and not derived from the data. Therefore, future longitudinal studies on this topic are warranted. Second, this study was conducted only in the Hainan Province of China, but online education has been utilized worldwide. Therefore, a cross-cultural study can be conducted in the future to compare whether there are differences in the online learning outcomes of college students between Western and Chinese countries. Third, only the serial mediation model was discussed in this study, but whether other variables moderate the serial mediation process remains to be further explored in future research.

Conclusion

In conclusion, this study demonstrates that college students' perceived school support significantly and positively affects online learning outcomes; ASE partially mediates the relationship between college students' perceived school support and online learning outcomes; online learning engagement partially mediates the relationship between college students' perceived school support and online learning outcomes; and college students' perceived school support exerts a complete mediation effect on online learning outcomes through ASE and online learning engagement.

The findings provide theoretical and practical implications. Theoretically, this study highlights the significance of environmental and personal factors in enhancing online learning outcomes for college students.

Research has shown that perceived school support (environmental factors) can indirectly influence online

learning outcomes through ASE and online learning engagement (personal factors). From a practical perspective, this study identifies environmental and personal factors that influence online learning outcomes, as well as their potential mechanisms of influence. The findings provide new directions for universities to effectively improve online learning outcomes for college students.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Full Length Research Paper

Influence of perceived organizational support on work engagement of university physical education teachers in Hubei Province, China

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Physical education teachers in colleges and universities have the crucial responsibility of acting as mentors and guides for the healthy growth of students. The work engagement of these teachers affects the quality of higher education personnel training and health education. Based on the job demand-resource model, this study conducted a questionnaire survey on 500 physical education teachers in 20 colleges and universities in Hebei Province, China. The subjects were selected through convenience sampling. Out of the total, 456 valid questionnaires were recovered. The intermediary effect was tested through the AMOS model analysis and the Bootstrap method. The results revealed that the perceived organizational support of the participating physical education teachers in colleges and universities can positively affect their sense of teaching efficacy, which in turn positively affects work engagement and has a partial mediating effect on the relationship between perceived organizational support and work engagement.

Key words: Perceived organizational support, teaching efficacy, work engagement.

INTRODUCTION

The "14th Five-Year Plan for Sports Development" promulgated in 2021 highlighted the necessity of strengthening the integration of sports and education and promoting the healthy development of youth sports (General Administration of Sport of China, 2021). In 2023, the State Council proposed in the government work reported, that the integration of sports and education must be deepened (Central People's Government of the People's Republic of China, 2023). The aforementioned

policies emphasize that the country should focus on physical education. Physical education teachers form the main team for conducting school sports work (Trigueros et al., 2019). They are the key elements for improving students' physical health (Dong Peng et al., 2019). Therefore, the work engagement of physical education teachers affects students' learning attitudes and the learning effect of physical education courses, in addition to affecting students' motor skills and physical fitness

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(Trigueros et al., 2019).

Eisenberger et al. (1986) found that perceived organizational support can offer a crucial guarantee for maintaining and improving individual work engagement. Perceived organizational support is the perception of university teachers of the school's support for their work, concern for their interests, and recognition of their value (Ling Wenqi et al., 2006). When an individual perceives a high level of perceived organizational support (Ling Wenqi et al., 2004), their potential is stimulated and they develop a positive attitude toward work. Accordingly, the individual shows greater enthusiasm at work, which affects their work engagement (Blanco-Donoso, 2021). Chen and Eyoun (2021) pointed out that perceived organizational support can help individuals determine work goals and provide the resources required for work. Perceived organizational support is a crucial work resource that can enhance work engagement by improving the intrinsic interest in work tasks (Cacciamani et al., 2022; Ji and Zhao, 2020).

Han and Wang (2021) reported that self-efficacy can motivate an individual in a specific situation and mobilize work resources to improve work engagement. When self-efficacy is high, work engagement will also correspondingly exhibit improvement (Bakker and Albrecht, 2018). Greenier et al. (2021) showed that the higher the teachers' self-efficacy, the higher their work engagement will be. Teaching efficacy, as the application of self-efficacy in teaching (Segarra and Julià, 2022), is the subjective feeling of teachers about the role of education and their own teaching. Yu and Luo (2000) believe that teachers' enhanced sense of teaching efficacy can enhance their work engagement in the teaching process and facilitate effective completion of instructional tasks.

Tschannen-Moran et al. (1998) stated that the formation of teachers' sense of teaching efficacy is affected by various efficacy-related pieces of information, such as perceived organizational support. Perceived organizational support, as a work resource, can influence the formation and development of the sense of teaching efficacy in teachers (Tett and Burnett, 2003). Teachers who perceive the work and life support offered by the school have better expectations of fulfilling role commitments and teaching tasks, as well as higher confidence. Therefore, the sense of organizational support can help improve the sense of teaching efficacy in teachers (Edinger and Edinger, 2018).

According to the job demand-resource model (JD-R), various work environments and job characteristics can be classified into two categories: job requirements and job resources. Job resources play an extrinsic role which can reduce individual work demands and promote individual work engagement (Bauer et al., 2014), work resources are manifested as workers feel various motivating factors, including perceived organizational support (Wu and Qi, 2021), Hobfoll (2002) pointed out

that through the role of resource gain, personal resources can help individuals perceive other work resources, thereby mediating the effect of work resources on work engagement (Grover et al., 2017). According to the JD-R model, self-efficacy, as a typical personal resource, can make an individual to be motivated and mobilize work resources to improve work engagement in a specific situation (Han and Wang, 2021). Therefore, work resources can activate personal resources to increase work engagement through a certain mechanism (Hobfoll, 2001).

In summary, perceived organizational support can affect the sense of teaching efficacy and work engagement in teachers. Teaching efficacy has some effect on the relationship between perceived organizational support and work engagement. The work engagement of physical education teachers endorses the physical and mental health of students, and healthy development of students profoundly affects the country's health education (Ren et al., 2022). Therefore, based on the JD-R model, this study explored the relationship between perceived organizational support, teaching efficacy, and work engagement among physical education teachers in colleges and universities in Hebei Province. To verify the mediating effect, this study addressed the following objectives:

1. To explore the influence of perceived organizational support of colleges and universities in Hebei Province on the work engagement of physical education teachers.
2. To explore the influence of teaching efficacy on work engagement of the physical education teachers.
3. To explore the influence of perceived organizational support in on the teaching efficacy of the physical education teachers
4. To explore the mediating effect of teaching efficacy of physical education teachers on the relationship between perceived organizational support and work engagement.

Perceived organizational support and work engagement

Work engagement is a positive state of work-related enrichment (Schaufeli et al., 2002). Teachers with high levels of work engagement display positive work attitudes and behaviors, which, in turn, affect their teaching effectiveness (Cacciamani et al., 2022). The high level of work engagement among physical education teachers can stimulate students' interest in sports and cultivate exercise habits in them, thereby influencing the development of school sports and students' physical health (Xiong et al., 2020). Hakanen et al. (2021) reported that work engagement is affected by many factors. Regarding organizational factors, the organization's work help or emotional support for individuals is a vital source of individual work resources.

Based on the principle of reciprocity, when individuals feel that they are supported by the organization, they will also try to meet the organization's expectations and help the organization achieve its goals, which thus increase their work engagement (Eisenberger et al., 1986; Yongxing et al., 2017). In a study of 366 teachers in Tibet, China, Ji and Zhao (2020) stated that perceived organizational support can significantly and positively affect the work engagement of teachers. The first research hypothesis is thus as follows:

H1: Perceived organizational support of physical education teachers in colleges and universities positively affects work engagement.

Teaching efficacy and work engagement

Self-efficacy is a self-motivation mechanism in which people think they can accomplish their set goals. People with a sense of self-efficacy are motivated to spend considerable effort and persist for a long time to overcome difficulties (Bandura, 2005). The higher sense of self-efficacy in teachers is more helpful in awakening or maintaining their own positive working state, such that they can be highly involved in education and teaching (Grenier et al., 2021). The concept of teaching efficacy originated from Bandura's (1977) self-efficacy theory (Segarra and Julià, 2022). The teaching efficacy of teachers refers to their subjective feelings about their educational and teaching functions (Lipscomb et al., 2022). Teachers with a sense of teaching efficacy are willing to devote more time and energy to their work, solve difficulties encountered at work, and devote themselves more to their teaching work (Cai et al., 2022). Accordingly, the second research hypothesis is as follows:

H2: Teaching efficacy of physical education teachers in colleges and universities positively affects work engagement.

Perceived organizational support and teaching efficacy

Self-efficacy is generally considered a basic perception of the self. It is gradually formed through various external factors and the continuous exercise of the self to the mind (Wang et al., 2017). Eisenberger (1986) stated that the function of perceived organizational support can affect the self-confidence of individuals. In short, perceived organizational support can affect self-efficacy. A high perceived organizational support allows individuals to maintain a positive attitude to deal with difficulties and setbacks, reduce the negative and adverse effects of stress, and improve their self-efficacy (Greenglass and Burke, 2000). Musenze et al. (2020)

found that the sense of organizational support of teachers significantly affects their sense of self-efficacy. Teaching efficacy is the application of self-efficacy in education (Gibson and Dembo, 1984). Teel (2003) showed that the support received by teachers from schools or leaders for their work includes both material and spiritual connotations. Work resources can affect the formation of teaching efficacy in teachers and their other personal resources. The third research hypothesis is as follows:

H3: Perceived organizational support of physical education teachers in colleges and universities positively affects the teaching efficacy.

The relationship among perceived organizational support, teaching efficacy, and work engagement

According to the JD-R model, work resources can meet the requirements of individuals, stimulate their work potential, and trigger a high work engagement level (Bakker et al., 2003). Hobfoll (1989) proposed the concept of personal resources. Through the role of resource gain, personal resources can help individuals perceive other work resources (Hobfoll, 2002). Thus, personal resources can mediate the effect of work resources on work engagement (Grover et al., 2017). Xanthopoulou et al. (2009) found that personal resources have a partial mediating role in the process of prediction of effect of work resources on work engagement. Self-efficacy, a personal resource, is people's confidence or belief that they can achieve a specific behavioral goal. Moreover, it is the expectation of whether people are able to achieve behaviors in a specific environment (Bandura, 1977). Perceived organizational support can directly affect teachers' self-efficacy and work engagement and indirectly affect their work engagement through self-efficacy (Caesens and Stinglhamber, 2014). The perceived organizational support is the application of self-efficacy of teachers in education (Gibson and Dembo, 1984), Han et al. (2021) found that this perceived organizational support can mediate the impact of work resources on work engagement, and therefore, the fourth research hypothesis is as follows:

H4: Teaching efficacy of physical education teachers in colleges and universities can mediate the relationship between perceived organizational support and work engagement.

RESEARCH FRAMEWORK

This study is based on the JD-R model. According to this model, while work resources promote work engagement, personal resources can help individuals perceive other work resources through resource gains, thereby mediating the effect of work resources on work engagement (Grover et al., 2017). Therefore, in

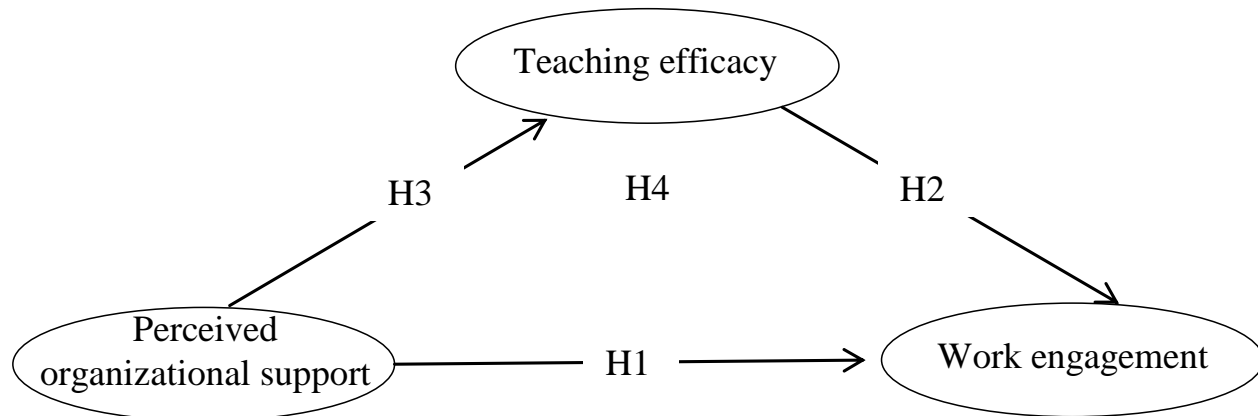


Figure 1. Research framework.

this study, perceived organizational support is considered a work resource, and the sense of teaching efficacy is considered an individual resource. As shown in Figure 1, we explored the influence of perceived organizational support and teaching efficacy on the work engagement of physical education teachers in colleges and universities in Hebei Province and examined whether organizational support influences work engagement through teaching efficacy.

Participants

The development of higher education is relatively weak in Hebei Province of China, facing opportunities for the coordinated development of Beijing, Tianjin, and Hebei. The degree of work engagement of physical education teachers in colleges and universities of Hebei Province is particularly crucial in implementing the policy for the integration of sports and education for college students. The present study used convenience sampling to conduct a questionnaire survey on physical education teachers in these colleges and universities. In total, 150 questionnaires were distributed in the pre-test stage, and 142 valid questionnaires were recovered. For the formal questionnaire, 20 colleges and universities in Hebei Province were selected, and 25 physical education teachers were randomly selected from each school. In total, 500 formal questionnaires were distributed, and 456 valid questionnaires were returned from 190 men and 266 women.

Instruments

This study adopts the "Perceived Organizational Support Questionnaire for Teachers in Higher Vocational Colleges" compiled by Zhao (2014). The scale comprises three dimensions, namely working support, identifying value, and caring about well-being, and has a total of 22 items. The reliability coefficient (Cronbach's alpha) of the returned questionnaire was 0.943. The results of the confirmatory factor analysis were as follows: $\chi^2/df = 1.906$, RMSEA = 0.045, SRMR = 0.030, RMR = 0.039, GFI = 0.929, AGFI = 0.913, NFI = 0.941, TLI (NNFI) = 0.968, IFI = 0.971 and CFI = 0.971. The fitting indicators were in line with the standard of general structural equation modeling (SEM) research (Qiu Haozheng, 2006), and the perceived organizational support model had a good fit. The questionnaire was more consistent with the research object of this study on perceived organizational support, that is, college physical education teachers. Therefore, this scale

was used in this study to measure the perceived organizational support of college physical education teachers.

This study adopted the Chinese version of the Work Engagement Scale translated by Zhang and Gan (2005). The scale comprises three dimensions, namely vigor, dedication, and absorption, and had a total of 17 items. The reliability coefficient (Cronbach's alpha) of the returned questionnaire was 0.914. The results of the confirmatory factor analysis were as follows: $\chi^2/df = 2.598$, RMSEA = 0.059, SRMR = 0.038, RMR = 0.054, GFI = 0.933, AGFI = 0.912, NFI = 0.927, IFI = 0.954, TLI (NNFI) = 0.946, and CFI = 0.954. The fitting indicators were in line with the standard of general SEM research, and the model exhibited a good fit. The scale conforms to the local Chinese culture, and thus was used in this study for measuring the work engagement of college teachers.

This study adopted the "Teacher Teaching Effectiveness Scale" compiled by Yu et al. (1995). The scale is divided into two dimensions, namely personal teaching efficacy and general teaching efficacy, and has a total of 27 items. The reliability coefficient (Cronbach's alpha) of the questionnaire was 0.960. The results of the confirmatory factor analysis were $\chi^2/df = 1.738$, RMSEA = 0.040, SRMR = 0.030, RMR = 0.038, GFI = 0.919, AGFI = 0.906, NFI = 0.938, TLI (NNFI) = 0.970, IFI = 0.973, and CFI = 0.972. The fitting indicators were in line with the standard of general SEM research, and the model fit was good. The survey objects involved while compiling and revising the scale were all Chinese teachers, which meets the needs of this research on Chinese college physical education teachers. Therefore, this study used this scale to measure the teaching effectiveness of college physical education teachers.

RESULTS

Discriminant validity and relevant analysis

The average values of perceived organizational support, teaching efficacy, and work engagement were 3.597, 3.666, and 3.581, respectively, and the correlations among the variables were all positive and significant ($p < 0.001$; Table 1), indicating that a positive relationship existed among the variables. The diagonal line is the square root of the average variance extracted (AVE) in each dimension, which is greater than the standardized

Table 1. The AVE and correlation coefficients of all variables (N = 456).

Variable	Mean	Standard deviations	Perceived organizational support	Teaching efficacy	Work engagement
Perceived organizational support	3.597	0.775	0.775 ^a		
Teaching efficacy	3.666	0.786	0.463 ^{***}	0.763 ^a	
Work engagement	3.581	0.774	0.448 ^{***}	0.531 ^{***}	0.749 ^a

Square root of average variance extracted (AVE). ***p < 0.001

Table 2. Difference between Model 1 and Model 2.

Variable	Model 1	Model 2
χ^2/df	2.147	2.114
GFI	0.988	0.981
AGFI	0.968	0.960
RMSEA	0.050	0.049
IFI	0.989	0.984
NFI	0.979	0.971
CFI	0.989	0.984
TLI(NNFI)	0.979	0.974
RMR	0.027	0.026
SRMR	0.030	0.030

correlation coefficients outside the diagonal line, suitable for the subsequent SEM analysis.

Model analysis

In this study, AMOS software was used to construct a structural equation model for perceived organizational support, work engagement, and teaching efficacy. According to the mediation effect test procedure proposed by Wen and Ye (2014), first, Structural model 1 of the total effect of the perceived organizational support of teachers on job engagement was established. If the path coefficient was significant, teaching efficacy was added as an intermediary variable to establish Structural model 2. In Model 2, if the path coefficients of perceived organizational support to teaching efficacy and teaching efficacy to work engagement were significant, then a mediating effect on teaching efficacy was considered to exist. If the path coefficient of organizational support and work engagement was significant and lower than that of Model 1, teaching efficacy was considered a partial mediator.

First, the total effect of the perceived organizational support of teachers on work engagement was tested, and Structural model 1 was established, as shown in Table 2. The fitting indicators of Model 1 were as follows: $\chi^2/df = 2.645$, GFI = 0.992, AGFI = 0.978, RMSEA = 0.045, IFI = 0.990, NFI = 0.984, CFI = 0.990, TLI (NNFI) = 0.982, RMR = 0.020, and SRMR = 0.023. Each fitting

indicator reached the standard value, indicating that the model fits well. In Structural model 1, the path coefficient of the total effect of perceived organizational support on work engagement was 0.616 ($p < 0.001$; Figure 2), reaching a significant level. This indicated that perceived organizational support positively affects work engagement, implying that the stronger the perceived organizational support of college physical education teachers in Hebei Province, the higher their work engagement will be. Therefore, H1 was verified.

Second, teaching efficacy was added between perceived organizational support and work engagement, and Structural model 2 of the mediation effect was established. The fitting indicators of Model 2 (Table 2) were as follows: $\chi^2/df = 3.467$, GFI = 0.972, AGFI = 0.952, RMSEA = 0.055, IFI = 0.966, NFI = 0.953, CFI = 0.966, TLI (NNFI) = 0.952, RMR = 0.028, and SRMR = 0.034. The fitting indicators were all in line with the standard values of general SEM research (MacCallum et al., 1992), and Structural model 2 of the mediation effect is presented in Figure 3.

Model 2 showed that teaching efficacy significantly and positively affected the work engagement of the teachers ($\beta = 0.544$, $p < 0.001$; Figure 3; Table 3). The β value was 0.544, and the p value was < 0.001 , indicating that the relationship was significant. Thus, the higher the teaching efficacy of physical education teachers in Hebei Province, China, the higher their work engagement level will be, thereby verifying H2.

The sense of organizational support significantly and

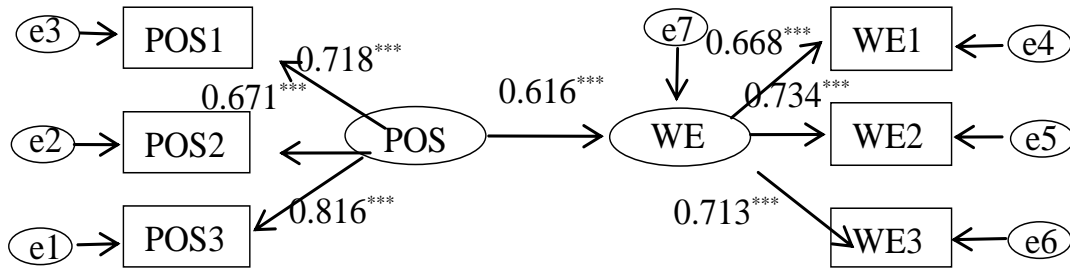


Figure 2. Model of the total effect of perceived organizational support on work engagement (Model 1). POS: Perceived organizational support; POS1: working support; POS2: identifying value; POS3: caring about well-being. WE: Work engagement; WE1: vigor; WE2: dedication; WE3: absorption.

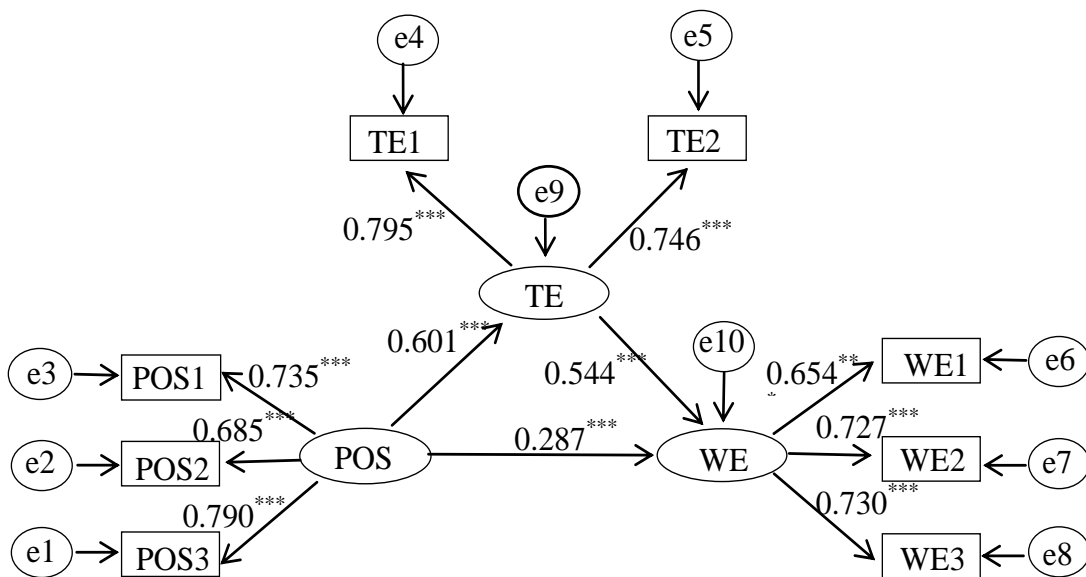


Figure 3. Perceived organizational support, teaching efficacy, and work engagement SEM path analysis (Model 2). POS: Perceived organizational support; POS1: working support; POS2: identifying value; POS3: caring about well-being. WE: Work engagement; WE1: vigor; WE2: dedication; WE3: absorption. TE: Teaching efficacy; TE1: personal teaching efficacy; TE2: general teaching efficacy.

positively affected the sense of teaching efficacy ($\beta = 0.601$, $p < 0.001$; Figure 3; Table 3). The β value was 0.601, and the p value was <0.001 , indicating that the relationship was significant. Thus, the stronger the perceived organizational support of physical education teachers in colleges and universities in Hebei Province, China, the higher their sense of teaching efficacy will be. H3 is thus valid.

Perceived organizational support significantly and positively affected teaching efficacy ($\beta = 0.601$, $p < 0.001$; Figure 3; Table 3). Teaching efficacy significantly and positively affected their work engagement ($\beta = 0.544$, $p < 0.001$). The standardized path coefficient of perceived organizational support on work engagement was significant at 0.616 ($p < 0.001$), as shown in Model 1.

Although the path coefficient reduced to 0.287 ($p < 0.001$) for Model 2, it was still significant (Figure 3). According to the mediating effect test criteria (Wen and Ye, 2014), the results showed a partial mediating effect on the relationship between perceived organizational support and work engagement of college physical education teachers in Hebei Province, China.

The Bootstrap mediation effect test method was adapted to test whether the mediation effect was significant. In this study, the Bootstrap method was used 2000 times of repeated sampling (Nevitt and Hancock, 2001). The mediation effect test was conducted. If the 95% confidence interval contained 0, it meant mediation was lacking. If the 95% confidence interval contained no 0, it meant that a mediation effect existed.

Table 3. Structural equation modeling analysis path coefficients.

Effect	β	SE	C. R.
Perceived organizational support→Teaching efficacy	0.601 ^{***}	0.064	9.409
Perceived organizational support→Work engagement	0.287 ^{***}	0.069	3.867
Teaching efficacy →Work engagement	0.544 ^{***}	0.077	6.418

*** $p < 0.001$, * $p < 0.05$

Table 4. Bootstrap SEM analysis of total, direct, and indirect effects.

Effect	Estimate	95% LLCI	95% ULCI	p
Perceived organizational support→Work engagement	0.287	0.134	0.434	0.001
Perceived organizational support→Teaching efficacy →Work engagement	0.327	0.228	0.450	0.001
Total effect	0.614	0.524	0.692	0.001

Table 4 shows that the indirect effect of organizational support on work engagement was 0.327, which was significant within the 95% confidence interval (0.228–0.450). The confidence interval did not contain 0, indicating the presence of a mediating effect. The direct effect was 0.287 significant in the 95% confidence interval (0.134–0.434), and the 95% confidence interval did not contain 0, indicating the presence of a partial mediation effect. The total effect was 0.614 significant in the 95% confidence interval (0.524–0.692), indicating the presence of a partial mediation effect. Therefore, the teaching efficacy of physical education teachers in colleges and universities has a partial mediating role in the relationship between perceived organizational support and work engagement. Thus, H4 is valid.

DISCUSSION

The study found that perceived organizational support of college physical education teachers in Hebei Province, China, significantly and positively affected their work engagement, and the research hypothesis H1 was valid. This result is consistent with those of Kurtessis et al. (2017) and Ji and Zhao (2020), indicating that the higher the teacher's perceived organizational support, the higher their work engagement level. According to the JD-R model, perceived organizational support is a vital work resource for college teachers and can supplement emotional labor-induced resource consumption. A high level of perceived organizational support can reduce the pressure on teachers. At the same time, perceived organizational support can expand the tolerance range of college teachers. Therefore, teachers would have more power to face students positively and reduce pretense and performances (Zheng, 2022). This would help teachers achieve work goals, stimulate individual potential, affect individual work attitudes, and alleviate

the damage induced by work demands to individuals. Therefore, a high level of perceived organizational support improves the positive work attitude of an individual, eventually affecting their work engagement (Blanco-Donoso, 2022).

Perceived organizational support of physical education teachers in colleges and universities in Hebei Province, China, positively and significantly affected the sense of teaching efficacy. This result is consistent with those of Teel (2003) and Lazarides and Warner (2020), indicating that the higher the perceived organizational support of teachers, the higher is their sense of teaching efficacy. The formation of sense of teaching efficacy in teachers is affected by various efficacy-related information, such as school environment and organizational support. According to the JD-R model, as a work resource, perceived organizational support can affect the formation and development of personal resources such as teaching efficacy. Therefore, if perceived organizational support is high, teachers will adopt a positive attitude to deal with difficulties and setbacks. This would also reduce the negative and adverse effects of stress, thereby promoting an improvement in teaching efficacy.

The teaching efficacy of physical education teachers exhibited a positive and significant impact on work engagement. This result is consistent with those of Perera et al. (2018) and Cai et al. (2022), indicating that the higher the teaching efficacy of teachers, the higher the work engagement level. According to the JD-R model, personal resources predict work engagement independently (Bakker and Demerouti, 2014). As a personal resource, teaching efficacy can promote the work engagement of teachers. Teachers with a high teaching efficacy are more confident in their teaching work, can better tackle problems in the education process, and believe in education and their own ability to promote students. Such teachers maintain a proactive state, persistently invest a lot of time and energy, and

work hard. They cause improvement in academic progress and resolve problematic behavior (Llorens et al., 2006). They exhibit high enthusiasm for teaching activities, even in the face of educational and teaching problems. After completing the teaching tasks, they would be highly willing to solve problems in the teaching work. Their own teaching effect and teaching ability will be higher (Simbula et al., 2011), and their work engagement will thus be improved.

Teaching efficacy of physical education teachers in colleges and universities in Hebei Province, China partially mediates the relationship between perceived organizational support and work engagement. This result is consistent with those of Luthans and Youssef (2007), Tierney and Farmer (2004), and Musenze et al. (2020). Self-efficacy plays a crucial mediating role in the relationship between perceived organizational support and work engagement. According to the JD-R model, perceived organizational support as a work resource can improve the intrinsic interest of individuals in tasks and thus positively affect individual work engagement (Eisenberger et al., 1986). Self-efficacy, as a major personal resource, can help individuals effectively face challenging demands through effort and perseverance in the work environment (Pérez-Fuentes et al., 2018). This can positively predict individual work engagement (Bhatti et al., 2018). Work and personal resources can independently affect an individual's work engagement and can be combined to predict work engagement. An individual with a high level of personal resources can perceive more work through resource gains (Xanthopoulou et al., 2009) and additional resources, thereby promoting their work engagement (Hobfoll and Lily, 1993). Thus, perceived organizational support as a work resource can enhance individual work engagement by increasing individual self-efficacy (Bakker and Demerouti, 2008), because teaching efficacy is the application of self-efficacy in teaching (Segarra and Julià, 2022). Teaching efficacy can play a mediating role in the effect of organizational support on job engagement.

CONCLUSIONS AND RECOMMENDATION

Perceived organizational support of physical education teachers positively affects work engagement in colleges and universities in Hebei Province, China. Universities and relevant departments should understand the realistic demands of teachers and improve perceived organizational support offered to college physical education teachers. First, work support for physical education teachers should be increased, work resources conducive to the completion of tasks should be provided to them, and work vitality of these teachers should be stimulated so as to promote their work engagement. Second, attention must be paid to the value recognition of physical education teachers. Colleges and universities should strengthen the satisfaction of emotional needs of

teachers, focus on the basic and key role of these teachers in the development of the entire educational cause, and enhance the value recognition of these teachers so as to improve their work engagement. Third, care must be taken to protect personal interests of physical education teachers at colleges, increase the concern for these teachers, and improve work enthusiasm of high-level physical education teachers. We must aim to increase the interest of physical education teachers, and thus improve their work engagement.

As a personal resource, teaching efficacy of physical education teachers can be used as an independent predictor of work engagement. It can also be combined with perceived organizational support to predict work engagement. To improve the teaching efficacy of physical education teachers in colleges and universities, first, schools must provide physical education teachers with more opportunities for learning, training, and communication. Through scientific and reasonable training, the professional development and comprehensive quality of physical education teachers can be enhanced, thereby improving their teaching efficacy level. Second, physical education teachers should continually update and enrich their knowledge of sports subjects, form a knowledge system that conforms to the development of modern physical education, improve teaching content and teaching methods and means, and attempt to gain more experience in the teaching process. This type of successful experience in teaching can enhance the teaching efficacy of physical education teachers.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Full Length Research Paper

Chemistry of petroleum products: Assessment of fuel attendants' knowledge around Sapele metropolis

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Petroleum products are very flammable and can ignite at extremely low temperatures if exposed to an open flame source or not handled appropriately. Individuals who handle petroleum products in the petroleum industry and fuelling stations are known as "petrol station attendants". The study was a descriptive cross-sectional study carried out among petrol station attendants working in a filling station owned by independent petroleum marketers in Sapele metropolis of Delta state from November 2022 to January 2023. The assessment was done with an adapted instrument for data collection, a 12-item questionnaire titled "Chemistry of Petroleum Products: Assessment of Fuel Attendants Knowledge around Sapele Metropolis". Most petrol attendants within Sapele metropolis fell within the age range of 18-35 years, predominantly 22-28 years being the highest with a respondent of 16 constituting 39% representation. There were more females working within Sapele as petrol attendants with 26 females out of 41 respondents representing 63% of the total sample population. About 51.21% of respondents did science or chemistry-related courses but their skills were limited, 58.53% of petrol attendants which was the highest proportion per qualification had Senior School Certificate Examination (SSCE) qualification, and those with a higher degree (National Diploma and Bachelor of Science) had a combined total of 14 respondents (34.1%), 48.78% of respondents which was below average were given chemistry and safety training of petroleum product by their employers, about 80.48% of respondents had managed to learn either by convention or practice safety techniques and were using safety protocol when handling petroleum product. 87.80% knew nothing about chemistry quality control tests such as octane rating, flash point, pour point, and smoke point. The percentage of science oriented graduate who work as petrol attendant in Sapele metropolis is very low. Hence, the study recommends science expertise with regards to chemistry knowledge in relation to safety practices among fuel attendants.

Key words: Petrol station attendant, chemistry, petroleum products, educational qualification.

INTRODUCTION

A petrol filling station as a facility is a place where petroleum products such as Premium Motor Spirit (PMS),

Liquefied Natural Gas (LNG), Dual Purpose Kerosene (DPK), Automated gasoline oil (AGO), and lubricants are

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sold (Ahmed et al., 2014; Ogundahunsi, 2014).

Petroleum products are highly inflammable (Ogundahunsi, 2014) and can ignite at very low temperatures (Ahmed et al., 2014) if exposed to an open flame source or if not properly handled. Individuals who handle petroleum products in the petroleum industry and fueling stations are known as petrol station attendants (Moke, 2019; Johnson and Umoren, 2018). Most petrol attendants are employed without basic pre-requisite science qualifications from a tertiary or post-secondary institution.

Petroleum products are organic materials gotten from the fractional distillation of crude oil (Onyinye and Nkechi, 2015). Crude oil is referred to as "black gold" and they are formed from biogenic sources as a result of complex diagenesis, silt, and sedimentation that occurred million years ago (Peters et al., 2007). Products derived from the fractional distillation of crude include but are not limited to kerosene, liquefied natural gas, petrol, diesel, lubricating oil, petroleum jelly (wax), and bitumen (Abdullah, 2012).

Chemical reactions used in the distillation and processing of petroleum products include cracking, flocculation, alkylation, isomerization, step reaction (initiation, propagation, and termination), and addition reaction (Chaudhuri, 2011).

Processes, where these chemical reactions are utilized, includes desalting, desulphurization, field separation (separation of waste, water, and gas), fractional distillation (Kolmetz, 2016). Petroleum products contain a varied mixture of aliphatic compounds (paraffin or olefins) (Kolmetz, 2016) and aromatics (Toulene, Xylene, Benzene, and Naphthalenes), (Kolmetz, 2016; Onojake et al., 2012).

Most products sold in petrol stations have a combination of chemicals that contribute to their behavior and reaction and only a good knowledge of petroleum products chemistry can guarantee proper interpretation and explanation of these products to customers when the need arises. Knowledge of petroleum product parameters such as colour, octane rating, flash point, specific gravity, vapour pressure, cloud point, pour point, viscosity, boiling point, and aniline point are used both for product specification and control and particularly for the formulation of policy geared toward safety and hazard management.

Studies such as those of Okafoagu et al. (2017), Afolabi (2011), and Johnson and Umoren (2018) all showed that educational qualification for petrol attendants in most petrol stations was usually secondary school level as only Moke (2019) reported a majority of attendants having up to tertiary level education. A study by zippa.com showed that 48% of petrol station attendants in the U.K. had high school diplomas while only about 18% had bachelor's degrees (<https://www.zippia.com/gas-station-attendant-jobs/education/>). The result of Moke (2019) could be attributed to the location to which the research was done

as it is a university town in Delta state.

Most secondary schools teach basic chemistry only. A good knowledge of the chemistry of petroleum products can only be obtained from the faculties of science and engineering of universities or at best science schools of education in mono-technic and polytechnics.

There is almost no literature bothering on the level of educational knowledge of science or chemistry among petrol station attendants, this trend has greatly added to the high hazard index and poor safety handling techniques among petrol attendants.

The issue of safety in petrol stations both for attendant and customers cannot be over-emphasized, accidents due to fire hazard leads to property loss (i.e. vehicles and automobiles) or in worst case scenario, lives and properties (Afolabi, 2011; Okafoagu et al., 2017; Ahmed et al., 2012). There has been documented incidence of fire disasters in recent times in petrol stations in some parts of Delta State, Nigeria. One of the remote causes of this recorded fire incidence is the poor handling technique and safety procedure adopted by petrol attendants (Ahmed et al., 2011; 2012), further investigation in most cases reveals that these petrol attendants do not know much about the science or chemistry behind petroleum products and in most cases they were not given adequate training prior employment and resumption of duty. This study is aimed at investigating the educational qualification, science orientation alongside the knowledge of chemistry possessed by petrol station attendant in Sapele metropolis and her adjoining districts and how this knowledge comes to play in safety procedures adopted for daily routine and operational practices.

A significant amount of research has been done on the explosion risk at gas stations, and Pula et al. (2006) found that among the loss-producing incidents, fires and explosions are the most frequently reported accidents. Petrol and other motor fuels at room temperature are potentially pollutants and hazardous. When combined with air in certain proportions can lead to fire and explosion. These pollutants if discharged into the environment can have negative health consequences on people and the environment. Illegal petroleum storage, transportation options, poor maintenance, carelessness, mechanical fault and other factors can spark fire explosion. Hence, it is advisable that lots of precautions should be adhered to when dealing with petrol in order to stop or minimize the rates of the occurrence of petrol accidents.

New petrol stations been generated these days are generated within residential areas which gives room for more secondary school certificate holders to be employed irrespective of their knowledge in Sciences or in the chemistry of petroleum products. If an accident occurs, it will not only affect the employees and the customer present at the fuel station, it will also affect the people who resides closed to the petro station. According

Table 1. Age characteristics of petrol attendants.

S/N	Age range (years)	Number of respondents	Percentage of respondents
1	< 18	1	2.43
2	18 - 22	13	31.70
3	22 - 28	16	39.02
4	28 - 35	11	26.82

Source: Authors Compilation (2022).

to Ma and Huang (2019), some fuel stations are situated close to residential areas, raising the risk of tragic human loss in the event of an explosion due to the high population density in residential areas. Hence, greater care and surveillance are needed when refueling subterranean fuel storage tanks as well as when fueling automobiles in order to reduce or prevent accidents at gas stations both inside and outside of residential areas.

Occurrences of unsafe acts and unsafe condition (UAUC) at fuel stations are quite common (Ahmed et al., 2011). A robust accident prevention program might lower the number of gasoline station incidents and even save lives (Modjo et al., 2022).

Adekitan et al. (2008) and Nnokwe et al. (2020) suggested the use of Gas Leakage Detection System. This is when a user's mobile device will receive an emergency alert message from the Gas Leakage Detection System when an emergency occurs. The system detects leaked gas using MQ-6 gas sensor whose calibrated outputs are used to trigger an alarm and display gas levels on a liquid crystal display (LCD) for ambient gas concentrations above 100 PPM (Nnokwe et al., 2020; Subri et al., 2021; Islam et al., 2022). The development of a gas leakage detection system should be developed, embraced and aired through radio stations for general awareness (Earlyanti and Wijayanto, 2020).

Previous studies on safety had examined and provided numerous resources to help decrease accidents and injuries, but these accidents will still occur if these resources are not effectively used and practiced daily. Hence, staff training, fire risk assessment (Mmom et al., 2022), vapour recovery systems, emergency response, alarm systems, and escape route are preconditions that should be met by a filling station business owner (Han et al., 2005). All the employees at petrol stations should follow the working instructions and understood the hazards associated with the job and take the job after taking all the precautionary measures (Ahmed et al., 2010; Yunus, 2019; Wadembere and Apaco, 2020).

The study was a descriptive cross-sectional study carried out among petrol station attendants working in a filling station in Sapele metropolis of Delta State. Permission was obtained from the owner of the filling stations and informed consent was obtained from the attendants before the data collection instrument was applied.

METHODOLOGY

Description

A total of 41 petrol station attendants from 12 selected filling stations owned by independent petroleum marketers in Sapele metropolis, Sapele Delta State, Nigeria were included in the study (Table 1). Data collection took place between November 2022 and January 2023. Sapele is an Okpe speaking town in Delta State, with coordinate of 5.8751°N, 5.6931°E. As at the year 2015, the estimated population of Sapele was about 232,020. Most people within Sapele are traders, artisans and business persons, with a handful of civil servants of different strata. The assessment utilized a modified questionnaire titled "Chemistry of Petroleum Products: Assessment of Fuel Attendants' Knowledge in Sapele Metropolis" to collect primary quantitative data, including customer demographics, educational background, years of service as an attendant, working hours, marital status, and religion. The questionnaire consisted of two sections: Section A, which captured socio-demographic information, and Section B, which focused on the respondents' knowledge of petroleum product chemistry, testing methods, awareness of hazards, and safety and preventive measures according to those of Afolabi (2011). All the questionnaires administered to the 41 petrol station attendants were retrieved and analyzed.

Percentage of respondents

The percentage of respondent was calculated using the equation below:

$$\text{Percentage of Respondents (\%)} = \frac{\text{Number of Respondents}}{\text{Total number of respondents}} \times 100$$

Statistical analysis

The results were analyzed using one way analysis of variance (ANOVA) to compare the various group averages.

RESULTS AND DISCUSSION

Socio-demography

Most petrol attendants within Sapele metropolis fell within the age range of 18-35 years, predominantly 22-28 years being the highest with a respondent of 16 constituting 39% representation. This range represents the working and active service years of most attendants; it also fell

Table 2. Sex characteristics of petrol attendants.

S/N	Sex	Number of respondents	Percentage of respondents
1	Male	15	36.58
2	Female	26	63.41

Source: Authors compilation (2022).

Table 3. Educational qualification of petrol attendants.

S/N	Educational qualification	Number of respondents	Percentage) of Respondents
1	No qualification	3	7.31
2	First school leaving certificate	-	-
3	Secondary school certificate exam	24	58.53
4	National diploma	11	26.82
5	Higher national diploma	-	-
6	Bachelor of science	3	7.31
7	Other higher qualification	-	-

Source: Authors compilation (2022).

Table 4. Years of service as attendant of petrol attendants.

S/N	Years of service as attendant	Number of respondents	Percentage of respondents
1	0-6 months	14	34.1
2	1 year	10	24.3
3	1-2 years	2	4.87
4	2-4 years	7	17.07
5	4 years and above	5	12.19

Source: Authors Compilation (2022).

within the range of those reported by Johnson and Umoren (2018), 21-25 years (42.8%) (Table 1).

There were more females working within Sapele as petrol attendants with 26 females out of 41 respondents representing 63% of the total sample population. Gender specifications were closer to those of Moke (2019) who had more female attendants (60%) (Table 2). Generally, most researchers have established that there are more female attendants than males within south-south Nigeria (Johnson and Umoren, 2018; Moke, 2019), as opposed to those reported for the North (95% males) (Okafogun et al., 2017) and the West (72%) (Afolabi, 2011), this disparity could be due to cultural perception of these areas on the job roles for females and males.

Secondary school certificate holders had the highest number of respondents with 24 out of 41 respondents (58.53%), those with a higher degree (Higher national diploma and Bachelor of Science) had a combined total of 14 respondents (11 National diploma holders and 3 University degree holders which sums up to 34.13%, those without any form of educational qualification

constituted the smallest number with 3 respondent representing 7.31%, most attendants within Sapele metropolis had at least a secondary school educational qualification which enabled them to work in a petrol station (Table 3). Researchers in Nigeria have reported a higher percentage of Senior school certificate examination holders who work in fuel stations (Afolabi, 2011) (98%) and (Johnson and Umoren, 2018) (83.7%), only Moke (2019) reported having higher degree holders with as high as 82.9% while Senior school certificate examination holders holding as low as 8.6%, this could be attributed to the location to which the research was done as it is a university town in Delta state (Table 3).

A preponderance of attendants had spent barely two years in the petroleum industry as those who had spent less than two years summed up 26 with a combined percentage of 63.41% (0-6 months (34.1%), 1 year (24.3%), 1-2 years (4.87%). Respondents who had spent between 2-4 years fell at 17.07% with the smallest representation being those who had spent more than four years with 12.19% (Table 4), this diminishing trend of

Table 5. Daily working hours of petrol attendants.

S/N	Daily working hours	Number of respondents	Percentage of respondents
1	< 4 h	1	2.43
2	4-8 h	6	14.63
3	>8	34	82.92

Source: Authors Compilation (2022).

Table 6. Marital status of petrol attendants.

S/N	Marital status	Number of respondents	Percentage of respondents
1	Single	33	80.48
2	Married	7	17.07
3	Divorced	1	2.43

Source: Authors Compilation (2022).

Table 7. Religion characteristics of petrol attendants.

S/N	Religion	Number of respondents	Percentage of respondents
1	Christianity	40	97.56
2	Islam	1	2.43
3	Animist (African traditional worship)	-	-

Source: Authors Compilation (2022).

Table 8. Safety and preventive measures.

Safety and preventive measures	Number of respondents	Percentage of respondents
Yes	33	80.48
No	6	14.63
Abstain	2	4.87

Source: Authors Compilation (2022).

petrol attendant years of service goes in pari-persu with the age of attendant, as most petrol attendant age between 28-35 years tend to leave the industry for a better prospect as the physical nature and demand of the job begins to take its toll on them (Table 4).

Petrol stations generally operate an 8h shift for petrol attendants following the standard procedure as laid down by the department of petroleum resources, 82.92% which represent 34 respondents, said they worked above 8 h, while 14.63% (6 respondents) worked between 4-8 h, only 2.43% (1 respondent) worked below 4 h (Table 5).

80.48% of petrol attendants were single, while 17.07% were married with only 2.43% were divorced individuals (Table 6). The Christian religion with 40 respondents representing 97.56% was the highest per religion; the Islamic religion had 2.43% representing only one respondent. Sapele is a town in south-south Nigeria,

deep in the heart of the Niger Delta. Christianity and western civilization had long taken root, this account for the overwhelming percentage of Christians (Table 7).

Assessment of chemistry knowledge of petroleum product

The level of educational qualification is a determining index of many factors and operations in the petroleum industry. Most attendants within Sapele had a SSCE as their highest qualification at 58.53% (24 respondents). 43.90% which represents 18 respondents (Table 8) either attended or finished higher institution, this result fell within the range of those who had higher degree qualifications at 34.14% (14 respondents) the difference of 9% (4 respondents) could be assumed to be those

Table 9. Assessment of Science knowledge amongst petrol attendants.

Assessment of sciences knowledge	Number of respondents	Percentage of respondents
With science knowledge	24	58.53
Without science knowledge	16	39.02
Abstain	1	2.43

Source: Authors Compilation (2022).

Table 10. Assessment of chemistry knowledge of petroleum product amongst petrol attendants.

Assessment of chemistry knowledge	Number of respondents	Percentage of respondents
With chemistry knowledge	21	51.21
Without chemistry knowledge	18	43.90
Abstain	2	4.87

Source: Authors Compilation (2022).

Table 11. Knowledge on how petroleum products are refined.

Refining process of petroleum products	Number of respondents	Percentage of respondents
Yes	12	29.26
No	27	65.85
Abstain	2	4.87

Source: Authors compilation (2022).

who attended but did not complete their higher school degree, this result was much lower than those reported by Moke (2019) which stood at 82.9%. Most petrol attendants studied sciences in school both high school and Degree level with 24 respondents (58.53%) studying sciences and 16 respondents (39.02) studying in other fields (Table 9), of this number of 24 respondents who studied sciences 21 respondents (51.21%) studied chemistry or chemistry-related course in school (Table 10). This implied that just over half of the total respondents had any form of chemistry education, let alone a good knowledge of petroleum chemistry, 43.90% (18 respondents) did not study any course related to chemistry (Table 10).

48.78% (20 respondents) said they were given safety and chemistry training on petroleum products, this number fell below average as those who said they were not given any safety training fell at 46.34% (19 respondents), this figure shows a lack of interest industry players devote to safety training and handling techniques (Udonwa et al., 2009). Moke (2019) in his studies establishes a correlation between higher degree graduate and increased safety awareness and practice among petrol attendants.

Petrol station owners and independent marketers devote less effort to technocratic development and safety

methodology amongst attendants, as more attention and emphasis are placed on the marketing, customer service and sales efficiency of petrol attendants. The result of safety awareness of petrol attendant was much lower than those of Afolabi (2011) and Daniel et al. (2022); most respondent agreed that they applied safety rules, about 33 respondents (80.48) were in the affirmative of been aware of safety precautions, but their range of skills were limited (Table 8). This result was higher than those reported by Okafoagu et al. (2017) 50.9%, for most petrol attendants around Sokoto state, Nigeria. Petrol attendants who grasp a good knowledge of chemistry would be conscious of the flammability and volatility of petroleum product and therefore seek the needed training to handle such volatile product (API, 2021; Ahmed et al., 2014) while at the same time contending with the demand of sales, handling and safety technique before, during and after dispensing of such product.

Petroleum product has a broad chemistry of how they are refined, but the most basic of this method is "fractional distillation" which applies cracking technique (Ashraf, 2012), 29.26% (12 respondents) knew how crude oil was refined while 65.85% (27 respondents) said they had no idea of how petroleum products were refined (Table 11). 33 respondent (80.48%) knew the generic and physical identification of the petroleum products such

Table 12. Awareness of the acronym used to describe the petrol products.

Premium motor spirit (PMS), Automated gasoline oil (AGO), Dual purpose kerosene (DPK) and Liquefied petroleum gas (LPG)	Number of respondents	Percentage of respondents
Yes	33	80.48
No	8	19.51

Source: Authors Compilation (2022).

Table 13. Chemistry of petroleum quality control tests.

Testing methods	Number of respondents	Percentage of respondents
Yes	2	4.87
No	36	87.80
Abstain	3	7.31

Source: Authors Compilation (2022).

as Premium motor spirit (PMS), Automated gasoline oil (AGO), Dual purpose kerosene (DPK) and Liquefied petroleum gas (LPG), 19.51% (8 respondents) did not know the meaning of the acronym used to describe the product they sold (Table 12).

A look through some of the tests carried out for quality and standard of PMS, such as flash point to ascertain ignition temperature, pour point to ascertain fluid dynamics, and octane rating to ascertain the anti-knock ability of petroleum (Nadkarni, 2000) showed that only 4.87% of respondent knew anything about such test procedure. 87.80% which is an overwhelming number said they knew nothing about the chemistry behind these quality tests such as octane rating, flash point, pour point, and smoke point, these procedures are adopted to control the final quality and appearance of products during fractional distillation and cracking (Table 13).

Automated gasoline oil has a sticky feel and burns much more slowly under pressure inside a Carnot engine, a function of how well and how long A.G.O burns is determined by the amount of organic hydrocarbon methylene (CH₂) per volume of the product, test such as "specific gravity" are used for determination in grams of hydrocarbon contained per volume of A.G.O, "viscosity" describes how sticky or the fluid dynamic behavior of A.G.O, while "aniline point" describes the level of saturation of an A.G.O product (C-C bonding) (Nadkarni, 2000), 78.04% (32 respondent) did not know anything about these test and their usefulness in the production of quality A.G.O, just about 4.87% (2 respondent) knew about these test and their use. 29.26% said they knew how petroleum product were refined but only 17.01% (7 respondents) knew in-depth the various chemical procedure used for refining of petroleum products, procedure such as desalting, desulphurization, alkylation, isomerism, vis-breaking, and catalytic cracking (Abdulahi, 2012; Chaudhuri, 2011) are advance technique used for production of quality petroleum product. 78.04% (32

respondents) responded negatively that they did not know about any of the chemical procedures mentioned above. Some attendants might have an idea of how petroleum products are refined, but on average, half the number of petroleum attendants is not science-oriented and roughly that same number had just a high school diploma education (Table 8), complex chemical procedures for petroleum distillation could only be obtained from the higher institution, particularly science faculties of universities.

Production and refining of petroleum fall under the downstream sector in Nigeria. The Nigerian government has regulatory agencies that oversee the daily running and monitoring of the production, transportation, and dispensing of petroleum products (Resolution Law Firm, 2020; Onyinye and Nkechi, 2015). The Nigerian National petroleum company limited operates as the flagship government agency that regulates the oil industry (Ken and Ernest, 2015; Resolution Law Firm, 2020), there are subsidiaries under the NNPC that regulates different sector of importance in the petroleum sector (Resolution Law Firm, 2020). The Department of petroleum resources, regulates most parts of the up and downstream sector, mostly those of depots (tank farms and storage facilities) and dispensing stations (Liquefied petroleum gas and petrol station) (DPR, 2021; Onyinye and Nkechi, 2015). Petroleum Price Marketing Company (PPMC) regulates the price of crude oil exported from Nigeria and the price of different petroleum products imported into Nigeria (PPMC, 2019), it does this in relation to demand and supply and international market force and dynamics. Weight and Measure Department, are a monitoring agency of the government that ensures that the right amount of product is dispensed to customers in exchange, to put it simply, they ensure customers are not short-changed by petrol station owners and they get what they paid for, they ensure station owners operate proper and standard approved calibration

Table 14. Knowledge about some agencies responsible for the regulation of petroleum in Nigeria?

Knowledge about some agencies	Number of respondents	Percentage of respondents
Yes	24	58.53
No	13	31.70
Abstain	4	9.75

Source: Authors compilation (2022).

(Onyinye and Nkechi, 2015).

58.53% of attendants knew of the existence of the NNPC, 31.70% did not know about them, 46.34% knew about agencies such as DPR, weight and measure, PPMC, and equal number 46.34% (19 respondents) did not know of the existence of these subsidiaries as such half of attendant population did not know or had not experienced the supervisory presence of these agencies (Table 14), this shows that these agencies are not paying much attention to technology, technocratic and expertise operation, and developmental operation in terms of chemistry development of petrol station attendants.

Conclusion

In conclusion, this study highlights the significant shortage of science-oriented graduates working as petrol attendants in the Sapele metropolis. The importance of science expertise, particularly in chemistry knowledge related to safety practices, cannot be underestimated, especially in fueling stations.

Recommendations

A gas leakage detection system capable of sending emergency alerts to users' mobile devices should be developed and promoted through radio stations to enhance safety in emergency situations. To ensure safety at petrol stations, it is important to employ competent managers and operators, who are proactive in implementing safety practices, address electrical faults and potential ignition sources, provide functional fire extinguishers and firefighting equipment, conduct daily safety reminders for employees, and prominently display signs and symbols indicating potential dangers within the station premises.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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Review

Philosophy of education: Aims, theory, common sense and research (Richard Pring, 2004. London: Continuum, 289 pages; \$20.85)

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This paper evaluated a Richard Pring's book titled "Philosophy of Education: Aims, Theory, Common Sense and Research", specifically part three of the book. In this review, we found that the book is valuable for anybody interested in education, especially professionals, practitioners, and researchers. Throughout the book, the author advocates his ideas consistently regarding educational theory, goals, and the effects on both the nature and conduct of educational research. From our evaluation, we obtained that the following points are good qualities of the book: Pring clarifies his point of argument by using illustrative examples and support it with adequate and pertinent empirical evidence. He also indicates the implications of each philosophical argument for research and practice. In addition, he thoroughly shows the critics of educational research as many times as he can. Finally, the author introduces a novel approach to the ethics of educational research. Despite these positive traits, the book has certain shortcomings such as use of difficult language, needless repetition of ideas in different chapters, failure to indicate ways in which the tarnished reputation of educational research might be improved and the quantitative- qualitative paradigms can work together. However, our overall evaluation finds the book as an excellent work on educational research and related issues that deserves praise and keenly recommend it to readers to be benefited from its outweighed strengths than the limitations. In addition, we suggest concerned individuals in education to review the whole chapters of the book to come up with better insights and comprehensive lessons essential to practitioners and the academic discourse.

Key words: Evidence, knowledge, virtues, research.

INTRODUCTION

British educator Richard Pring, who is currently retired, has had a long and illustrious career. Pring authored more than 20 important works, edited more than six books both alone and with his colleagues, and had two books published in his honor. We chose Pring's book for

review out of several books that our professor had suggested to us as essential readings for the course on the philosophy of education for a number of reasons: (1) As professionals in the field of education, we were interested in having and sharing insights about

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educational research and we found that Pring's book is much more comprehensive and suitable to our purpose than most other philosophical books in education; (2) From the author's biography, we learned that Pring has dedicated his entire career to dealing with and writing about critical and important educational issues, and (3) As far as our reading is concerned, Pring pays more attentions in his book to educational research than most other philosophical books in education. Thus, we chose this particular book for our review analysis because of the author's enormous and relentless contributions to education over a lengthy period of time, as well as the reasons mentioned so far. The book has three sections and 15 chapters that were separately published on various dates before edited as a book. Aims, values, and standards are the focus of the first section, which is divided into seven chapters. These chapters are (a) education as a moral practice, (b) educating people, (c) the goal of education, liberal or vocational, (d) the context of education, monastery or marketplace, (e) subject-centered versus child-centered education, (f) standards and quality in education, and (g) political education: the relevance of the humanities. In the second section, the author discussed the theme of common sense and educational theory, which has three unique chapters such as common sense and education, the language of curriculum analysis, and Knowledge out of Control. The last section, the subject of our critics, contains five independent but interconnected concepts about educational research.

As have already been stated, the authors did not review the entire book's chapters, they just pay attention to part three, which discusses educational research, and contains five chapters. In part three, the author discusses evidence-based policy and practice, truth, knowledge, and power, the erroneous duality between quantitative and qualitative research, the good and bad traits of educational researchers, and the future of educational research. As a result, the authors' assessment of the book's merits and flaws is discussed below based on those five chapters. Even though they have not cover a full assessment of the book's contents, they think readers can learn about some of the following important topics from both the book and their own reflections: (a) the significance of evidence-based policy and practice for the field of education; (b) the need for careful and appropriate application of some key concepts, such as reality and objectivity, truth, facts, theory, and knowledge in the practice of educational research; (c) the misguided, extreme debate between the quantitative and qualitative research paradigms; and (d) the necessity of integrating personal virtues with research principles, rules, and standards for effective practice of research ethics, and (e) the future of educational research in terms of understanding the context and the necessity to develop solid and independent funding and quality control systems and institutions.

EVIDENCE-BASED POLICY AND PRACTICE

The author outlined some significant objections and charges made against educational research in this chapter. Pring lists a few of the criticisms of research in the field of education, including:

...too fragmented (too little of the large-scale and bold hypotheses thoroughly tested); based on different assumptions, samples, and data; often less than rigorous in method; not unambiguously addressed to a specific question to which the policy maker or the practitioner needs an answer (Pring, 2004: 197).

By highlighting the successes of the Cochrane and Campbell collaboration centers, which benefited from their strict adherence to evidence-based approaches to policy and practice, Pring has successfully capitalized his argument for evidence-based policy and practice. Here ported to us that education authorities acknowledged that the Cochrane and Campbell strategy is necessary for the quality of research in education to guide both government policy and practice using the success of the two centers as a showcase. However, the application of Cochrane and Campbell's evidence-based methodology to the subject of education has elicited a range of responses. The author identified three philosophical issues as the core of the distinctions between hostile and hospitable responses as well as criticism of educational research. The first concern is the type of evidence. The book's main argument here is the risk of using evidence from constrained and context-free viewpoints. Because, in the author's opinion,

...there are different forms of discourse, each characterized by different ways of looking at the world, different kinds of truth claims, and different ways of investigating the truth. What counts as evidence will depend upon the types of discourse one engages in. As a result, there is a danger of criticizing a piece of evidence because it does not meet the standards of evidence in different forms of discourse (Pring, 2004: 197).

Pring listed four instances in which evidence was used in the education field incorrectly. First, some supporters of the evidence-based method argued in favor of it by blurring the lines between scientific and non-scientific forms of discourse and dismissing some unfounded claims. Second, other opponents who only use one type of evidence to refute an argument's validity may completely disregard it as being unrelated to the intricate issues at hand in educational policy and professional practice. Third, although evidence and proof are two quite distinct concepts, they are sometimes used interchangeably. Politicians that promote evidence-based

policy as the best course of action frequently make arguments like this. However, when a policy that was implemented based on study findings ends up being insufficient, they feel let down. They missed that being supported by evidence does not always imply being right. Instead, it indicates that one course of action appears to be the most logical one over the other in light of all the evidence and a comparison of it, either *for or against*. Fourth, educational discourse is by definition eclectic. It uses various types of evidence, including historical, psychological, and scientific data as well as personal experience. The book's rigorous distinction of evidence misuse and a powerful comment on its potential future application within various contexts and goals might be seen as a positive attribute in light of the evidence.

The extension of the methods of the natural sciences to the understanding of humans is seen as the second philosophical issue within the core of educational research criticisms and different levels of acceptance to that of the Cochrane approach to the field of education. The state of the human mind, according to many philosophers and academics, constitutes a different form of reality than that which is the focus of the natural sciences. In other words, science cannot study Man because it might not be able to comprehend social structures and human beings as a whole.

Although there is some evidence supporting such beliefs, the author vehemently contends that it is possible to articulately predict the prevalent habits and practices of human beings. If people do not fall prey to the uniqueness fallacy, it is possible to learn more about human beings using research techniques from natural science. The author attempted to demonstrate the viability of applying the Cochrane evidence-based approach of health science to the education sector without undermining the significance of appreciating the distinctive characteristics of human nature in general and the education field in particular. This is another strong point of the book.

The adoption of logically separated educational ends/goals from the means of reaching them is the third philosophical problem of concern. Pring asserted that:

...within the now prevalent managerial discourse, the means/end model of educational planning and engagement seems almost self-evidently correct; there is a logical separation of the ends of education from the means of achieving those ends (Pring, 2004: 205).

Although the author's expression seems indirect, the aforementioned phrase implies that higher-level authorities and politicians created the aims and goals of education, while lower-level practitioners, in this case, teachers, are responsible for pursuing those ends. As a result, the decision-making process and the goal/means of the educational planning model are logically separated.

The core of the argument is that teachers are less

empowered to create these goals/ends while officials abuse their authority to craft educational objectives in the form of targets and force teachers to meet those targets. The Amharic proverb “*ገምገል የለበት ከብት ለቀማ*” (literally to mean “going out to pick up the dung where the cows were never there”) best describes this situation. Although the teacher is the expert in the educational interaction (ideally based on the necessary evidence) in knowing what means will most successfully reach those aims, according to the author, their competence does not lay in the discussions about the ends themselves. This would mean that the educational endeavor would not succeed in achieving its goals or objectives. This implies that the book preaches to us the importance of teachers' genuine and empowered engagement in both the development and implementation of the planned objectives.

Pring made a scathing statement for educators as the chapter's final comment. Teachers, ministers, and other government officials in the field of education claim to be using evidence, but proponents of evidence-based policy and practice contend that the evidence has not been gathered and applied in a rigorous enough manner; it lacks the systematic investigation, in fact, the scientific rigor (Owens, 2004), that has revolutionized other spheres of public life. Educationists are criticized for not conducting thorough enough systematic evidence searches. The worst aspect was that Pring, using Salvin's suggestion, disclosed that:

At the dawn of the twenty-first century, education is finally dragging, kicking and screaming into the twentieth century. The scientific revolution that utterly transformed medicine, agriculture, transportation, technology, and other fields early in the twentieth century almost entirely bypassed the field of education (Pring, 2004:206).

As a professional in education, we feel that this is a bitter news. It is from this point that we want to criticize the book. The author does not offer any sound justifications for the failure of the education field compared to its equivalents, except for the philosophical justifications mentioned above. The author provided thorough documentation of the criticisms of educational research as well as the key justifications for how and why they were misrepresented. However, as someone who has dedicated his entire life to improving education, it would have been preferable if the author had pointed out the underlying reasons why this field has lagged behind so far more than others. Is it really because evidence-based policy and practice aren't being used, or is it due to the peculiar nature of the field, or is it because the educational industry as whole employed dimwits, or is there another reason? All of these issues, in our opinion, should have merited discussion in the book. On the other hand, although it is admirable to find similarities between the natural sciences and education, we think the

idiosyncrasies of the area outweigh the similarities. Consequently, for the most part, the education field generally needs its atypical methods, theories, practice, evidence, and approaches to do so. Otherwise, it was strongly believe that, with the use of borrowed methods, educational research and its practice would never be able to overcome their far-reaching problems. However, except for insistently advocating the copying and adoption of the already developed research methodologies in natural science, the book says nothing about introducing novel approaches to research in the field of education.

TRUTH KNOWLEDGE AND POWER

Pring discussed what he deemed the essential notions in this chapter, including reality and objectivity, truth, facts, theory, and knowledge. The author's position was that:

...analysis of these concepts might be best in approaching the divisive controversies which prevail in educational research. They are indispensable in our conversation with other people and thinking about and ordering of our experience. Despite their indispensability, the appropriate application is a matter of disagreement, and where one position oneself in these debates affects ones views about the practice and the validity of the research (Pring, 2004: 209-210).

The author offers a thorough explanation of those essential concepts and demonstrates how understanding them is beneficial to educational research. Pring advised cautious and integrated use of those fundamental ideas for better implications in educational studies. The author attempted to maintain a balanced knowledge of most of these fundamental themes with strong argumentative features. In this regard, the author makes every attempt to steer clear of the notions' extreme meanings. For example, a significant number of philosophers denied the existence of one independent reality at all. Because, they believe in multiple and socially constructed realities and conclude that a single reality would not exist independently of individual creations against which they might assess or evaluate their perceptions. The author, however, firmly argues that adopting the aforementioned viewpoint is incorrect, contending that the opposite of such a viewpoint rejects any social reality at all-it has no existence outside of what we choose to construct. In support of this claim, the author noted:

The realism, however, which I argue for, must not be confused with the naive realism that critics have in mind. Naïve realism is the view that there is a one-to-one relation between our description of reality and reality itself - that our language, as it were, mirrors reality (Pring, 2004:212).

The author acknowledges the notions of postmodernists' multiple realities and recognizes that social forces might be in charge of different realities that are socially constructed. The goal of the book, however, is to show that there is a reality that can be found by applying objectivity, a method by which one goes on to describe an objective state of affairs, that is, a state of affairs that exists independently of personal wishing it to be so. Many authors, especially those associated with postmodernism, underlined the futility of seeking the truth in their writings. Instead, they engaged in negotiation to reach a consensus. Nevertheless, the search for it (truth), according to Pring, is by no means unavoidable occurrence, although there are numerous interpretations, theories, and conditions around it. The author makes a compelling case for how an accurate understanding and application of truth will significantly advance education research while failing to acknowledge this has weird and inexplicable repercussions on both the theory and practice of research. The concept and use of facts are also clarified by the author. He underlined that understanding facts should be viewed concerning theory and descriptions of reality since facts are embedded in theory-laden representation. The book also takes a strong stance in favor of theory and practice's logical interdependence. For the theory-phobic groups, it offers sufficient justifications and examples that are supported. Pring stated the following to illustrate the importance of theory in both study and practice:

...the much-despised theory, in the sense of a framework of concepts and beliefs, far from being separate from practice, is implicit in it. Those, who want researchers to cut the theory and say what works, forget that what counts as working makes many unquestioned assumptions that need to be examined (Pring, 2004:220).

The author introduces a critique of educational research before discussing knowledge, another crucial notion.

Critics argue that educational research does not create a body of knowledge upon which policy makers and professionals can rely. First, lots of the education research are small-scale and fragmented; hence, there are no cumulative growth of such knowledge. Second, educational discourse seems to be full of people criticizing others research such that there is nothing conclusively verified - no knowledge. Research conclusions seem more like transient beliefs than well-established knowledge (Pring, 2004:220).

Pring develops his argument and specifies what should be in such a body of knowledge using such critiques as a starting point. He considered that:

...these bodies of knowledge are the theories,

propositions, and explanations accumulated through inquiry, criticism, argument, and counter-argument. They are what have survived testing and criticism. They are, as it were, public property. And indeed, their credential depends upon their being open to public challenge and refutation. Thus, any well corroborated body of knowledge, can only be provisional and open to further change through criticism. In fact, the link between knowledge and certainty is broken (Pring, 2004:221).

The author believed that teachers should encourage young students to understand these publicly established bodies of knowledge instead of passing along their personal beliefs and convictions. The book's strength lies in its aspiration that educational research to have its own body of knowledge with unique ideas and concepts, principles and theories, modes of inquiry, and accepted truth tests. This body of knowledge might be grown through criticism, experiment, testing, and reflection, and it is this body of knowledge that a policymaker or professional can confidently draw upon when deciding what to do.

Despite the positive qualities stated above, we have observed some flaws in chapter 2 of part three of the book. First, although the chapter's topic is "power", which is written alongside "truth" and "knowledge", the book does not adequately describe the influence of power, either as a promoter or an inhibitor of educational research. Of course, he discussed some aspects of the influence of power, linking it to the postmodern embrace. But in my opinion, it is insufficient, and the case has nothing to do specifically with the practice of educational research. The impact of power on educational research and teachers was instead briefly covered by the author in the next chapter, which did not include power as a topic. This demonstrates the needless repetition of similar ideas in different chapters.

Second, the author clearly defines the role of teachers as familiarizing their students with the body of acquired knowledge. On the other hand, he restrains teachers not to impart their own beliefs and convictions in the classroom.

Here, two limitations was noticed:

(A) the accumulated body of knowledge constitutes more of, if not at all, the knowledge organized and obtained through scientific procedures/research. It might exclude important facets of social values, morality, and cultural legacies, and there might be other facets of knowledge that are not subject to scientific investigation.

(B) Teachers may have fundamental beliefs and convictions for their students based on their professional and personal experiences. As a result, they should not be limited to imparting merely the body of existing knowledge.

Third, the author claims that bodies of knowledge are,

as it were, public property. This statement seems to be an unverified assertion. What does "public property" mean first—is it in terms of open access or criticism? The argument lacks clarity in this regard. Scientific rigor, in our opinion, has produced the majority of bodies of knowledge and such body of knowledge is not a public property if we look at the issue in terms of access. We don't think the body of accumulated knowledge is or will be public property, even though the source of evidence for it may be more or less open to and from the public. Undoubtedly, one of the most valuable economic resources for individuals, groups, organizations, and countries is scientific knowledge. However, everyone could not access it for free; it is heavily privatized and protected instead. If we assume that teachers' primary responsibility is introducing their students to the existing body of knowledge, the question is whether they can easily access such a body of knowledge. In practice, it might be impossible for them. For instance, if our professor did not provide us with this book to evaluate, we would not have had access to it under our privilege even though it is the outcome of scientific investigation and is regarded as public property (*as to the author's expression*).

Fourth, the author made the point that conducting effective educational research requires a thorough understanding of and use of essential ideas including reality, objectivity, truth, facts, theory, and knowledge. That's great! The book's shortcoming is that the author does not define education research when he develops his thesis. Does he think it falls within basic, applied, or both categories of research? Except for subliminal cues that lead one to surmise that the author might have focused on fundamental research, the book offers no explicit evidence of this.

FALSE DUALISM OF EDUCATIONAL RESEARCH

In this part of the study, the author firmly argued against the illusory dualism of quantitative and qualitative paradigms in educational research. In doing so, Pring stressed four crucial circumstances: First, he attempted to show a key book that influenced the dichotomy (Guba and Lincoln, 1989). Second, he critically analyzed dualism's underlying philosophical presuppositions. Third, he briefly discussed the argument's political and moral ramifications. Finally, he considered how the quantitative and qualitative paradigms' duality is deceptive. The author's fundamental view in supporting this claim is that the quantitative-qualitative paradigm is a false duality. Before presenting his counterarguments, the author summarizes the positions of the two paradigms as shown below:

Countless texts and theses in educational research distinguish between quantitative and qualitative

research - and demonstrate a loyalty to one, or the other. Often, quantitative and qualitative are seen in opposition that invoke different paradigms and epistemologies. The division between the two has become quite sharp, reflected in their respective languages or different logical configurations of familiar words such as objectivity/subjectivity, reality/multiple realities, truth/consensus, knowledge/opinion, understanding/perception (Pring, 2004:229).

Pring further shows where the disagreement between the two paradigms lies on. He stated that:

The contrast is drawn between the objective world (out there independently of our thinking about it) and the subjective worlds (in our heads, as it were, and individually constructed); between the public discourse and private meanings; between reality unconstructed by anyone and the multiple realities built by each individual (Pring, 2004:229-230).

Nonetheless, the author condemned that such type of extreme discourse between the two paradigms is not genuine and relevant enough for the practice of educational research. He noted that:

The tendency to dichotomize this way is understandable but misleading. By emphasizing one particular distinction, it obscures or eliminates other, more subtle ones. And educational research has therefore too often been seduced by those false dualisms and reflected in or guided by those who theorize about it (Pring, 2004:230).

Further, it seems that the author criticizes the supporters of social constructivists or fans of a qualitative paradigm (Altheide and Johnson, 1994; Berger and Luckmann, 1966; Guba and Lincoln, 1994; Kuzel and Like, 1991; Secker et al., 1995; Smith, 1983) for their presupposition that:

In resisting the quantitative paradigm, one is inevitably forced to adopt qualitative paradigm. That, however, is a mistake (Pring, 2004:236).

The implication and the good quality of the book here are that there might be weak points in the quantitative paradigm. As a result, identifying, critiquing, correcting, and filling those gaps and problems is expected from any scientific procedure, discourse, and the person who works in the area. However, this does not necessarily call the destruction of the basics of the existing paradigm for the sake of coming up with another paradigm with its problems in the name of opposing the former one. The other strength of the book in this area is the author's persuasive argument that the current split between

qualitative and quantitative paradigms in educational research is unhelpful, impractical, and even misleading. The apparent distinction shown above is insufficient for any paradigm to stand alone and provide researchers with enough confidence. The two paradigms have several flaws in addition to their merits. This forces them to avoid the dichotomy and instead calls for combining the best aspects of the two paradigms. And we believe that's why mixed research methodologies are becoming more accepted today.

The author's attempt to maintain balance while arguing and asserting that the dualism between the quantitative and qualitative paradigms is a false dichotomy is another positive aspect of the book concerning the subject at hand. He made an effort to be objective and avoid putting himself in one of the categories. In other words, this chapter maintained his prior chapter's balanced perspective toward independent reality and socially constructed multiple realities. This neutrality is essential for readers to be objective to form their own opinions.

Although the book possesses the traits mentioned above, it also has substantial and minor restrictions. The author discussed in detail to demonstrate and persuade his audience about the false dualism of the two paradigms. According to Pring's final statement in the chapter, qualitative research paves the way for the quantitative, and the latter will be suggestive of distinctions investigated in a more interpretive approach (Pring, 2004: 243). In this understanding, this single line is insisting on the employment of both qualitative and quantitative at a time. Although the suggestions and comments are commendable, it is far less satisfactory to direct researchers who are/were ardent proponents of a specific paradigm, either quantitative or qualitative. We think it is insufficient to merely state that the widely held dualism between qualitative and quantitative camps considering as it is wrong. The author needs to talk more about how monism might effectively combine the better of the two paradigms. Of course, this may be the responsibility of research methodologists, but the author, who is also an educator and a philosopher, would have an opinion on the viability of mixed use of the quantitative and qualitative paradigms in educational research projects. Other philosophers, including Noddings (2015), argued more about how to combine the two research paradigms than this book does.

The author explored the criticisms of educational research in four separate chapters, on pages 197, 220, 228, and 260, which presents the book's second minor flaw. That merely amounts to a repeat and redundancy of the same problem in other locations. This illustrates the less stringent effort made throughout the book's edition. As we mentioned in the opening, the author assembled the book using 15 previously published papers. Such repetitious situations ought to have been removed when Pring edited the book. But that seems doubtful, and we do not believe that it was done on purpose.

VIRTUES AND VICICES OF EDUCATIONAL RESEARCHER

Pring makes an argument regarding the limitations of thinking about research ethics in terms of just principles, codes, and rules in this section. From an ethical standpoint, he maintained that taking into account the researchers' virtues or qualities is more important than the ethical principles they support. According to him,

Moral dilemmas which arise in research are often dealt with by appealing to certain general principles. However, that code or those principles do not precisely tell what one should do on any occasion. As a result, there is no chance of escaping from moral deliberations- the complex judgments required for seeing, first, the relevance of particular principles or codes to this or that situation, and second, the priority given to this or that principle when it is conflicting with another (Pring, 2004: 247).

On the other hand, the author argued that the gap between high-level principles on the one hand and action on the other depends on moral deliberation. Again, moral consideration depends on the general dispositions one inclines this way or that. That is:

A courageous person sees danger differently from a coward; the kind person will recognize redeeming features that the uncharitable fail to see; the loyal friend will focus on ways to help that a mere companion will not detect (Pring, 2004: 247).

The main claim made here is that how researchers approach moral discussion depends on the type of person they are or the propensity they have to act or react in a certain way as opposed to another. Pring suggested that for researchers to successfully reconcile opposing principles, rules, or regulations using their virtues, they should focus on their dispositions or virtues. However, the author cautions that improving the researchers' virtue could not be effective if:

(a) Government policies and practices increasingly control those social and personal virtues; (b) there is unsupportive social context to personal virtues, and (c) there is no virtues research community that requires the necessary virtues from its members and encourages the practice of it (Pring, 2004: 259-260).

With all of the aforementioned justifications, it was concluded that the book has merit since it addresses the most important aspect of research ethics, which calls for the highest caliber of moral and intellectual virtue. The book discusses the significance of adding such moral and intellectual virtues in addition to the practice of following research principles to maximize the benefits of research for the researcher, the researched, and the larger

community. The book offers concrete examples that clearly and logically explain the case for the necessity to apply moral and intellectual virtues in research ethics while also stressing the need of doing so. But the author also acknowledged that integrating and balancing moral and intellectual values into research ethics is not a straightforward process. The author hopes that by doing this, we will be reminded of the need for thorough, cautious, and patient methods and efforts that are crucial to cultivating moral and intellectual virtues to work under research principles, codes, or standards.

THE FUTURE OF EDUCATIONAL RESEARCH

Pring focused on two topics in the final chapter to synthesize the main points of part three of the book: the context of educational research and its future directions. In the initial instance, the author contended on the existing contexts in that:

(a) The government and its agencies are not interested, generally speaking, in research or in evidence-based - despite claims to the contrary; (b) There is too much fragmented and low-level research to serve a purpose as it might, either professionally or in policy terms, and (c) The changing shape of higher education will inevitably lead to a hierarchy of institutions in terms of research funding, academic status, and research students (Pring, 2004:263-265).

Pring suggested two solutions for the situations mentioned above. In response to these three contexts, he claimed that (a) a review of the institutional and financial foundations of research is necessary, and (b) a review of the quality assurance mechanisms for the research, particularly the peer review of important journals, is essential to ensure professional, academic, and political confidence in the reporting of research. The book's strongest argument is that it recognizes the current contextual issues in educational research and suggests answers to those issues. However, the book's drawback in this regard is that it only suggests remedies that apply exclusively to the British environment. In other sections of the book, the author argues covering the broader areas of the philosophy of education, particularly in the cases of educational research. However, in proposing the way forward, the author limited the discussion to the British Education Research Association (BERA) affiliated universities. In addition, in contrast to earlier chapters, the author doesn't discuss philosophical topics in the final chapter. Based on his research expertise, he simply offered his suggestion. Of course, this is not an issue in and of itself. However, as the focus of the book is on educational philosophy, readers may anticipate philosophical arguments in each of the chapters.

However, the author does not discuss these philosophical arguments in the final portion of the book.

CONCLUSION

In general, it was thought that the book is valuable for anybody interested in education, especially practitioners and researchers. The author's constant ideas regarding educational theory, goals, and the effects on both the nature and conduct of educational research are reflected in the book. The book also demonstrates the following characteristics in addition to the strengths and limitations that we covered in each section of the main body of the paper: The author first clarifies his point of view by using illustrative examples, then supports each line of argument with adequate and pertinent empirical evidence and sources. Next, the author indicates the implications of each philosophical argument for research and practice. Third, he thoroughly shows the critics of educational research as many times as he can. Finally, the author describes a novel approach to the ethics of educational research (vitreous researchers). Despite these positive traits, the book has certain shortcomings, first, related to the use of difficult language. Although the writing may be plainer and a better representation of British culture, this may not hold for readers in other nations, especially those who are not natives. Second, we noticed some needless repetition of ideas or notions in the five chapters that were viewed.

Readers might find this awkward. Third, even though the author makes a significant effort to examine the shortcomings of research in the field of education, his dedication to demonstrating ways in which the tarnished reputation of educational research might be improved falls well short. Overall, this excellent work on educational research and related issues deserves praise because its strengths outweigh the flaws. In this regard, despite the fact that our deliberate selection of only part three prevents our article from giving a thorough and complete picture of all the chapters of the book, we nevertheless think that it will offer some insights to the academic discourse on the topic. Particularly, those who have not read the book yet will learn from our critiques about its good qualities and limitations.

Others, who may have more in-depth knowledge of the subject, will begin writing their books using the constraints mentioned as a starting point. Still, other people may develop viewpoints on the book that are distinct from our own.

Hence, we encourage all the interested and concerned educators to read such a remarkable work and review the whole chapters of the book to come up with better insights and comprehensive lessons essential to practitioners and more academic discussions on the area.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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