

Short Paper

# Impact of Cooperative Learning Strategies on Social Studies Pre-Service Teachers' Performance in Cybercrime Prevention

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## Abstract

*Purpose* – This study aimed to investigate the effect of cooperative learning strategies on the performance of Social Studies pre-service teachers in cybercrime prevention. The study adopted the Social Cognitive Learning Theory of Albert Bandura, focusing on learning from four areas: Observation, Understanding, Predicting, and Change in behavior. A quasi-experimental design was considered appropriate for this study.

*Method* – The participants for this study (386 pre-service teachers) were selected using a multistage sampling procedure. The instruments used in this study included the Cooperative Learning Strategy Guide (SLSG), the Conventional Method Guide (CMG), the Computer Literacy Test (CLT), and the Pre-service Teachers' Performance Test (PTPT).



The experimental procedures were conducted in three stages: pre-treatment, treatment, and post-treatment, spanning eight weeks. Inferential statistics such as Analysis of Covariance (ANCOVA) and Estimated Marginal Means were used to test the hypotheses at a 0.05 level of significance.

*Results* – The findings revealed that Cooperative Learning Strategies (CLS) had a significant main effect on Social Studies pre-service teachers' performance in cybercrime prevention. Pre-service teachers exposed to CLS had higher adjusted mean scores than their counterparts in the control group. Additionally, there was no significant main effect of gender of Social Studies pre-service teachers on their performance in cybercrime prevention.

*Conclusion* – The study concluded that the use of Cooperative Learning Strategies enhanced pre-service teachers' performance in cybercrime prevention compared to conventional learning strategies.

*Recommendations* – It is recommended that the use of Cooperative Learning Strategies (CLS) should be encouraged in teaching cybercrime prevention in tertiary institutions to enhance the academic performance of pre-service teachers.

*Research Implications* – This study has contributed to the body of knowledge by investigating the effectiveness of CLS in teaching cybercrime prevention in Social Studies education. The study has scholarly implications for designing teaching strategies appropriate for teaching crime prevention themes in Social Studies to pre-service teachers in Nigeria.

*Keywords* – cooperative learning, social studies, pre-service teachers, academic performance, cybercrime prevention

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## INTRODUCTION

The offenses committed by internet criminals against innocent users seem to overshadow the immense advantages that the internet has brought to mankind (Amosun et al., 2015). The advent of Information Communication Technologies and their usage to accomplish the established aims and objectives of tertiary education, specifically, and society, is negated by the involvement of users in cybercrimes that have resulted in the exploitation of cyberspace at the expense of the welfare of other users (Tonhauser & Ristvej, 2019:1594). Crimes committed through the internet, predominantly by youths across the world, range from cyber harassment, racial abuse, the spread of obscene pictures, rumor peddling, impersonation, defamation of character, collecting money under pretenses, bullying, flaming, stalking, phishing, password theft, and more (Choi et al., 2019).

Cybercrimes are characterized as provocation, exploitation, bullying, etc., carried out using ICT gadgets (mobile phones, PCs, tablets, etc.), as well as social media platforms such as Facebook, WhatsApp, Skype, TikTok, Twitter, Instagram, Likee, Messengers (Yahoo or Facebook), and others (Makhulo, 2018:26). Cybercrime is broadly divided into property cybercrime and interpersonal cybercrime. For the sake of this study, the researcher is concerned with the notion of interpersonal cybercrime, as it tends to deal directly with individuals' behavior in cyberspace. According to Roberts (2007), interpersonal cybercrime is an offense committed against the individual(s). It is usually aimed at the defamation of the target's character, using Information and Communication Technology devices. Interpersonal cybercrime seems to have become embedded into the fabric of university education and other sectors of education in Nigeria. It has had an adverse effect on the national development of the country and is regarded as a social menace that needs the urgent and collective attention of the public. Involvement in interpersonal cybercrime has led to increased school dropout rates and has boosted the level of criminal acts in Nigerian society, which is a case for public concern and attention (Slonje et al., 2012).

Most of these acts of misconduct are committed through the utilization of personal computers (PCs). The development of the web has brought about the rise of acts of criminality and unlawful behavior in cyberspace. Illegal internet-based activities have many faces and can entail a few activities, targeting a variety of victims or groups. In several countries, specifically Nigeria, Italy, the United States of America, and Canada, cybercrime has turned into a major issue. Cybercrimes can easily spill over into actual space. However, this pattern of criminal behavior contradicts Jaishankar's (2008) study, which states that cyberspace is familiar territory to cybercriminals. Regardless of the nature of the crime, criminals use both physical and online spaces to commit crimes. Cyberspace is a transitional realm for many people, including criminals. They do not stay in cyberspace - they come and go as they would anywhere else. This allows cybercriminals to move from one location to the next, strike at an internet address, and use a different server to cover their tracks. This makes cyberspace one of the best avenues to commit crimes and then vanish (Jaishankar, 2008).

This makes it different from conventional crime, as the criminal does not have to be near the victim. Digital criminals are equipped to swiftly perpetrate illegal activities, even over long distances (Jaishankar, 2008). Due to this, the investigation of cybercrimes is extremely complex. The complexity of setting up an internet-based criminal scheme and investigating and resolving it can be mind-boggling. As indicated by Ige (2008), web crimes are sometimes also referred to as "Yippee Yahoo" or "Hurray Plus", both road names used by fraudsters utilizing "mayehun" (voodoo power/enchantment) for their activities. In his review, Ige (2008) states that the "utilization of one more named individual and a social security number to get labor and products," frequently known as identity theft, was among the most common forms of cybercrime perpetrated by the youth in Nigeria.

The findings of Ige's (2008) study called for the creation of a cybercrime prevention program that would include education in addition to the myriad of security systems established by computer scientists and information security specialists. As indicated by Brunton (2013), the incorporation of ARPANET into the Internet triggered a surge in Nigerian fraudulent schemes, specifically Ponzi-like activities. As indicated by Liang and Liu (2010), internet crimes can be broadly categorized into two main types, namely criminal acts involving information organizations and computer systems and offenses related to computer networks. These categories, described by Liang and Liu (2010), are based on crimes committed in China's internet landscape. Scholars' explanations of internet crime may be based on illegal acts committed in the cyber environments of specific countries.

## **LITERATURE REVIEW**

### ***Cooperative Learning***

Through debate and deliberation, cooperative learning (CL) can help students clarify their ideas and perspectives. Group conversation is usually more thought-provoking than teacher-led dialogue, allowing learners to obtain immediate responses that improve their communication skills (Orey, 2010). Cognitive understanding improves through interacting with learners from various backgrounds, emphasizing collaboration to find the best solutions to problems. Throughout history, humans have sought and found solutions by sharing experiences and expertise, and by collaborating with others, showcasing the essence of collaboration (Kus et al., 2014). Cooperative learning assists students in determining co-learner understanding (Sturz, Kleiner & Fernandez, 2005). Instead of working individually, CL tasks stimulate collaboration and communication among group members, aiding in the acquisition of more learned and community competencies (NDT Education Resource Center, 2012; Buchs & Butera, 2015; Casey & Goodyear, 2015; Lirola, 2016; Sharan, 2015). According to Ramos Ordoñez and Pavón Vázquez (2015), CL encourages deep thinking. CL usually results in an improved correlation among outstanding, average, and below-average learners, according to Aziz and Hossain (2010), enhancing students' sense of value and positivity towards the subject. Learners, according to Johnson and Johnson (1989), should willingly participate, be concerned about the learning process, and take responsibility for their learning.

Cooperative learning is a technique in which learners are divided into smaller groups to collaborate and expand their own and others' learning (Trowbridge et al., 2000; Ajaja & Eravwoke, 2012). Akinbobola (2008) states that cooperative learning is a method in which learners with diverse academic talents cooperate in smaller groups to achieve a common goal. Students in groups communicate, discuss their perspectives and knowledge, seek additional information, and make decisions for the group. It involves applying various learning tactics to increase subject knowledge, with key elements including individual accountability, interpersonal skills, and small groups. For effective

interdependence, small groups must be created, and physical interaction is essential. Cooperative learning is known for effectively engaging pre-service teachers in the learning process and enhancing their scientific and critical thinking skills (Borich, 2004).

Cooperative learning is a teaching technique in which students collaborate in groups to work on problems (Akhtar, Perveen, Kiran, Rashid & Satti, 2012). When pre-service teachers collaborate in groups, they engage in more extensive discussions, exhibit higher levels of dialogue, experience fewer interruptions when others are speaking, and contribute more meaningful insights, according to Gillies (2006). Cooperative learning utilizes group work to achieve academic goals.

Cooperative learning is a guidance technique in which learners of different races, abilities, genders, nationalities, and skill levels collaborate in smaller groups to assist each other (Bölükbaş et al., 2011). Cooperative learning, as indicated by Wichadee (2012), is a student-focused method of instruction. When pre-service teachers work cooperatively, they learn to listen, give, and receive help, reconcile differing opinions, and resolve problems democratically (Palmer et al., 2017). In cooperative learning, groups of learners work together to explore ideas and data, seek additional information, and evaluate their findings. It is student-focused and centered on learning goals rather than objectives (Kolawole, 2008).

The five key elements of cooperative learning are:

- Constructive interdependence
- Promotive communication
- Individual accountability
- Development of interpersonal and social skills
- Teamwork

When students are placed in groups without constructive interdependence, the learning environment lacks coordination (Johnson & Johnson, 2009). Positive relationships in cooperative learning settings imply that learners must cooperate as a group to achieve their learning goals. Pre-service teachers should be responsible for their learning and that of their group members (Slavin, 2011). Collaborative learning groups can range from two to five people, allowing everyone to engage in a clearly defined task (Olojo, 2011). Cooperative learning encourages contact among all students in the classroom, guiding them to evaluate each other as collaborators on the overall task. It stimulates curiosity in-class activities and motivates diligent work in reading-focused classes (Awofodu, 2016). When learners of varied abilities work together on a task, they must engage and cooperate as a group, according to Naseem and Bano (2013), enhancing their approach, interpersonal skills, and self-concept.

Collaborative learning also reduces dependence on teachers. Collaborative learning tasks are often challenging, requiring higher-order cognitive skills, enabling students to

investigate and comprehend critical knowledge (Ajaja, 2018). The teacher's role shifts from providing information to encouraging learner understanding, becoming a guide or encourager. Cooperative learning requires learners to work together as a team, fostering positive interdependence. Educational obligations in cooperative learning are planned so that everyone participates, and all learners are accountable (Candler, 2013).

The observed misuse of ICT for cybercrimes highlights the need to train pre-service teachers in prevention strategies at the university level. This is to prevent the escalation of cybercrime in the absence of strict laws and means to prosecute offenders. To empower the university system and society to combat this threat, the researcher intends to propose a cybercrime prevention concept to pre-service teachers. Pre-service teachers are undergraduate students in the process of training to eventually educate others in society. If not well-trained or exposed to the dangers of criminal use of cyberspace, they may become involved in criminal activities themselves (Choo & Smith, 2008).

Interpersonal cybercrime prevention themes were presented to pre-service teachers in a modified module, with broad themes and sub-points. Class and individual exercises were conducted by instructors from the United Nations Office on Drugs and Crimes Module. The educational content on crime prevention was integrated into the pre-service teachers' current educational program, focusing on Value Education, Environmental Education, and Security Education. Cooperative learning was utilized and considered more learner-friendly than traditional techniques. The content on crime prevention aimed to bring about a positive change in students and positively impact their academic performance.

This study examined the effect of cooperative learning strategies on Social Studies pre-service teachers' performance in cybercrime prevention in universities in Ekiti State, Nigeria.

The following null hypotheses were formulated:

1. There is no significant main effect of Cooperative Learning Strategy (CLS) on Social Studies pre-service teachers' performance in cybercrime prevention.
2. There is no significant main effect of computer literacy on Social Studies pre-service teachers' performance in cybercrime prevention.
3. There is no significant effect of Cooperative Learning Strategy (CLS) and gender on Social Studies pre-service teachers' performance in cybercrime prevention.

## ***Theoretical Framework***

### ***Social Cognitive Learning Theory***

Since the study aims to examine the impact of teaching and learning strategies on the learning outcomes of pre-service teachers in universities in Nigeria, it is necessary to

employ a theory that deals with learning in terms of the different domains of learning, and the fact that learning hinges on the knowledge and attitudes of learners. This has informed the choice of the Social Cognitive Learning Theory, as postulated by Albert Bandura. Bandura's works take a holistic approach, considering his earlier work on Social Learning Theory, which focused on social learning. To further incorporate his knowledge of human cognition and social learning, he expanded on his initial theory to develop the Social Cognitive Learning Theory. This theory explains how human beings learn through the phases of understanding, predicting, and changing their behavior (Razieh, 2016:11).

Based on this, Bandura placed more emphasis on the cognitive aspect of learning in the Social Cognitive Learning Theory. He focused on the idea that humans rely on their cognitive abilities in social experiences, enabling them to change and develop their behavior (Green & Piel, 2009). The learning framework of humans hinges on four phases: observation, understanding, predicting, and behavior change. Further research on the Social Cognitive Learning Theory led McCormick and Martinko (2004) to assume:

1. Human beings learn through their observations of what others do.
2. Learning can result in a change in human behavior, and vice versa because it is regarded as intrinsic (i.e., self-motivation).
3. Human beings may observe someone else doing something and decide not to follow suit.

Additionally, Betz (2007, p. 404) supports Bandura's theory based on his research on human behavior, assuming:

1. Human behavior is targeted towards a certain aim and objective.
2. Human beings can grow to the stage of eventually regulating their behavior.
3. The human cognitive domain occupies an important space in the process of learning.

When introducing a preventative curriculum using scaffolding and cooperative learning strategies to elucidate the influence of preventing interpersonal cybercrime on the learning outcomes of pre-service teachers, the Social Cognitive Learning Theory aids in explaining how individuals can develop self-reliance without constant monitoring, leading to positive behavioral change. This fosters a conducive learning environment free from cybercrimes. The theory deals with learning, considering how learners go through processes of observation, understanding, predicting, and behavior change.

The Social Cognitive Learning Theory, based on these four key aspects, is crucial to understanding and engaging learners. It is important to evaluate these aspects to explain why this theory is preferred over the older Social Learning Theory, which focuses only on three levels: observation, imitation, and modeling, neglecting the cognitive and affective aspects of learning such as understanding and behavior change. This study emphasizes the significance of considering these aspects when applying new learning strategies (Green & Piel, 2009:11).

## METHODOLOGY

The study utilized a pretest-posttest control group quasi-experimental design to evaluate the impact of cooperative learning strategies on the performance of Social Studies pre-service teachers when taught cybercrime, specifically interpersonal cybercrime prevention. The design is represented schematically as follows:

$$\begin{array}{lclcl} E_1 & = & O_1 & X_1 & O_2 \\ C & = & O_3 & C & O_4 \end{array}$$

Where:

- E<sub>1</sub>: Experimental Group 2 (cooperative learning strategy (CLS))
- C: Control Group (conventional method)
- O<sub>1</sub>, O<sub>3</sub> = Pre-tests in E<sub>1</sub>, E<sub>2</sub> and C respectively
- O<sub>2</sub>, O<sub>4</sub> = Post-tests in E<sub>1</sub>, E<sub>2</sub> and C respectively
- X<sub>1</sub>, = Experimental treatment (X<sub>1</sub> is to E<sub>1</sub> in CLS)
- C = Conventional method for the control group

The participants for this study, 386 pre-service teachers, were selected using a multistage sampling procedure. The first stage involved the use of a simple random sampling technique to select two universities (one university for each of the experimental and control groups) in Ekiti State, Nigeria. This was followed using a purposive sampling technique to select the Department of Social Studies Education in each of the selected universities. Consequently, in stage 3, the entire class of second-year students in these departments for each of the selected universities was used.

The researcher developed adapted module guides, achievement tests, and rating scales for the following instruments: Cooperative Learning Strategy Guide (CLSG), Conventional Method Guide (CMG), and Pre-service Teachers' Performance Test (PTPT). The experimental procedures for this study were in three stages: the pre-intervention stage, the intervention stage, and the post-intervention stage. The researcher used eight weeks to conduct the whole study. At the pre-intervention stage, permission was obtained from the relevant authorities of each department to conduct this study. After this, research assistants were trained in the contents of the intervention. Those who managed the control group were not given any training. The students in the experimental group were then exposed to the intervention by the Social Studies Education lecturers, who were regarded as research assistants. In the next step, a post-test was administered to students in both the experimental and the control groups immediately after the completion of the intervention. Inferential statistics such as Analysis of Covariance (ANCOVA), Estimated Marginal Means, and Bonferroni post-hoc were used to test the



hypotheses at a 0.05 level of significance. Analysis of Covariance applies to this study because of its ability to reduce the error variance and project the true effect of the independent variable (cooperative learning strategy).

### ***Selection of research location***

The locations for this study were chosen utilizing a multistage inspecting methodology. The principal stage included the utilization of a straightforward irregular examining procedure to select two colleges, one college for each learning methodology, in the district. These were Bamidele Olumilua University of Education, Science, and Technology, Ikere (traditional technique), and Ekiti State University, Ado-Ekiti (cooperative learning strategy). Both are situated in Southwest Nigeria. The selection of these universities was specifically determined by the availability of pre-service teacher disciplines in the selected universities, as not all universities in Nigeria are accredited to train prospective teachers. The ethical clearance number for this study is UFS-HSD2020/1956/21.

## **RESULTS**

**Hypothesis 1:** There will be no significant main effect of cooperative learning strategies (CLS) on the performance of Social Studies pre-service teachers in cybercrime prevention.

The results presented in Table 1 indicate a significant main effect of the intervention on the performance of Social Studies pre-service teachers in cybercrime prevention ( $F_{(2,384)} = 28.537$ ;  $p < 0.05$ , partial  $\eta^2 = 0.134$ ). The effect size is 13%, meaning that 13% of the variance in the dependent variable is attributed to the independent variable. Since the associated probability value of 0.000 is less than 0.05, which was set as the level of significance for testing the hypothesis, the null hypothesis ( $H_01$ ) is rejected. This result indicates a significant difference in the post-test mean scores of Social Studies pre-service teachers who taught cybercrime prevention based on the specific intervention (cooperative and conventional learning strategies). Therefore, Hypothesis 1 was rejected. To determine the magnitude of the significant main effect across the intervention groups, the estimated marginal means of the intervention groups were calculated, and the results are presented in Table 2.

The results in Table 2 reveal that Social Studies pre-service teachers who were taught cybercrime prevention using cooperative learning strategies (CLS) in Group 1, had a higher adjusted post-achievement test mean score ( $\bar{x}=34.69$ ), while the conventional strategy (CS) control group had the least adjusted post-achievement test mean score ( $\bar{x}=21.81$ ). This is represented as  $CLS > CS$ . Furthermore, the source of the significant difference obtained in Table 2 was traced using the Bonferroni post-hoc test.

Table 1. Summary of Analysis of Covariance (ANCOVA) of the post-performance test of Social Studies pre-service teachers by intervention, gender, and computer literacy

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	19204.380 <sup>a</sup>	16	1200.274	32.004	.000	.581
Intercept	17388.424	1	17388.424	463.650	.000	.557
Pretest	176.717	1	176.717	4.712	.031	.013
Group	2140.492	2	1070.246	28.537	.000	.134
Gender	139.211	1	139.211	3.712	.055	.010
Complit	711.470	2	355.735	9.485	.000	.049
Group * Gender	164.174	2	82.087	2.189	.114	.012
Group * Complit	51.610	3	17.203	.459	.711	.004
Gender * Complit	78.254	2	39.127	1.043	.353	.006
Group * Gender * Complit	265.492	3	88.497	2.360	.071	.019
Error	13838.729	369	37.503			
Total	309384.000	386				
Corrected Total	33043.109	385				

a. R Squared = .122 (Adjusted R Squared = .084)

b. Computed using alpha = .05

Table 2. Estimated marginal means of post-performance test by treatment

Group	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Cooperative	34.690 <sup>a</sup>	1.255	32.221	37.158
Conventional	21.806 <sup>a</sup>	.952	19.935	23.677

a. Covariates appearing in the model are evaluated at the following values: PRETEST = 26.45

b. Based on the modified population marginal mean

The results in Table 3 reveal that the post-achievement test scores in cybercrime prevention of the Social Studies pre-service teachers exposed to cooperative learning strategies (CLS) were significantly different from those of their counterparts taught via the conventional strategy (CS). This implies that the use of cooperative learning strategies was the main source of differences in intervention.

Table 3. Bonferroni posthoc analysis of post-achievement test by intervention

(I/J) Group (I/J) Group	Mean	Std. Error	Sig. <sup>d</sup>	95% Confidence Interval	
				Lower Bound	Upper Bound
Cooperative	12.884*				
Conventional		1.706	.000	8.781	16.987
Conventional	-12.884*	1.706	.000	-16.987	-8.781
Cooperative					

Based on estimated marginal means

\* The mean difference is significant at the .05 level.

b. An estimate of the modified population marginal mean (I)

c. An estimate of the modified population marginal mean (J)

d. Adjustment for multiple comparisons: Bonferroni

**Hypothesis 2:** There is no significant main effect of computer literacy on the performance of Social Studies pre-service teachers in cybercrime prevention.

The data for testing hypothesis 2 is presented in Table 1 above. The results in Table 1 indicate a significant effect of computer literacy on the performance of Social Studies pre-service teachers in cybercrime prevention ( $F_{(2,384)} = 9.485$ ;  $p < 0.05$ , partial  $\eta^2 = 0.049$ ). The effect size is 4.9%, suggesting that 4.9% of the variance in the dependent variable is due to the independent variable. With a probability value of 0.00 below the significance level of 0.05, the null hypothesis ( $H_0$ ) is rejected. This implies that computer literacy significantly impacts the mean achievement scores of Social Studies pre-service teachers in cybercrime prevention, regardless of the learning strategy used (cooperative or conventional). To determine the magnitude of this effect, the estimated marginal means of the groups were calculated and are presented in Table 4.

Table 4. Estimated marginal means for computer literacy

Complit	Mean	Std. Error	95% Confidence Interval	
			Lower bound	Upper bound
Low	22.863 <sup>a</sup>	1.200	20.504	25.222
Average	26.675 <sup>a</sup>	.510	25.673	27.677
High	32.260 <sup>a,b</sup>	1.068	30.159	34.360

a. Covariates appearing in the model are evaluated at the following values: PRETEST = 26.45

b. Based on the modified population marginal mean

Table 4 shows that Social Studies pre-service teachers with high computer literacy scores had the highest adjusted achievement mean score (32.26), followed by those with average computer literacy scores (26.68). In contrast, Social Studies pre-service teachers with low computer literacy scores had the lowest adjusted achievement mean score (22.86). This suggests that Social Studies pre-service teachers with high computer literacy scores achieve more than their counterparts.

**Hypothesis 3:** There is no significant effect of cooperative learning strategies and gender on the performance of Social Studies pre-service teachers in cybercrime prevention.

The data for testing hypothesis 3 is presented in Table 1 above. The results presented in Table 1 indicate that there was no significant two-way interaction effect of the intervention and gender on the performance of Social Studies pre-service teachers in cybercrime prevention ( $F_{(2,384)} = 2.189$ ;  $p > 0.05$ , partial  $\eta^2 = 0.012$ ). The effect size is 1.2%, meaning that 1.2% of the variance in the dependent variable is due to the independent variable. Since the probability value associated with 0.114 is greater than 0.05, the null hypothesis (H03) is not rejected. This suggests that the specific intervention (cooperative and conventional learning strategies) does not impact the achievement of male and female Social Studies pre-service teachers differently in cybercrime prevention.

## DISCUSSION

The results of the study indicate a significant difference in the post-test mean scores of Social Studies pre-service teachers who were taught cybercrime prevention, based on the specific intervention (cooperative and conventional learning strategies). This finding aligns with a similar observation made by Umaru (2010). Acquiring the abilities needed to solve learning challenges boosted learners' interest, self-efficacy, and conviction. The benefits of collaborative learning include improved self-efficacy, resilience, decision-making abilities, sympathy, open-mindedness towards differences, and even better school attendance. Teamwork, as noted by Jacobson and Baribor (2012), stimulates students' learning interests, stirs their curiosity, and develops their team spirit and communication skills within a community. Learners who work in groups tend to be more dynamic in their learning process. When students collaborate in groups, they learn how to express themselves and consider the ideas of others. Cooperative learning, according to Şimşek, Yılar & Küçük (2013), is a method that allows people to work together in groups to achieve a certain end product or goal. Similarly, Ruël, Nauta & Bastiaans (2003) viewed cooperative learning as a teaching method that enables students to employ psychological processes to contribute to their knowledge acquisition. Naseem and Bano (2013) found that when learners of different cognitive, academic, and physical levels work together toward completing a specific task, they can interact and collaborate as a group.

There was a significant main effect of computer literacy on the achievement of Social Studies pre-service teachers in cybercrime prevention ( $F_{(2,384)} = 9.485$ ;  $p < 0.05$ , partial  $\eta^2 = 0.049$ ). The effect size was 4.9%, indicating that 4.9% of the variance in the dependent variable could be attributed to the independent variable. Since the associated probability value, 0.00, is smaller than 0.05, which was set as the level of significance for testing this hypothesis, the null hypothesis (H02) was rejected. This suggests that computer literacy has a significant effect on the mean achievement scores of Social Studies pre-service teachers in cybercrime prevention under both cooperative and conventional learning strategies.

According to Merç (2015), pre-service teacher trainees purposefully used technology for their academic goals. The study also discovered the ICT strategies used by these pre-service teacher trainees. Respondents stated that they made good use of ICT in their educational activities, although the lack of infrastructure had a discouraging effect on the use of ICT in the classroom. Additionally, the study found no significant two-way interaction effect between the intervention and gender on the performance of Social Studies pre-service teachers in cybercrime prevention ( $F(2,384) = 2.189$ ;  $p > 0.05$ , partial  $\eta^2 = 0.012$ ). The effect size was 1.2%, indicating that 1.2% of the variance in the dependent variable could be attributed to the independent variable. Since the associated probability value, 0.114, was greater than 0.05, the null hypothesis ( $H_03$ ) was not rejected. This implies that the intervention received (cooperative and conventional learning strategies) does not have a different impact on the achievement of male and female Social Studies pre-service teachers in cybercrime prevention.

## **CONCLUSIONS AND RECOMMENDATIONS**

Based on the findings of this study, it can be concluded that the two groups, one utilizing cooperative learning strategies and one using the conventional method, were similar at the start of the experiment. The implementation of cooperative learning strategies improved the performance of pre-service teachers in cybercrime prevention, with this group outperforming the one using the conventional method. Additionally, computer literacy also enhances the optimal performance of pre-service teachers in cyberspace, potentially positively impacting their results in cybercrime prevention. It was determined that both cooperative learning strategies and the conventional method do not show bias towards a specific gender.

Based on the findings of this study, the following recommendations can be made:

1. The integration of cooperative learning strategies (CLS) into the teaching of cybercrime prevention in tertiary institutions should be encouraged to enhance the academic performance of pre-service teachers.
2. University lecturers should update their knowledge on the utilization of cooperative learning strategies (CLS).
3. Given the steps involved in cooperative learning strategies (CLS), university lecturers should effectively manage their time to incorporate these strategies into the teaching of cybercrime prevention through Social Studies.

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## DECLARATIONS

### ***Conflict of Interest***

The authors declare that there were no conflicts of interest or personal relationships that may have inappropriately influenced the finalization of this article.

### ***Informed Consent***

The pre-service teachers selected for this study gave their consent before the commencement of the experimental and control activities completed in this study. The gatekeepers at the universities selected for this study voluntarily gave their approval for students in the selected Faculties and Departments to participate in the study.

### ***Ethics Approval***

The article followed institutional ethical review formalities and received approval with UFS HSD2020/1956/21.

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