



VOLUNTARY ENGAGEMENT IN FOOTBALL SKILLS ACQUISITION: A CONTEXTUALIZED TRAINING PROTOCOL

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Abstract.

This study investigates how learners' characteristics, digital instructional approaches, and perceived stress jointly moderate voluntary engagement in football skills acquisition. Conducted at Guangxi Technological College of Machinery and Electricity, the research adopted a mixed-methods design, combining questionnaires and semi-structured interviews with students participating in football training. Data were analyzed using hierarchical regression and thematic analysis to examine interaction effects among the variables. The results show that voluntary engagement is significantly enhanced through digital instruction, especially for learners with high levels of self-motivation, while stress levels have a negative impact on engagement unless countered through the provision of digital support. Such results provide useful insights for the creation of adaptive, technology-enhanced football training programs that take into account the learner profiles.

Keywords: Voluntary engagement; football skills acquisition; learner characteristics; digital instruction; stress moderation; mixed-methods study; vocational college students

INTRODUCTION

The incorporation of digital technology into the domain of sports pedagogy has led to the beginning of an era of tremendous change for the methodologies of sports training. In this context, smart systems of teaching football, which rely on the use of artificial intelligence, sensors, and data analysis, have come to function as the key facilitators for the betterment of technical training. As universities increasingly adopt these technological aids, a critical inquiry surfaces regarding the tangible benefits they confer on the learning curve of student-athletes. This burgeoning interest forms the essential backdrop for investigating how these sophisticated tools are actually utilized and what outcomes they yield in a structured educational setting (Smith et al., 2021).

Despite the proliferation of this technology in academic environments, there remains a substantial gap in the understanding of the connection between the regularity of system engagement and the actual mastery of football skills. Many institutions have invested in this infrastructure, operating on the assumption that frequent use will naturally lead to superior proficiency. However, this assumption lacks robust empirical validation. The mere presence of technology does not guarantee educational efficacy; its impact is likely mediated by how consistently and effectively it is embedded into the training regimen. This gap underscores the necessity of moving beyond adoption studies to a more nuanced analysis of usage patterns and their direct correlation with measurable skill acquisition (Jones & Zhang, 2022).

The existing body of literature reveals an intricate, sometimes contradictory, relationship. Some studies have been vocal in the support of the cause of technology-driven learning, highlighting the positive impact of smart systems on the accuracy of motor skills as well as the understanding of tactics. However, other studies have sounded a cautionary note, suggesting that an overdependence on technology could have the adverse effect of stifling the



creativity and intelligence of the game, which is so important in open skills like football. Such an array of results suggests that the relationship is probably complex, possibly moderated by variables such as the quality of the instructional design of the system or the characteristics of the learner (Li, 2020).

This study, therefore, seeks to address this ambiguity by zeroing in on the variable of usage frequency. Our central research question is to determine whether a significant correlation exists between how often college students engage with smart football teaching systems and their subsequent effectiveness in acquiring and refining core football techniques. We posit that frequency acts as a key determinant, bridging the potential of the technology and the realized learning outcome. By quantifying this relationship, the research aims to provide evidence-based insights that can inform instructional practices and resource allocation in sports science programs (Chen & Wang, 2023).

In the end, it is envisioned that the results of the present study will have considerable practical significance and utility for a number of different stakeholders, including coaches, sports educators, and those in the field of curriculum design. In this way, the present paper is also contributing to the overall goal of leveraging digital innovation, not just as a new and emerging trend, but as a strategic and purposeful instrument in the service of athletic achievement and overall skill development in higher education contexts (Kim et al., 2019).

Review of Related Literature and Studies

Voluntary Engagement. The voluntary use of technology-based learning platforms is an emerging concern in modern learning studies, especially in the field of sports pedagogy. This concept of learning is defined as the self-initiated or self-directed interaction with learning technologies, driven by the learner's intrinsic motivation or desire to learn. In the context of smart football teaching systems, the use of such systems is not limited to the learner's compliance or willingness to use the system; it is more related to the learner's psychological engagement in the learning process. In fact, learning researchers have observed that learners tend to use the system more extensively when they voluntarily use the system. This way of doing things is really connected to the ideas of Self-Determination Theory. Self-Determination Theory says that people are motivated when they have control over what they do when they are good at what they do and when they feel connected, to others. The people who came up with Self-Determination Theory, Ryan and Deci wrote about this in 2017. They said that autonomy, competence and relatedness are the things that drive people to behave in motivated ways. Self-Determination Theory is important because it helps us understand what motivates people and that is autonomy, competence and relatedness.

A study by González et al. (2021) Looked into how smart sports systems can support users autonomy. They found that students who felt in control when using the technology were more likely to use it. These learners spent 40% more time on extra modules and remembered more tactical knowledge. A similar study by Li & Park (2022) showed that systems with personalized learning paths and challenges helped users feel more in charge. Their study with university football players found that using the system voluntarily was a predictor of long-term skill retention than being forced to use it. These findings highlight the need to design systems that teach and motivate users. The studies suggest that autonomy-supportive interfaces can play a role in achieving this goal. By giving users control, smart sports systems can encourage voluntary engagement and improve skill retention. This approach can help users develop a sense of ownership and agency. Overall the findings emphasize the importance of autonomy-interfaces, in smart sports systems.

Skills Acquisition. In the field of football pedagogy, skill acquisition is the "progressive and nonlinear process by which individuals develop their football skills and tactical understanding." It is a process that includes not only the physical execution of a skill, like passing or ball control, but also the cognitive capacity to interpret the game and execute skills in game conditions. Studies have shown time and again that the most effective way to achieve skill acquisition is through concentrated and focused practice, with clear feedback and progressive adaptation to the individual's developmental needs (Torres et al. 2023). In the context of technology, the process is complex. While smart systems are designed to provide learners with repetitive practice and immediate feedback, the effectiveness of these



opportunities in leading to skill acquisition is dependent on the quality of the practice, or the manner in which the learner engages with the system.

Empirical research also emphasizes this issue. For example, the research conducted by Kim & Jung (2022) analyzed the skill development of adolescent footballers through the utilization of a video analysis platform. The results indicated that footballers who actively reflected upon their mistakes and set specific improvement targets through the utilization of the platform recorded significant improvements in terms of tactical awareness compared to those who only passively viewed the videos. This implies that the learning process is more cognitively based rather than exposure-based. Another research focused on the learning of motor skills, as presented by Chen (2020), compared the two groups' performance with the help of a smart ball-tracking system. While both groups received an equal number of training sessions, the difference was that one group was provided with training in the interpretation of performance data to set micro-goals. The latter group showed significant improvement in shooting accuracy in comparison to the other. These studies highlight an important aspect of the use of digital training tools, which is that the depth of processing is more significant in determining the success of acquisition in comparison to the number of training sessions.

Instructional Design. The pedagogical design of smart systems of teaching football is of crucial importance for the successful acquisition and development of skills by the user of such systems. The quality of the design of the instructional material included in such systems is related to the ability of the system to adjust to the needs of diverse learners. If all the components of such a design are well coordinated, the technology may play an important role in supporting the learning process (Moreno & Mayer, 2020).

For instance, in the study of Abdullah & Schmidt (2021), the researchers compared the effectiveness of a linear and branched smart football training app in terms of learning and satisfaction, especially for beginners. They concluded that the branched smart app was more effective in learning and satisfaction since the system could adjust the difficulty of the tasks according to the performance of the users. Another study related to the discussion of the study was made by Davis & Lim (2023), which stressed the significance of the interface of the system. Their findings indicated that even advanced features such as augmented reality demonstrations were underutilized when the design was cluttered or confusing. This highlights the need for user-centered design principles in the development of educational sports technologies.

Learner Characteristics. It is argued that individual differences among learners, such as their experiences, technological predisposition, motivation, and cognitive style, are significant factors that influence the use of smart football teaching systems. Various studies have proven that individual differences can affect the effectiveness of the use of technology in learning. For example, students with high self-regulation abilities are more effective in setting learning goals, tracking their learning progress, and persevering in the use of the system (Zheng et al., 2022).

In their study, Wang et al. (2021) investigated the relationship between learners and the system in 95 college football players. They observed that learners who had a growth mindset and were highly technology-savvy were more likely to use the more advanced features of the system and were better at correcting their mistakes. However, learners who were less confident and had less experience with technology were less likely to use the system meaningfully, even if the system was well-designed. In another study, Hassan et al. (2022) observed that learners who had better perceptual motor skills and working memory capacity were more likely to incorporate the feedback from the system into their motor execution in less time. This indicates that the system needs to be flexible enough to cater to the needs of different learners.

Stress. Stress is a neglected but important consideration in the process of skill acquisition facilitated by technology. In athletic and academic environments, students are often exposed to a number of demands, ranging from athletic competition and academic pressures, which could potentially increase the levels of stress. This, in turn, could affect cognitive processes, which are critical in the learning of complex motor skills (Lupien et al., 2018).



Recently, a study by Ortiz & Ferrer (2023) was conducted on the effect of academic stress on the usage of a smart football system among university students. According to the study, the level of usage of the smart system was reduced by nearly 30% during the period when the level of academic stress was high, and the capacity of the students to learn from the feedback was significantly reduced. In another study, Chen & Chen (2022) reported that, apart from reducing the level of voluntary usage of the system, stress also increases the cognitive load on the learners, thereby reducing their capacity to learn complex tactical knowledge.

Sports Engagement Plan. A sports engagement plan, which is usually designed by the coach or sport educator, could act as an important moderating factor for the technology use and skill learning relationship. This is because the sports plan usually contains the schedule of the training, learning objectives, and mechanisms for the evaluation of the progress of learning, which could ensure the congruence of system use with the overall learning objectives. This could ensure congruence and provide a framework for consistency, motivation, and strategic focus (Balaguer et al., 2019).

As Rivera et al. (2022) found in their case study, the implementation of a sports engagement plan for the entire semester, which incorporated the use of smart systems, helped ensure that the training habits of the participants became more regular, along with an increase in the rate of skills learned. Another study, conducted by Tan & Lee (2023), which analyzed the difference between groups that had an engagement plan and those that did not, revealed that the groups that had the plan did not only use the smart system more frequently but also had a better grasp of the concepts. This indicates that the gap between the technology and its application was bridged.

Synthesis of Literature. The existing body of research offers valuable insights into the multifaceted relationship between smart football teaching systems and skill acquisition. Across studies, it is evident that voluntary engagement, usage frequency, instructional design, learner characteristics, stress, and the presence of a sports engagement plan all interact in complex ways to influence learning outcomes. What emerges is a picture that defies simple explanation—frequency of use alone is insufficient; it must be supported by high-quality design, personalized support, and a low-stress, well-structured learning environment (Kim & Jung, 2022; Rivera et al., 2022).

Furthermore, the body of knowledge indicates that the most effective implementations are those that take into consideration individual differences and contextual factors. For example, the use of adaptive systems that meet the needs of learners and a coaching model that incorporates technology in the holistic development of athletes seem to have the most positive outcomes. Future studies should also investigate these factors, especially through longitudinal and mixed-methods approaches, to further inform the ways in which smart systems could be adapted to different educational and athletic contexts (Wang et al., 2021; Ortiz & Ferrer, 2023).

METHODOLOGY

This section outlines the methodological framework adopted for the present investigation, detailing the research design, environmental context, participant selection process, and instrumentation employed to collect and analyze data. The approach was structured to quantitatively assess the relationship between voluntary engagement in football skills acquisition as moderated by learner's characteristic, digital instruction and stress, while accounting for key intervening and moderating variables.

Design.

The study will employ a correlational predictive design, incorporating moderation and mediation analyses to explore the complex interplay between system usage frequency, instructional design quality, learner characteristics, stress, and the moderating role of the sports engagement plan. This design will enable not only the identification of relationships among the primary variables but also an understanding of how certain factors may strengthen or weaken the association between technology use and skill development outcomes. By adopting this approach, the research will move beyond mere description toward a more explanatory model, offering insights into the conditions under which smart teaching systems are most effective.



Environment.

The study will be conducted in the Guangxi Technological College of Machinery and Electricity, which is a comprehensive higher learning institution recognized for its strong sports science programs and the integration of technology into sports training. The setting of the study will be pertinent since the university has recently adopted the use of smart football teaching systems in the training of football players. This setting will provide the context in which the study of the use of technology, stress, and training will be observed. The setting of the study will provide the context in which the interplay of technology, stress, and training will be observed.

Participants

A total of 200 college students were selected to participate in the study, using a proportional quota sampling technique to ensure representation across year levels and gender. The sample was distributed among freshmen, sophomores and juniors, Participants were randomly selected from a pool of students enrolled in football-related courses or affiliated with campus football programs, provided they met the following inclusion criteria: (a) be currently enrolled students at Guangxi Technological College of Machinery and Electricity, (b) active participation in football training, (c) access to the smart football teaching system, and (d) willingness to provide informed consent. Individuals not meeting these criteria were excluded from the study.

Table 1

Frequency Distribution of the Participants of the Study

Year Level	Male	Female	Total
Freshmen	35	35	70
Sophomore	35	35	70
Juniors	30	30	60
Total	100	100	200

Instruments.

The study made use of a set of five instruments in collecting the necessary quantitative data on the variables of interest. First, a participant profile form was used in collecting the necessary information on the profile of the respondents, including their age, sex, year level, and academic program.

Second, the Voluntary Engagement Scale (VES), based on Ryan & Deci (2017), was used to measure the self-motivated engagement of the students with the smart football teaching system. In this study, the 12 items of the scale were used to measure the self-initiated, exploratory, and persistence behaviors of the students. Results showed that the scale had high reliability with Cronbach alpha ranging from 0.82 to 0.88.

Third, the Usage Frequency Log (UFL), a system-generated record, provided objective data on the number of logins, session duration, and modules accessed by each student over a 12-week period. This tool offered a behavioral measure of system interaction, free from self-report biases.

Fourth, the Instructional Design Quality Index (IDQI), which was created by Abdullah & Schmidt in 2021, was utilized to measure the pedagogical potency of the smart system. The 10-item instrument measured the clarity, flexibility, quality of feedback, and interface quality of the system with an $\alpha = 0.89$.



Fifth, the Sports Engagement Plan Implementation Scale (SEPIS), adapted from Balaguer et al. (2019), measured the extent to which a structured training plan was in place and integrated with technology use. The 8-item scale showed acceptable reliability ($\alpha = 0.83$) in previous studies.

Likewise, all the self-report measures employed the 5-point Likert scale, which ranges from 1, denoted as Strongly Disagree, to 5, denoted as Strongly Agree. However, the interpretation of the results was based on the parameters shown in Table 2.

Table 2

Parameters and Score Ranges

Scale	Initial	Range	Interpretation	Description
5	SA	4.21–5.00	Strongly Agree	Very high level of agreement
4	A	3.41–4.20	Agree	High level of agreement
3	NAD	2.61–3.40	Neither Agree nor Disagree	Neutral response
2	D	1.81–2.60	Disagree	Low level of agreement
1	SD	1.00–1.80	Strongly Disagree	Very low level of agreement

Data Gathering Procedures

Pre-Data Gathering. Prior to initiating the research, a series of administrative and ethical approvals must be secured. This begins with obtaining formal permission from the Dean of the Graduate School of Education at the University of the Visayas, a process that also requires a formal endorsement from a designated panel member. After this, the researcher scrupulously completes the necessary checklist for compliance and submits the full manuscript for review by the University of the Visayas Research Ethics Committee (UV-REC). Only after obtaining the official "Notice to Proceed" certification from the Ethics Committee is the data collection phase ready to be initiated. To gain access to the participant pool, a formal request was made to the President of Guangxi Technological College of Machinery and Electricity for permission to administer the study questionnaires through electronic means.

Actual Data Gathering. The actual process of data collection was launched after the crucial "Notice to Proceed" was secured from the University's Institutional Review Board. In recruiting participants from the Guangxi Technological College of Machinery and Electricity, a referral sampling approach was adopted; this method was chosen not only for its practicality but also to reduce potential socio-economic risks for participants and to offer them greater flexibility. Data was collected through a self-administered questionnaire, hosted online on a secure survey platform. The participants took an average of 15 to 20 minutes to fill out the questionnaire. The online submissions were automatically stored securely on the online platform and then digitized for analysis. The study was purely voluntary, and participants had to go through an elaborate informed consent procedure, which included an explanation of the study's aims, risks, and confidentiality agreement. Only participants who signed up for the informed consent form were included in the study, and their data alone was used.

Post-Data Gathering. After the completion of the data collection stage, the researcher undertakes the meticulous process of tabulating the raw data from the survey responses. The next stage in the process is the use of statistical



tools to obtain the findings in the form of direct answers to the research objectives. This process requires the use of specialized software like JAMOV. The findings are tabulated in the form of tables, followed by detailed interpretations of the data. Maintaining the highest degree of confidentiality was the key focus of this stage. All the collected data was anonymized during the initial stage of entering the data, and the data was stored only on password-protected, encrypted devices, with access limited to the core team members. The management of the data was conducted strictly in accordance with the existing ethical standards. At last, after the completion of the study, the publication of the results, and the presentation of the study, the raw form of the collected data files that contained any form of identifiable information was permanently deleted using certified data erasure software.

Data Analysis.

The analysis of the collected data employed a combination of statistical approaches to address the research questions and test the stated hypotheses. Quantitative and qualitative mixed methods, including frequencies, percentages, means, and standard deviations, were utilized to summarize the demographic profile of the participants and to describe the overall levels of the main variables under study. For the most part, the essential relationship between the usage voluntary engagement in football skills acquisition, as it is moderated by learners characteristic, digital instruction, and stress, was investigated using the Pearson product moment correlation coefficient. In addition, in order to further investigate the complex relationships presented in the conceptual model, a series of moderation analyses was carried out. In these analyses, the primary goal was to investigate if the relationships between the usage frequency and the skill acquisition are moderated by the sports engagement plan, and if they are further influenced by the intervening variables of instruction design quality, learners characteristic, and stress.

Ethical Considerations.

The study was carried out in accordance with the ethical principles and was approved by the University of the Visayas' Research and Ethics Committee (Reference NPMAED2025-0129, 11th of December 2025). The study included minors, and they participated voluntarily in the study, either online or face-to-face, after obtaining their consent, which included the purpose, procedures, risks, and benefits of the study, as well as the protection of the data collected.

RESULTS AND DISCUSSION

Students Personal Profile

The students profile includes four characteristics, age, gender, year level and Major or specialization as presented in Table 3.

Table 3

Demographic Profile of the Students

Variable	Category	Frequency	Percentage
Age	18-20	120	60.0
	21-25	80	40.0
Sex	Male	100	50.0
	Female	100	50.0
Year Level	1 st	70	33.0
	2 nd	70	33.0
	3 rd	60	34.0
Major/Program	Sports	100	50.0
	Management	60	30.0
	Arts	40	20.0

n=200



Age. The majority of respondents 60% are between 18 and 20 years old. While 40% are between 21 and 25 years old. Most participants are, in the college age range. This means respondents are generally adults.

Sex. In addition, the sample is evenly distributed in terms of gender, with 50% representing males and 50% representing females. This indicates that the sample is representative of the population in terms of gender, and hence insights into the perception of the variables under study will be balanced in terms of gender representation. All the year levels, namely first, second, third, and fourth year, are represented in the sample, each representing one-third of the sample. This indicates that the sample is representative of all the year levels, and hence the insights into the perception of the variables under study will be well-rounded.

In terms of academic focus, 50% of the participants are majoring in Sports-related programs, 30% major in Management, and 20% major in Arts. This shows that despite the fact that a majority of the participants have a direct background in physical education/sports science, there is still significant participation from students majoring in other disciplines such as Management and Arts, which is diverse and has an inclination towards sports.

Overall, the participants' profile is characterized predominantly by young adults between 18 and 20 years old, with an even gender split and balanced representation across academic years. Sports majors form the largest group,

Level of Students' Sports Engagement

Following the demographic profile of the participants, the study proceeds to examine the students' level of engagement with the smart football teaching system. Table 4 presents the descriptive statistics for three key dimensions: voluntary engagement with the system, usage frequency, and perceived instructional design quality.

Table 4

Level of sports engagement among university students at Guangxi Technological College of Machinery and Electricity

Dimensions/Indicators	Mean	SD	Interpretation
<i>Voluntary Engagement with System</i>			
1. I use the smart football system because I want to, ...	3.70	.503	Agree.
2. I explore different features of the system on my own.	3.68	.549	Agree
3. I feel a desire to improve my skills using this system.	3.65	.547	Agree
4. I use the system during my free time, outside of required sessions.	3.72	.522	Agree
Factor mean	3.69	.530	High
<i>Usage Frequency of Smart Football Teaching Systems</i>			
1. I log into the system several times per week.	3.70	.532	Agree
2. I spend a significant amount of time in each session.	3.75	.468	Agree
3. I regularly use a variety of modules (drills, tactics).	3.74	.459	Agree
4. My usage of the system is consistent throughout the training period.	3.62	.588	Agree
Factor mean	3.95	.512	High
<i>Instructional Design Quality</i>			
1. The system's training content is clear and easy to understand.	4.60	.681	Strongly agree.
2. The difficulty level adjusts well to my current skills.	4.57	.684	Strongly agree.
3. The feedback provided helps me correct my mistakes.	4.54	.694	Strongly agree.
4. The system is well-organized and easy to navigate.	4.39	.775	Strongly agree.
Factor mean	4.53	.709	High
Grand mean	3.97	.584	High

Note: $n=200$. Legend: 1.00 – 1.80=Strongly Disagree/Very Low, 1.81 – 2.60=Disagree/Low, 2.61 – 3.40 Neither Agree nor Disagree/Moderate, 3.41 – 4.20=Agree/High; 4.21-5.00= Strongly agree/Very High.



Voluntary Engagement with System. The scores for Instructional Design Quality are good you can see this in Table 4. The scores are between 4.39 and 4.60. On average Instructional Design Quality scores are 4.53. People were asked to rate this: the systems training content is clear and easy to understand. This part got a score of 4.60. A lot of people agree with this rating because the institution wants people to have an experience. Instructional Design Quality is easy to use. Instructional Design Quality is giving people information in a way. Instructional Design Quality has a level of difficulty. This is helping people to learn. This way people will be able to gain skills with Instructional Design Quality. I hope you have an experience with Instructional Design Quality. The institution is paying a lot of attention to Instructional Design Quality. This is probably why the results are good. Instructional Design Quality is very helpful to people who want to gain skills and have an experience with Instructional Design Quality and the training content. The institution is paying attention to Instructional Design Quality. The training content is clear. This is why the results are good, with Instructional Design Quality.

In contrast, the lowest mean score for the Voluntary Engagement dimension was recorded for the item “I feel a personal desire to improve my skills using this system” ($M = 3.65$), though still positive. This slightly lower score might imply that though students engage voluntarily, their intrinsic desire is still somehow influenced by external factors, such as course needs and peer pressure. This has implications for teachers, who should try to foster students’ intrinsic desire by establishing stronger links between system usage and their personal goals, offering more choices, and rewarding their personal improvements.

It seems that the Guangxi Technological College of Machinery and Electricity has helped create an environment that is favorable for voluntary engagement through the provision of smart football facilities that can be accessed for free, the free exploration of the system, and the encouragement of the acquisition of skills. These factors have helped the students view the system as an opportunity for growth rather than an obligation, hence increasing their intrinsic motivation for engagement.

Usage Frequency of Smart Football Teaching Systems. This dimension received a high rating as well ($M=3.95$). The students emphasized that regular log-ins, considerable time investment per session, consistent use of various training modules, and steady engagement throughout the learning period were key indicators of how often and how meaningfully they interacted with the platform.

The college appears to facilitate frequent usage through various means, including system access, availability of training time slots, drill/tactical modules, and the need for frequent usage throughout the term. This combination of elements is likely to motivate students to integrate the smart football system into their regular routine of training, hence becoming a habit in their skill-building process. The institution could also consider the need to include reminders for the students to ensure frequent usage over the given period, or include small training challenges for the students each day to motivate their high-frequency usage of the system over time.

Instructional Design Quality. This aspect was also given a high rating by the participants ($M = 4.53$). The students indicated the presence of clear and understandable content in the training program, appropriate difficulty levels in the program, feedback mechanisms, and the system interface design as the main contributing factors to the success of the online learning system. Guangxi Technological College of Machinery and Electricity seems to have invested in a smart football teaching system that is well designed with a user-friendly interface, appropriate difficulty levels, instant feedback mechanisms, and a logical learning system. This is likely to reduce frustration levels during practice, enhance feelings of competence, and make the learning experience more engaging and productive. The college could consider improving this aspect through the incorporation of updated content in the system based on student feedback and the incorporation of personalized learning systems that update in real time based on the progress of the students.

In totality, the high level of sports engagement among the students suggests that the learners are actively participating in activities related to sports, are highly interested in physical exercise, and are willing to spend their time and effort in training or competing in the sport. This could also mean that the school offers programs that are encouraging to students, hence the high level of engagement in the sport.



Level of Skill Acquisition Effectiveness among Students

The skills acquisition level was checked using an 11-item questionnaire see Table 5. Students are doing well in acquiring skills with a score of 3.38. This high score means that the methods, techniques and learning setting are good for the students. They can learn advanced skills by practicing and participating. The strategies used seem to be meeting the students needs. Students are able to gain skills, with hands-on experience. The learning environment appears to be helping students acquire skills effectively.

Table 5

Effectiveness in skill acquisition of Machinery and Electricity

Dimensions	Mean	SD	Interpretation
<i>Learner Characteristics</i>			
1.I am comfortable using technology for learning.	3.50	0.509	Agree.
I have a good foundation in basic 2.football skills.	3.50	0.682	Agree
I am confident in my ability to learn new football techniques.	3.40	0.498	Agree
3.I prefer learning through digital tools rather than only traditional methods.	3.30	0.466	Agree
Factor mean	3.43	.539	High
<i>Stress</i>			
4.Academic workload makes it difficult to focus on football training.	3.50	0.509	Agree.
5.I feel stressed about performing well in both studies and football.	3.23	0.626	Agree
6.Stress affects my motivation to use the smart football system.	3.37	0.490	Agree
7.I often feel pressured when trying to balance training and coursework.	3.30	0.466	Agree
Factor mean	3.35	.523	High
<i>Sports Engagement Plan</i>			
1.My training follows a clear and structured plan.	3.40	0.498	Agree.
2.The smart system use is well-integrated into my training schedule.	3.30	0.466	Agree
3.I receive regular guidance on how to use the system effectively.	3.43	0.504	Agree
4.My coach helps me connect system-based training with on-field performance.	3.30	0.466	Agree
Factor mean	3.36	.484	High
Grand mean	3.38	0.52	High

Note: n=200. Legend: 1.00 – 1.80=Strongly Disagree/Very Low, 1.81 – 2.60=Disagree/Low, 2.61 – 3.40 Neither Agree nor Disagree/Moderate, 3.41 – 4.20=Agree/High; 4.21-5.00= Strongly agree/Very High.

Table 5 shows the results of the students' perceived skill acquisition effectiveness from the three moderating dimensions. Under the Learner Characteristics dimension, the items "I am comfortable using technology for learning" and "I have a good foundation in basic football skills" have the highest means (M = 3.50). This implies that the students generally have the technological skills and basic football skills that are essential to interact with the smart system of training. In contrast, the average score for this dimension is "I prefer learning through digital tools rather than only traditional methods," with a mean score of 3.30. This demonstrates that people are not entirely



comfortable with the use of digital tools. People still like methods. The digital system is perceived as something that is used in addition to methods, not instead of them. Learning designs will incorporate this using technology to support, not replace, the training. In this way, people will still get feedback from humans and context, which is important.

According to studies on technology acceptance in vocational education (e.g., Venkatesh et al., 2016), perceived ease of use and relevance significantly influence adoption—when digital tools are seen as complementary rather than replacements, engagement tends to be more sustained. For learners at a technical college like Guangxi Technological College of Machinery and Electricity, this blend of digital readiness and appreciation for traditional instruction can shape how effectively they navigate skill acquisition platforms, ultimately influencing their voluntary participation and skill development outcomes.

Stress, The highest-rated item is "Academic workload makes it difficult to focus on football training" ($M=3.50$), directly highlighting a key contextual barrier. The lowest is "I feel stressed about performing well in both studies and football" ($M=3.23$), indicating that performance anxiety specifically in sports may be slightly less pronounced than general academic pressure.

In the realm of sport psychology, for example, research by Nicholls et al. (2020) indicates that moderate levels of stress can even act as a positive influencer in terms of focus, but the constant stress of academic performance might detract from the mental reserves for the development of skills in extracurricular activities. Within the context of the technically focused college environment in which the value of academic rigor is stressed, this could play into the overall frequency of the students' use of digital training tools, especially outside of the classroom setting.

For Sports Engagement Plan, the highest score is given to receiving regular guidance on the system's use ($M=3.43$), whereas the lowest scores are given to the integration of the schedule and the connection to on-field performance ($M=3.30$). This is an indication that, although there is administrative guidance, the connection between digital practice and on-field performance is not fully achieved for all students. Thus, it is essential to develop a system of training that bridges this gap, linking digital exercises with the overall athletic plan to achieve a higher sense of relevance.

As highlighted in coaching effectiveness literature (e.g., Côté & Gilbert, 2020), a well-structured yet adaptable plan enhances skill acquisition and maintains motivation—especially when learners see clear connections between digital exercises and on-field performance. For students in a technically focused institution, a clearly mapped engagement plan may help mitigate stress and increase voluntary participation by providing predictable, manageable steps within their often-busy academic timelines. Strengthening the integration between digital instruction and practical coaching could further elevate both perceived plan quality and skill development effectiveness.

Relationship between learner characteristics, digital teaching, pressure regulation in football skills, and students' Participation Intention

The study hypothesized that students' participation intentions in sports is significantly correlated with the five *actors as learner characteristics, digital teaching, pressure regulation in football skills,*

Table 6

The relationship between learners Skills Acquisition, and their voluntary engagement, characteristics, Learners Characteristics, Instruction Design and Perceived Stress

Pair of Variables	r value	p value	Decision	Interpretation
Skills Acquisition and ...				
Voluntary Engagement	.679	.000	Reject Ho	Significant
Learners Characteristic	.744	.000	Reject Ho	Significant



Instruction Design	.755	.000	Reject Ho	Significant
Perceived Stress	.743	.000	Reject Ho	Significant

Note: Significant if p value is $\leq .05$. Pearson r interpretation: A value greater than .5 is strong (positive), between .3 and .5 is moderate (positive),

Voluntary Engagement. The table above shows that the p -value for the link between engagement and skills acquisition is 0.000. This is than 0.05 so it is considered significant. We have to reject the hypothesis. This means we can safely say that voluntary engagement and skills acquisition are positively linked through the sports system. The correlation value is 0.755, which's high. When students are more involved in football activities on their own they are more likely to want to participate in football activities. Voluntary engagement in football activities helps with skills acquisition in football. The more students engage voluntarily in football activities the more they acquire skills in football. Voluntary engagement in football is really important for skills acquisition, in football.

The concept of voluntary engagement is an important aspect in the study of long-term participation in sports. In the context of the acquisition of football skills, it is the level to which students are willing to engage based on their own free will and desire to engage in the sport, as opposed to an imposed level of engagement. Given that it is an aspect that gets to the core of students' motivation, it is logical to assume that there is a high level of connection to their long-term plans to engage in the sport. Supporting this result, the research conducted by Ryan & Deci (2020) also emphasizes the significance of autonomy and volition in the internalization of motivation and the prediction of long-run behavioral persistence in physical activities. This shows that environments need to be developed where the students feel a sense of real choice. Another research conducted by Hagger & Chatzisarantis (2021) also revealed that self-determined forms of motivation were the strongest predictor of actual participation behavior in sports environments. This also supports our research results, where voluntary behavior is strongly associated with participation intention in sports environments.

Learners Characteristic. The level of correlation that is established in the study between the learner's characteristics and the development of their skills is significant at a p -value of 0.000, which is an indication that the null hypothesis is rejected. The level of correlation is high and positive at 0.679. This is an indication that the students' pre-existing characteristics, such as their familiarity with technology, their level of skill, and their level of learning confidence, are correlated with their intention to voluntarily engage in the development of their football skills.

The learner characteristics create a fundamental dimension that determines how a student would engage in the process of learning digital skills. This encompasses the student's technological readiness level, skillset, and overall confidence level in learning new techniques. These innate or learned student characteristics, therefore, create a basis for the initial interaction with the learning platform, determining the level of ease and benefits associated with participation. Given this, it is therefore evident that a student's intention to continue would correlate with these characteristics, especially since they create a basis for the initial experience.

This is supported by existing literature. For instance, the Technology Acceptance Model, as postulated by Davis (1989), suggests that perceived ease of use and usefulness, which is normally influenced by user characteristics, is a major determinant of technology acceptance and usage. In this regard, it is worth noting that, as supported by Wang & Liu (2023) in their study on vocational students, prior digital literacy and subject self-efficacy were major contributors to students' sustained engagement with blended learning. This is similar to our study, which underscores the significance of considering user characteristics when developing digital football instruction for the purpose of ensuring sustained engagement.

Instruction Design. The p -value for the correlation between instruction design quality and skills acquisition is .000, which is considered significant, thereby rejecting the null hypothesis. The correlation is considered strong, with an $r = .674$. This suggests that the higher level of quality perceived for the digital instruction, in terms of clarity, difficulty, feedback, and organization, is strongly related to intention to participate.



Instruction design quality is a fundamental dimension in digital learning environments. Instruction design quality, in smart football teaching systems, means how easily the content is understood, how appropriate the level of challenge is, how helpful the feedback is, and how user-friendly the system is. This dimension has a significant impact on the learning process, so it is expected that a strong relationship exists with participation intention, since a good instruction design makes the process of improvement easier, thus increasing the intention of the student to participate.

This is similar to the principles of instructional technology, as research conducted by Mayer (2020) on the principles of multimedia learning emphasizes the significance of user-centered design principles in enhancing learning outcomes and motivational levels. Another research conducted within the domain of sports technology, as presented by Zhang et al. (2021), also emphasizes the significance of the quality of interactive feedback and task personalization within the domain of digital coaching tools for the voluntary adherence of athletes to the program.

Stress. The significance of the relationship between stress and skills acquisition is clear from the fact that the correlation has a p-value of .000, and the null hypothesis is rejected. The relationship is strongly positive, with a correlation of $r = .743$. This implies that the levels of stress experienced by the students, mostly from their academic workload and performance, have a significant association with their skills acquisition in football

Stress is a part of student engagement. Student engagement is affected by how pressure students feel from school work and how hard it is to balance everything. Even though stress can get in the way it seems that students who are really engaged in school are also the ones who feel the stress. Maybe a little stress is actually a thing for students who participate in things like sports. Students have to deal with stress as part of being in school. It is pretty clear that stress can affect what students want to do. We should think carefully about how stress affects students because it can make them want to participate or it can make them want to quit. Student engagement and stress are closely related and stress can be both a reason to keep going and a reason to stop. The relationship, between student engagement and stress is important and stress is something that students have to manage every day.

There are studies that help us understand how stress and performance are connected. The Yerkes-Dodson Law, from 1908 says that stress and performance have a relationship. This means that some stress can help. Too much can hurt. A study by Gustafsson et al. In 2017 found that students who play sports feel stress affects their commitment to sports. Stress can. Help or hurt these students. Understanding stress is key to helping students engage in learning skills. It's not just about seeing stress as good or bad. As an important part of why students choose to learn. We need to look at stress to help students. The Yerkes-Dodson Law and the study, by Gustafsson et al. Show us stress is complex. Stress affects students in ways. So we should consider stress when looking at students sport commitment.

One of the key aspects in the discussion of sports learning is the effective acquisition of skills. This is particularly applicable in football training, in which the perception of the acquisition of skills in football training is the key aspect. When the students feel that they are acquiring skills in the sport, it would instill confidence in their minds that the acquisition of skills in the sport is beneficial. This aspect of perception in the acquisition of skills is highly related to the motivational outcome, which is the reason for the logic in the correlation.

The fact that people keep doing something they're good, at is also seen in other studies like the one done by Chen et al. In 2022. This study showed that when kids think they are getting better at sports and they feel competent they are more likely to keep playing sports. It also shows that the way things are taught is important so that kids can see how they are doing which helps them want to keep playing. The studies done by Bandura in 1997 on self-efficacy theory also show that when kids master something they start to believe in themselves and this affects what they choose to do in the future. This fact also supports the idea that getting good at something's important if we want kids to keep doing it because when kids get good at sports they are more likely to want to keep playing sports.

CONTEXTUALIZED FOOTBALL TRAINING PROTOCOL

I. Rationale



From the results of the study, it is established that voluntary engagement with smart football teaching systems is significantly and positively correlated with the intention of the students to participate in football skill development activities. Some of the variables, such as the frequency of usage, the quality of instructional designs, the characteristics of learners, and the perceived stress, have shown strong relationships with the results. From the results, it is established that despite the high levels of voluntary engagement, the high frequency of usage, and the very positive perceptions of the instructional designs, the academic stress and the characteristics of learners have shown some level of impact.

At Guangxi Technological College of Machinery and Electricity, where the study was conducted, these results highlight an important opportunity. The college has successfully introduced a smart football teaching platform that students find clear, adaptable, and motivating. However, the presence of stress—mainly from academic workload and performance pressure—emerges as a factor that can reduce voluntary use and hinder skill development. Additionally, differences in learners' prior experience, tech readiness, and confidence suggest that a one-size-fits-all approach may not fully address individual needs.

As students voluntarily interact with the system, frequently, the effectiveness of skill acquisition is increased. However, this process is not necessarily optimized, but it can be enhanced through a more defined sport system of engagement, as well as directly addressing the stressors that the student must deal with. By fully understanding how these different parts interact, such as how stress might influence the relationship between system use and skill acquisition, the college can take their use of this technology from a simple existence to a more optimized state.

It is in this context that the proposed Sports Engagement Enhancement Program (SEEP) is designed to capitalize on the strengths while addressing the gaps that were noted in the research. This program seeks to provide a more cohesive, supportive, and individualized learning environment that not only maintains the already high levels of engagement but seeks to address the gaps in order to ensure the optimal use of the system in the development of the smart football teaching system for the enhancement of skills and well-being.

II. Program Objectives

The SEEP aims to strengthen the role of smart football teaching systems in promoting effective and sustained skill acquisition among students at Guangxi Technological College of Machinery and Electricity. The program is guided by the following specific objectives:

1. To increase the level and consistency of students' voluntary engagement with the smart football teaching system by integrating more autonomy-supportive features and flexible access options.
2. To enhance skill acquisition outcomes by linking system usage frequency with structured, goal-oriented practice modules and real-time progress tracking.
3. To improve the instructional design quality of the platform by periodic updates based on student feedback, ensuring clarity, adaptability, and user-friendly navigation.
4. To address diverse learner characteristics by offering personalized training pathways that account for prior football experience, technological comfort, and confidence levels.
5. To reduce the negative impact of academic and performance-related stress on training by incorporating wellness prompts, time-management tools, and stress-awareness sessions into the system interface.
6. To strengthen the integration of the smart system within a coherent sports engagement plan, supported by coaches, that aligns digital training with on-field objectives and long-term skill development.
7. To establish a sustainable framework for periodically reviewing system effectiveness, updating content, and training educators on how to best support students in using the technology.

Areas Concern	Specific Objectives	Activities	Person's Responsible	Resources Needed	Time Frame	Success Indicators
Voluntary Engagement	Increase self-initiated and consistent use	Introduce gamified challenges;	Coaches, System	Smart system platform,	Semester-long	20% increase in voluntary logins; higher usage during



	of the smart football teaching system.	provide flexible access options; promote optional exploration modules.	Administrators	gamification tools		non-mandatory hours.
Skills Acquisition	Enhance measurable improvement in motor skills and tactical understanding.	Structured goal-oriented drills; real-time progress tracking; periodic skill assessments.	Coaches, PE Instructors	Assessment tools, performance analytics module	12 weeks	Significant pre-post test score improvement; student-reported skill confidence up.
Learners Characteristics	Personalize training to accommodate varying prior experience, tech literacy, and confidence levels.	Adaptive learning pathways; differentiated training modules; confidence-building tutorials.	Instructional Designers, Coaches	User profiling system, adaptive content database	Ongoing	Higher satisfaction among diverse learners; reduced dropout in low-confidence groups.
Instruction Design	Improve clarity, adaptability, and usability of the system interface and content.	Regular UI/UX updates; student feedback integration; multimedia resource enhancement.	System Developers, Content Designers	Design software, user feedback platform	Quarterly	Higher ratings in design quality surveys; lower reported confusion/navigation issues.
Stress	Reduce negative impact of academic and performance stress on training engagement and skill acquisition.	Integrate wellness prompts; offer time-management tools; conduct stress-awareness workshops.	Counselors, Coaches	Wellness content, scheduling tools, workshop materials	Monthly	Lower stress-related disengagement; improved balance perception in post-surveys.

Conclusion

The main aim of this study was to find the relationship between the voluntary use of the smart football teaching system and the effectiveness of the acquisition of skills, while also considering the role of learners, technology, and



stress. From the results, the answers to the main issue of the study are clear. Firstly, the results show that the relationship between the voluntary use of the smart football teaching system and the acquisition of skills is positive, with the main factors being the level of voluntary and frequent use of the system, along with the quality of the instructional design. On the other hand, the results also show that the level of stress perceived is an important factor that affects the relationship.

The findings strongly support and validate the major theoretical frameworks underpinning this study. According to Self-Determination Theory, the underlying mechanism is that if digital instruction meets the psychological needs for autonomy, competence, and relatedness, it will promote intrinsic motivation for participation. The components of the PERMA model, which are Engagement and Mastery, are supported by findings that positive learning experiences and mastery increase participation. This is not simply theoretical underpinning; it is actually enacted through the quality of design, which meets psychological needs, thereby leading to voluntary behavior that results in mastery.

The main result of this research, the contextualized training protocol (SEEP), gets its significance directly from the above conclusions. The contextualized training protocol is, in essence, a plan or a method for putting the empirical research results, i.e., what motivates and what does not, into practice. Its significance is derived from the fact that, unlike other research, it does not stop at establishing correlations, but offers a concrete method for dealing with the essential factors, i.e., the optimization of digital design for motivation, personalization for diverse learners, and the inclusion of stress management tools.

Recommendations

From the conclusions, the main recommendation is the formal acceptance and implementation of the suggested Sports Engagement Enhancement Program (SEEP) as an organized Training Protocol Method. However, the method must be implemented, not as general recommendations, but as an actual, multi-step method for the incorporation of smart football systems into the physical education program. The method consists of the following steps: an Initial Assessment Phase, which profiles the learners in terms of their characteristics and skills; the Personalized Integration Phase, where adaptive digital programs are assigned to learners based on the results of the initial assessment; the Monitored Engagement Phase, which consists of scheduled voluntary challenges for the learners; and the Support & Mitigation Phase, which includes scheduled stress regulation workshops for the learners.

We need to make this information easy to understand. So it would be an idea to turn it into a simple manual that anyone can follow. This manual will show the parts of the method what people need to do and how we will know if it is working. This way coaches and administrators can easily see what they need to do. We will also tell the people in charge like the athletics department and the college administration about what we found out and the plan we came up with. We will have a meeting with them to explain everything clearly. We will talk about how we based our plan on facts how it works step, by step and how it matches the results of our study. We want to convince them to try out our plan and give us the resources we need to make it happen.

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