Research in Learning Technology
Vol. 27, 2019

ASSOCIATION FOR LEARNING TECHNOLOGY ALT

REVIEW ARTICLE

Smart learning environment: Teacher's role in assessing classroom attention

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(Received 9 April 2018; final version received 25 November 2018)

The main purpose of this article is to investigate the impact of teacher's position on students' performance in higher education. A new pedagogical approach based on collaborative learning is used due to the design of a smart learning environment (SLE). This workspace uses, respectively, information and communication technologies (ICT) and radio frequency identification (RFID)-based indoor positioning system in order to examine students' perceptions and the involvement of groups into this smart classroom. The merge of interactive multimedia system, ubiquitous computing and several handheld devices should lead to a successful active learning process. Firstly, we provide a detailed description of the proposed collaborative environment using mainly new technologies and indoor location system serving as a platform for evaluating attention. The research provides an obvious consensus on the teacher's role in assessing classroom attention. We discuss our preliminary results on how teacher's position influences essentially students' participation. Our first experiments show that the integration of novel technologies in the area of higher education is extremely promoting the traditional way of teaching. The smart classroom model has been recommended to support this evolution. As a result, the found results indicate that the teacher's position increases the learner's motivation, engagement and effective learning.

Keywords: RFID-based location system; teacher's position; collaborative learning; information and communication technologies; classroom observation system; pervasive computing

Introduction

The development of new wireless, ubiquitous and mobile technologies has drawn the attention of researchers. Several works have explored the use of mobile learning (m-learning), and ubiquitous learning (u-learning) as some complementary teaching methods to facilitate the achievement of learning outcomes and reduce location and time constraints (Laru, Naykki and Jarvela 2015). Hence, m-learning is defined by the use of mobile or different wireless devices for the aim of learning. Nonetheless, u-learning is essentially based on ubiquitous computing. The most important role of this technology is to support the smart learning environment (SLE) which contains many connected sensors and devices that deliver services at anywhere and at any

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Citation: Research in Learning Technology 2019, **27**: 2072 - http://dx.doi.org/10.25304/rlt.v27.2072
(page number not for citation purpose)

time (Chin and Chen 2013). However, the achievement of learning outcomes into a smart classroom culture is determined by the university's ability to evaluate its objectives and educational strategies to encourage active interactions among the groups of students (Omae *et al.* 2017). Therefore, learners could cooperate to learn and work together to produce solutions for problem situation proposed by the teacher in the context of collaborative learning process (Tesavrita, *et al.* 2017). In addition, the unparalleled rapidity of information related to information and communication technologies (ICT) expands new educational opportunities to manage groups differently. Hence, technology-based learning offers several new tools to cooperate, learn and evaluate (Makahinda 2018). Many universities are now aware of the vital role of digital collaborative exchange via web and software systems (Moyne *et al.* 2018). For this reason, the merge of ubiquitous technologies and collaborative learning represents a challenge for these institutions and organisations. The described concept contributes widely to the progress of knowledge-based economy considering that new pedagogy creates a dependent combination of creativity and suitability to enable a digitally best access of educational information (Cope and Kalantzis 2013). In this context, several software solutions are aware of the importance of location information which can play a significant role in today's knowledge culture regarding the possibility to offer several location-based services (Guo, Liu, and Wang 2015). Nowadays, all these applications' requirements are based on real-time tracking systems. Indoor localisation technologies have emerged to obtain accurate position and even improve the performance of indoor localisation (Potgantwar, Kohli, and Shirke 2015). The main aspect of our research is determined by the influence of teacher's position in the SLE on student's achievement. In this study, we present the principal effects of teacher's position and we develop it with our observations about students' performance. Active learning is based on small groups' work and the teacher must move from group to another to control their progress. As ubiquitous and indoor localisation technologies are developed, institutions can profit from these systems to determine principal keys of successful learning activities. Whence, the purpose of this work is the integration of indoor tracking system and mobile devices in the area of higher education to identify the main elements of studying student's behaviour. The purpose is to examine how learners perceive SLE while considering particular features: the student's general experiences of learning through SLE, the student's experience of using interactive multimedia platform for learning and finally the demonstration of how teacher positioning could be used as a tool for interpreting students' performance in the smart classroom model.

Further, in this work we present initially our system aiming to ensure the involvement of students in collaborative learning process. Also, we report our preliminary results of the proposed classroom observation system aiming primarily the evaluation of students' behaviour relating to the teacher positioning within the SLE. This designed platform provides an accurate indoor localisation system to observe educational impacts on learners' participation. Firstly, we present the novel architecture of SLE that allows active learners to gain access to learning content through several smart handheld devices via using real-time educational services.

The rest of this article is outlined as follows. In the 'Literature Review' section, we describe the literature review and some related work. This section is followed by presenting the design of our implemented software platform. In the next section, we explain the methodology, and then, we present generated results and the conclusion.

Literature review

Pervasive computing is considered recently as a new key in the information and communication world (Kun 2017). It is associated with numerous connected electronic devices which have communication capabilities as wireless sensor network nodes, handheld devices, radio frequency identification (RFID) and so on. In this context, smart workspace is defined as a novel paradigm that ensures the conjunction of smart pedagogical practices to deliver educational content differently. Obviously, the connection of a great number of wireless sensors, combined with the use of mobile handheld devices, software systems and a variety of intelligent equipment, provides effective communication to learners at anywhere and at any time. Hence, new technologies present the most significant way to incorporate the use of technological strategies to ensure the enhancement of exchange experience by providing to learners the transfer of higher-order knowledge (Zhu, Sun, and Riezebos 2016). Moreover, the connected devices are considered as a requirement for determining effective results, which also supports a diversity of mechanism to deliver educational services. RFID technology is considered as an appropriate technology for this kind of environments. It requires several hardware and software systems to enable interaction with smart devices and actors of the classroom. Besides, tracking systems based on RFID provide the possibility to deploy tracking infrastructure (Gharat *et al.* 2018). Therefore, these systems are already in use with mobile applications that would have been completely changing the area of education regarding the importance of feedback of learners and teachers which are extremely important. It facilitates learning process and even critical thinking skills via active interactions (Elhoseny *et al.* 2018). Hence, evaluation and feedback from the teacher during the course is even more significant according to the influence of his position on increasing the motivation of students. The positioning information is very substantial regarding the increasing number of new developing techniques which are dedicated to specify an accurate location information. Real-Time Locating Systems known as RTLS have become an important element of several existing ubiquitous positioning aware platforms (Dong, Li, and Yin 2018). While global positioning system (GPS) has been emerged as an effective outdoor real-time locating solution, it fails to have a quite successful indoors (Santerre and Geiger 2018). Likewise, a large number of RTLS technologies have been developed to resolve indoor tracking problems. It offers the possibility to track students or teachers into classrooms according to their academic performance which has become very important to enhance classroom effectiveness and raise results of low- and high-ability learners. Many technologies are used to obtain these accurate positions such as RFID and WiFi. RFID is known as a wireless use of electromagnetic fields in order to transmit data (Gharat *et al.* 2017). The signal transmission occurs between tags and anchors communication devices to locate individuals. RFID is divided on two types (passive and active). The first type (passive RFID) runs only in proximity to a specified RFID anchors. The second type (active RFID) tags send out the appropriate signal to the anchor every few seconds (Nakao *et al.* 2011). Many methods, such as triangulation software, are used to determine the tagged person's position (Ciezkowski 2017). Nonetheless, RTLS solution is used to automatically track the location of objects or persons in real time. Besides, the advantage of RTLS is the possibility to track and monitor real-time movement of individuals via computer application software. Usually, the use of novel technologies has continuously played a very important role in higher education, regarding the heterogenous data generated by the deployed platform. Therefore, evaluating teaching methods requires the adoption of more technological services that facilitate the enhancement of students' learning experience.

Some related works present a categorised and extensive research into the area of indoor tracking using several software technologies. Other studies demonstrate how these techniques serve for evaluating the quality of students' learning in higher education. In the following part, we discuss each of these aspects distinctly. Up to now, several types of indoor location systems are developed for smart environments. The authors propose a system of indoor location tracking of individuals, especially students and staff, using RFID technology. This growing technology is often used to indicate person's location. The presented system allows the tracking place with several facilitates using RFID tag, reader and even ZigBee protocol for wireless communication. Then, Bobescu and Alexandru (2015) illustrate an application which describes an indoor positioning system using Android mobile devices. The use of this method is based on an algorithm of Wi-Fi trilateration that resolves the problem of indoor signal propagation focusing on collecting signal measurements that recover reliability localisation. Indoor tracking techniques offer opportunities for smart environment to ensure the location-based information of persons. However, in Dari, Suyoto, and Pranowo (2018), mobile device is considered as a location pointing device using GPS. The use of GPS as a tool to get the location of course lack accurate information when it is used indoors. Nevertheless, the indoor location-based services in a room that leverages the use of access point are very significant due to the information of the received signal strength (RSS) obtained from the access point. The technique discussed in this work called the location fingerprint technique is combined with the use of RSS's fingerprint to determine the position. In the same context, another study supports the indoor positioning system of mobile devices using iBeacon, in particular. This system is focused on scalable and the highest level of accuracy in indoor positioning awareness iBeacon, which is known as a cross-platform technology for both iOS and Android handheld devices based on services offered by Bluetooth Low Energy (BLE) (Kakanejadi Fard, Chen, and Kook Son 2015). Otherwise, mobile technologies change the traditional educational methods through the instauration of the concept of learning which can take place at any time and anywhere. The main purpose of this work is to describe the assessment manner in this kind of classrooms and even to demonstrate the approach of evaluation by defining skills which students need to succeed in achieving their learning outcomes. Raca and Dillenboug (2013) explore a system for automatically assessing attention in the classroom. This research determines the behaviour metrics and observations of different reactions of students during the lecture. Researchers analysed the duration of attention considering the aspects of quantifying body motion and estimation of gaze direction. Mainly, it represents essential criteria due to the provided results to evaluate interaction among teacher and students according to the resolution of incoming data to estimate observations. Finally, Gillies (2008) argues the importance of observations focused on how teachers can encourage discussions among learners and how they can work together applying the collaborative method. Thus, two major studies are presented: the first one describes the difference in teachers' verbal behaviours during cooperation among small groups. The second one presents benefits derived from assessments given by teachers to use communication skills to improve students' learning and thinking during cooperation.

The above-mentioned studies determine how new technologies of indoor location systems can provide opportunities for universities to identify student behaviour as well as teacher feedback. The impact on the course progress can be observed to identify the achievement of learning outcomes. Furthermore, evaluating effective teaching in intelligent environment is more difficult than traditional classroom. Interaction among teacher–student is extremely important according to the effectiveness of the teaching process based on real-time feedback. These solutions represent several limitations when we talk about novel educational concept.

Design Solution

Smart Learning Environment Architecture

This section illustrates the description of the proposed technological software platform supported by the SLE (Figure 1). We present below the implementation of several software modules of the architecture and the major component known as embedded gateway. The new collaborative environment is based on ICT which provide a full range of asynchronous and synchronous communication tools. The designed system requires the combination of sensors, smart devices, software, applications and real-time services. Therefore, smart classroom improves the experience of collaborative learning regarding the delivery of high-quality data to students. Thus, we chose for our implementation: videoconferencing system, video on demand (VoD) streaming server, cloud management information system (CMIS) and a gateway. The proposed gateway is known as a bridge between a various number of connected devices that completed the software platform with numerous available technologies. We present below principal elements of our designed SLE.

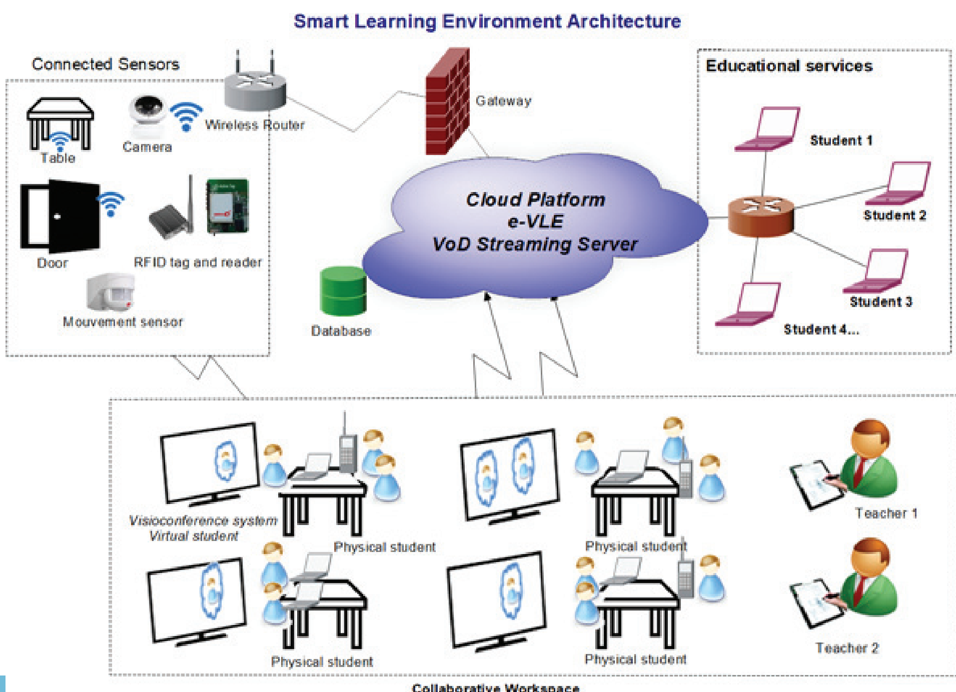

Figure 1. Smart learning environment architecture.

Videoconferencing system

The main goal of videoconferencing system is to enable real-time interactions among groups of learners. It is based on the strategy of sharing delivery of educational content. Hence, unified communication technologies are offered by the videoconferencing system to engage each group of students to expand collaborative learning experience. In fact, learners are allowed to join the session course from their handheld devices to collaborate and to achieve the same learning outcomes during a real-time video session by discussing with students who have constraints to assist. Our suggested system meets the requirements of institutions by providing an effective network video infrastructure solution for multidimensional communications, software tools and, finally, a reserved bandwidth management.

Video on demand streaming server

The streaming video provides a complete recording of live lecture for playback on demand service. While VoD application saves a huge number of videos, we decided to host the server on a cloud platform. Whence, all learners who missed the lecture can perfectly join any of the available videos and follow any part of the session course at any given place and time.

Extended virtual learning environment

An extended virtual learning environment (eVLE) is essentially required for the deployment of a complete software platform. It provides the delivery of learning materials such as Moodle to learners via the web.

Cloud management information system

CMIS offers to the students the best use of educational resources. It is intended to increase the effectiveness of the management of several collaborative workspaces. The cloud-based platform contains eVLE platform, database storage, users and classroom management modules that serve to share educational information using several ways as email, blogs and forums via their smart devices.

Gateway's architecture

The gateway located in the SLE includes multiple modules that improve interactive communication among groups and the teacher. Initially, we present the module of access permission and authentication that allows the management of teachers and students. Then, teacher's module provides a complete remotely supervising discussion among learners. The Video on demand streaming server module enables the management of the collaborative classroom since it is equipped with an IP camera to store course sessions. Streaming data are played in real time via any connected device considering security module. The captured video of the session is automatically saved in media server. Finally, the module of virtual meeting facilitates new ways of communication using services of videoconferencing system. As described in Bdiwi and Bargaoui (2015), a personalised middleware for embedded gateway within the collaborative environment is presented. The offered middleware architecture of the gateway model shown in Figure 2 contains four main layers. The first layer, the application, manages all services in the SLE. The second layer, the classroom manager, provides a context data exchange of the lectures and allows the management of the connected devices. The third layer, the device manager, includes a context-aware detection. It is dedicated to discover and add the possible new equipment. The last layer, access technologies, manages protocols of communication among different devices.

The middleware presented above is supported by the concept of ubiquitous and pervasive computing. This technology ensures the connection of several sensors to deliver educational services. The platform enables the communication of several heterogeneous devices connected through wireless network to the embedded gateway.

Classroom observation system

In this section, we give an overview of our new SLE based on an indoor positioning system of the teacher. Then, we describe some challenges that we faced in technical implementation process.

The effectiveness of the pedagogical course in this presented classroom is evaluated by the students' performance via an indoor positioning system. The different proximity positions of the teachers are used to define how students can collaborate, learn and preserve their perfect behaviour. Thus, learners study by cooperating with the rest of their groups, taking notes and asking some questions. The accuracy of teacher's location inside the workspace is extremely important due to the impact on the engagement of students and expectations for a successful learning experience. The system architecture of the collaborative SLE is based on an indoor active RFID location system that provides accurate teacher's position as in Figure 3. In order to approve the reliability and the efficiency of using active RFID system for positioning purposes, an experimentation was conducted. The SLE is presented as our experimental area. It represents a square with the size of 5 m × 5 m equipped with RFID components and several other sensors. The technical architecture includes some main elements to improve a seamless interaction among learners. Initially, an active RFID tag for each teacher is equipped with a built-in battery, and each one transmits periodically its associated data. This information contains identification

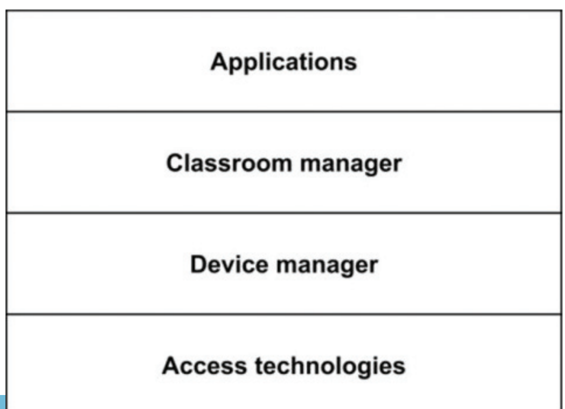

Figure 2. Middleware architecture's gateway.

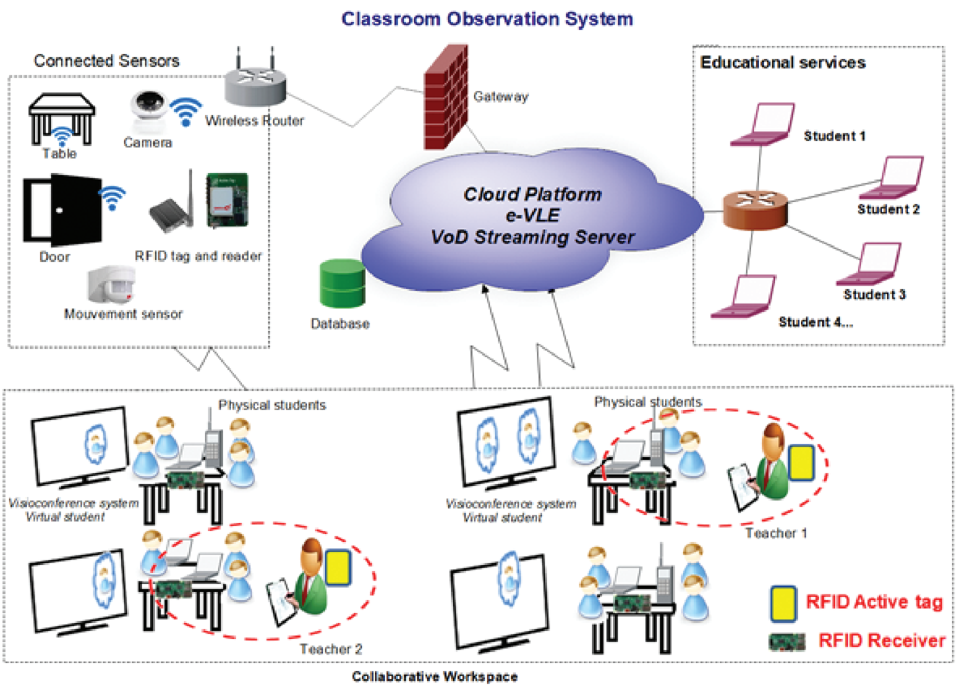

Figure 3. Classroom observation system.

and some specific application data. Our proposed system uses five RFID hardware anchors that should be implanted within tables where students are grouped. The number of connected readers is proportionally equivalent to the number of collaborative groups. The used indoor localisation technique is based on proximity. When teachers are positioned nearby the table of each collaborative group, the RFID anchor will automatically detect the tag's data while it contains its database. Hence, this basic approach requires a defined distance between the reader and the teacher's tag, which is typically under 1 m in the case of the wireless connection. An active RFID system ensures the simultaneous detection of several tags in the action zone. As shown in Figure 3, five hardware readers and two teachers' tags are interconnected to make a network dedicated to the indoor positioning system. These hardware devices are linked to our middleware's gateway for data processing. As described above, the gateway is dedicated to manage the whole SLE via connecting devices and enabling services. This software platform is also implemented to allow the processing of data collected from tags and anchors that will be executed in the gateway's application layer. The architecture of the collaborative workspace combines ubiquitous computing, multimedia interactive system, real-time location system and several software tools to share educational information and determine the position of the teacher. The classroom observation system serves to evaluate the increased attention of students. It provides different results that will be discussed and shows the enhanced compliance when the teacher is in close proximity within the groups. Thus, the evaluation of students' involvement and attitudes can be determined through the teachers' position. This work was completely implemented and tested within the experimental area. The hypothesis following this research study is that location-based services can extremely help teachers to manage the behaviour of collaborative groups while it promotes the effectiveness of assessment process and feedback. Teachers need to know how students can be involved in collaborative learning process.

Methodology

In this experimental section, we present the main goal of the research study that determines how teacher's position in the SLE can affect the involvement of students. In the context of cooperative work, learners' participation is much more imperative than classical lecture. Besides, the assumption related to this research work was that students' engagement levels would be extremely higher in groups' work benefiting from ICT. We explain a brief description of our teaching experience using the classroom observation system to determine several positions of the teachers. In this study, the course named 'Arduino Workshop' was taught by two specialist teachers in the field of embedded system for a period of 7 weeks. Then, each part-time of the course is fixed to one and a half hour per week. The observation system designed to assess the behaviour of students during the achievement of the proposed project was put into practice. Learners are first-year engineering students, the groups of students are randomly selected, they have not met before and they have never worked together. Learners are working in five groups of five or six members. These students specify the analysis requirements of the project applying a collaborative process strategy. Teachers walked around groups and addressed some questions and gave some tasks. The essential goal of this course is to design and develop a prototype of joystick controller inspired by the need of video games. They work with a hardware card based on Arduino board and sensors to develop a useful joystick. During all sessions, groups of learners have to present their work progress of using Arduino board, on which an analogue joystick was already connected. The controlled data of the joystick are associated with the position of command and can be monitored via the Arduino setup. However, the positioning system deployed indicates whether different groups of learners are enthusiastic about the required work and determines efficiently the learners' work progress. Through this experience, teachers could define the increased autonomy in cooperative group work situations to reflect and think strategically.
This experiment aims essentially to examine the following:

- How have learning been involved in the experience of collaborative learning in the SLE?
- What is the role of the teacher's position in improving learners' performance?
- How have learners used the feedback received from their teachers to improve their collaborative experience?
- Are learners more interactive with the proximity position of the teacher?

The presented study is conducted principally to analyse the effect of teacher's position on students' participation and achievements. In order to reach this goal and answer the research questions asked below, it is imperative to test research hypotheses.

The following hypotheses need to be verified using the classroom observation system to ensure that the experimentation involves the collection and analysis of data without changing any existing conditions:

H_0: There is a difference in the achievement of learners working individually in the SLE and those who cooperate using a variety of smart devices.

H_1: There is a difference on the participation rate of learners who engage in collaborative learning due to the teacher's position.

H_2: There is a difference in the learners' achievements due to the lack of cooperation and confidence in their ability.

To examine the described hypotheses, a test was used to observe the effect of teacher's proximity in the SLE during the supervision of the groups. The effect on the achievement was measured via marks reached after evaluation and via supervising the progress of the work throughout the sessions.

We need also to formulate the hypotheses that will be essentially verified via the student's achievements. These hypotheses are defined as follows:

H_3: The proximity position of the teacher increases the students' performance and motivation.

H_4: The proximity position of the teacher has no impact on the students' performance and motivation.

We focus our experimental work on the impact of the achievement mark on the probability of a group of students receiving a high average of proximity time and feedback during the course sessions. The model is written in following form:

μ1: Student's mark when the average of teacher's proximity time is high.

μ2: Student's mark when the proximity time is limited.

$$H_3: \mu 1 > \mu 2$$

$$H_4: \mu 1 = \mu 2$$

These formulas are verified if the amount of time spent with the high proximity time of the teacher is positively related to the group's performance and motivation. Otherwise, the proximity time has no impact on the group's performance and motivation.

Results and discussion

Based on our classroom observation system, we conducted that the accurate position of the teachers impacts the motivation and the behaviour of collaborative groups work. Furthermore, the preparation of learners and materials are critical aspects of the collaborative experience in the SLE. Hence, it's essential to present the time spent working with students from the start of the course, and refining the final review through feedback of teachers in order to present samples, and understand the project requirements. We present how the weeks of supervision must take place.

The work progress is presented in Table1.

Citation: Research in Learning Technology 2019, **27**: 2072 - http://dx.doi.org/10.25304/rlt.v27.2072

Table 1. Description of the work progress.

Week 1	Details of problem situation explaining the essential goals to achieve are given to students.
Week 2	Groups of learners are engaged to collaborate and analyse the guidelines to be used in the achievement process.
Week 3	Learners consider feedback given by teachers from previous weeks and they have to adjust the reviewing document.
Weeks 4 and 5	Learners provide the prototype of the analogue joystick. Teachers evaluate their work in progress and propose the strategy to determine required objectives in the context of active learning.
Weeks 6 and 7	Groups of students submit their final assessment and reports. Students are required to consider the feedback provided by their teachers.

Moreover, we may validate the above hypotheses based on the premise that students have the same experimental conditions that are presented through the classroom observation system. H_0 is verified in Table 2, which presents a group of students who collaborate together; the learner who works individually has an impact on group's results. H_1 is tested and it shows different results of groups who have a variant of participation rate due to the teacher's position. H_2 is also verified via the consideration of similarities of the marks of learners when they show a lack of cooperation and confidence in their ability. To test H_3 and H_4, results must be related to some criteria such as 'students' motivated behaviour', 'teachers' practice' and finally the marks of each group after achieving their learning outcomes. We observed the different teachers' locations in the SLE during 7 weeks. Our main results are given in Table 2.

We perceive that members of group 2, group 3 and group 5 have increased motivation during the sessions. Thus, they ask several questions to the teachers to lead active group discussion and to determine the solution related to the problem situation. In this context, each teacher uses a diversity of group's proximity zones to maintain specifically the students' attention during the collaboration meeting. The average of these three groups' discussion is determined as 13 min per session. The results of these groups are verified by the condition of $\mu1 > \mu2$, so our test of H_3 is approved.

However, we deducted according to the positions that members of group 1 and group 4 are usually passive regarding the lack of confidence in their ability. These students consistently use their handheld devices to work independently by avoiding active discussion. Furthermore, the observational study of positioning teachers provides important feedback to ensure involved learners interaction. On average, teachers spent 4 min near passive students. For these groups, the results are verified by the condition of $\mu1 < \mu2$, so H_3 is verified in this context. In collaborative learning, forms of motivation decline when learners have no questions and no voice in the educational development. The second significant observation is that the collaborative workspace layout offers to teachers a better way to move around the groups in order to supervise their activities.

As a result, the positions of teachers extremely helped the engagement and involvement of learners who are redirected to the efficient strategy of collaborative work. Teachers positioned in the front of the SLE could observe the students' behaviour during the sessions via remote computers connected to all used smart devices. Whence, teachers can also take advantages from using their position to show their involvement with students. This experimental study aims at investigating how teachers' position can influence learners' behaviour and opportunities to learn using

Table 2. Description of teacher–student interaction in smart learning environment.

Groups	Students' motivated behaviour	Teachers' practice	Marks (0–20)
Group 1	Members have poor productivity due to fixing low learning goals for themselves.	Teachers regularly use keywords that motivated the learners' attention during all sessions. **The average of the proximity time: 5 min**	10.20
Group 2	Members actively discuss and solve meaningful problems.	Teachers engage students in justifying their feedbacks. **The average of the proximity time: 15 min**	16.75
Group 3	Members apply different concepts and strategies to achieve their goals.	Teachers pursue the active engagement of the group. **The average of the proximity time: 10 min**	13.50
Group 4	Members lack confidence in their ability. Students adopt individual work.	Teachers propose the strategy to determine goals and active cooperation is delivered by teachers. **The average of the proximity time: 3 min**	09.20
Group 5	Members ensure deep knowledge of problem situation content.	Teachers encourage students to expend their best effort. **The average of the proximity time: 14 min**	15.60

the observation system. The discussed results show that teachers who have a proximity positioning with active groups have a prominent impact on students' marks. According to the location of teachers, members positioned in the action zone represent an improved amount of active interaction. In this work, we recommend that teachers should keep the attention of active learners by staying longer nearby the collaborative groups during each session while they give actively new instructional strategies in discussion. Besides, teachers who walk around the SLE can monitor screens of students from their handheld device to keep the attention of learners during groups' activity. This study dedicated to observe teachers' positioning aims to examine how these action zones influence learners' participation and assessments. The results found a significant association of teachers' position and students' motivation. Hence, the impact of teacher positioning on learners' involvement is extremely important. The research illustrates the design and implementation of classroom observation system that tests the influence of indoor positioning system on students' behaviour and performance. This study is a first investigation of previously implemented SLE using ICT, interactive multimedia system and mobile technologies.

Conclusions

This article presents the significant role of teacher's position in assessing the smart classroom attention considering the impacts of engaging students in collaborative educational activities aiming essentially to improve the learning experience. In this work, we design a new architecture system that enables the use of several technologies as ICT, indoor positioning system and so on in the SLE. Then, we discuss the obtained results of our experimental study of evaluating students' involvement towards collaborative learning process. Our major findings show that groups progressively become more involved in the SLE when the teacher is positioned nearby members. These students are still attentive and ask several questions to achieve the learning outcomes, while other students are even more passive. Whence, technologies might provide modern solutions to determine the students' attitudes towards the collaborative workspace. A significant amount of techniques and technologies addressed in this article was implemented and completely tested to reveal that the proximity of teachers is extremely important to assess the attention of students in the context of collaborative work.

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