

24.2020



International Journal: **Emerging Technologies in Learning**

Papers

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An Analysis of Subjectivation Processes Mediated by New Digital Technologies

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Short Papers

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Gamified Learning: Are Vietnamese EFL Learners Ready Yet?

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Proposal of Methodology for Evaluation of Ergonomics of Teaching Materials Using Eye Tracking

<https://doi.org/10.3991/ijet.v15i24.19319>

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Abstract—Educational materials are a key component of the educational process. In this respect, it is an instrument that is essential throughout the education process and where quality plays a key role. The quality of educational materials must be assessed in terms of expertise and timeliness, and in terms of observance and application of didactic and pedagogical principles. Only high-quality educational materials bring greater efficiency to the entire education process. An essential aspect of assessing the quality of educational materials is also their ergonomics. That is, assessing whether the educational material works in accordance with the author's ideas. The principle of ergonomics, which includes comprehensibility and user-friendliness, is already commonly used in the design of web pages or advertising flyers. Their aim is also to communicate information and lead the attention of the reader. This article is devoted to the definition of the methodology by which we evaluate this ergonomics for educational materials and based on research we are able to formulate recommendations in this area.

Keywords—Eye tracking, ergonomics, quality, educational material

1 Introduction

The current primary and secondary education in the Czech Republic is characterized by considerable diversity in the area of the creation of educational materials. This diversity has been largely supported by operational programs implemented in the field of education, which allowed the creation of educational materials. This trend was relatively massive in the 2007-2013 programming period, and partially it is supported in the 2014-2020 programming period too. In the 2007-2013 programming period, the scope and form of the educational materials were defined by the beneficiary. His primary duty was to publish these materials on a publicly accessible portal. The educational materials produced in this way, were referred to as DUMs (Digital Learning Materials). According to the SAO's finding, several hundred thousand materials were produced in this programming period [10]. The basic assessment that these materials underwent was economic adequacy. The created and published materials did not undergo the classical review procedure, their validity was determined by the popularity

on the portal www.dumy.cz rated by stars by the professional public and the user public. However, the evaluation criteria are not known.

In the 2014-2020 programming period, much less support was defined for the creation of new or innovated materials. One of these calls defines a new standard DVZ (Digital Educational Resource). In this case, the criteria for assessing the quality of DVZ were defined by the National Institute for Education of the Czech Republic [6]. Even in this case, it is rather a technological evaluation of emerging educational materials that do not reflect their true quality.

From the above conclusions, it is possible to define a clear need for assessing the quality and ergonomics of emerging learning materials in order to increase the efficiency of their deployment. The current definition of the quality of educational materials is based on the general definition of the quality of the teaching process. In general, it is possible to draw inspiration from the book Quality Education [9], which addresses the general structure of the educational unit and hence the general structure of educational material in terms of pedagogy and didactics.

The open question is the situation in the construction of teaching material, where the structure is respected in terms of didactics and pedagogy, but the material is not appropriately arranged in terms of ergonomics. In this case, the best structure is degraded by improper arrangement and the learning material may not be effective. The design requirements are largely influenced by the technologies used by the target group in their daily lives. Development in this area is relatively rapid and defines the need for constant updating of the arrangement of suitably structured materials. In terms of data needed for the update, we can start with questionnaire surveys, which are burdened with considerable subjectivity and idealization, or with technologies that allow us to capture both the conscious and subconscious behaviour of the respondent.

2 Visual Memory

With the advancement of modern technology of today's students mainly use visual memory. The visualization acquaints students with figures that the teacher cannot provide — mainly used in natural sciences. However, we need to adapt our interpretation of the curriculum through visualization — have an effect on the eyesight of student. It is generally known [11] that eyesight is about 10 times faster than the hearing channel, i.e. the amount of information that we get insight at the same time is 10 times that of hearing [2].

2.1 Benefits

- Visual aids (such as figures, graphs, animation animations in electronic form) attract the attention of students and thus increases motivation;
- Stimulate students' visual memory;
- Increasing the amount of stored knowledge – 87 % of all information we perceive sight, while by hearing we perceive only 9 %.

Visual memory is intended for seen information: it is important in terms of object perception, keeping it in memory and subsequent equipment. It is a kind of short-term memory, which processes the information that we receive for the use of the eyesight.

Our goal in this respect is to study and experiment with visual perception because our visual experience changes frequently stage processing of visual information and affect our ability to see.

It is therefore desirable to use visual memory at work as we need to remember (not only hear but also see) any data represented in some form (be it figures, continuous text, graphs, tables, drawings, symbols or anything else), and the student can help with that to himself.

We can encounter the visual distinction at visual memories. The visual distinction of detail helps students to see differences in visual aids (e.g. figures or graphs) [5].

Further uses visual analysis and synthesis. The visual analysis helps students to find only a part of them, which is important for them. The Visual synthesis helps students to integrate the individual parts together (for example, graph and information - see our experiment). The visual memory helps students to see pictures and later to remember words. The visual memory is essential for the successful perception of the teaching substance at school.

3 Description of Eye Tracking Technology

The principle of Eye Tracking is based on sensing eye movement using a device that monitors eye movements. This principle has been used in the fields of psychology, medicine, engineering, marketing and education. In particular, the field of marketing studies of respondents' behaviour is very interesting from the point of view of this article because it addresses the quality and ergonomics of the input. The principle of Eye Tracking is based on sensing eye movement using a device that monitors eye movements. This principle has been used in the fields of psychology, medicine, engineering, marketing and education [1]. In particular, the field of marketing studies of respondents' behaviour is very interesting from the point of view of this article because it addresses the quality and ergonomics of the input. By tracking eye movement while viewing a catalogue, e-shop, or advertising flyer, it is possible to measure the attention that a potential customer pays to individual products. Another result that this investigation brings us is the trajectory of eye movement across the area of interest. The measurement process is defined by a clearly defined time and so it is possible to determine the sequence of the respondent's concentration on individual parts of the examined area.

Eye movement sensing can be divided into three basic groups according to the method used, which focus on measuring eye movement in the head or measure the point of view. For this measurement, we use devices that are commonly referred to as eye trackers. ETs most often use video to determine eye movement or measure electrical potential.

3.1 Mechanical methods of eye movement sensing

The method of mechanical sensing eye movement is characterized by high precision, but relatively high discomfort. In this case, it is the application of an optical reference object to a contact lens that is applied directly to the eye. The basic method uses a wire coil that is measured by moving through an electromagnetic field. This is a relatively invasive method. This method measures the position of the eye relative to the head and is generally not suitable for measuring viewing points.

3.2 Videoclography

These are techniques that record the distinctive features of the eyes during rotation / translation, such as the apparent pupil shape, the position of the limbus (iris and whites) and the corneal reflection close to the light source (often infrared). Automatic limbus tracking often involves the use of photodiodes mounted on the frame of the spectacles, and almost always involves the use of invisible, usually infrared, lighting. Some of these methods require the head to be fixed. The results obtained with this measurement are not suitable for the calculation of attention rate.

3.3 Electrooculography

Electrooculography is the most used method of monitoring eye movements. The essence of this method is to measure the differences in the electrical potential of the skin by using electrodes placed around the eye that generate changes in the movement of the eyeball. This technique measures eye movements relative to the head position and is therefore generally not suitable for measuring viewing points unless the head position is measured. Electrooculography has two great advantages:

- Wearing contact lenses or glasses does not affect measurement
- Not too expensive.

3.4 Recording of eye movements

Eye trackers record large amounts of data in one second, which corresponds to the oscillations of the human eye. Most of these devices are able to track the right and left eyes separately. This raw data is filtered and aggregated into a form that allows us to capture the fixation of the eye and the oscillation rate of the eye. The key record is the fixation of the eye, which is the state when the eye is at rest and in the range of a few ms to s. However, even the fixed eye performs micro-movements. These are tremor, drift or oscillation (saccades). For data processing and recognition of the above-mentioned phenomena, the algorithms that enable us to determine fixation are key. These include the “dispersion-based” algorithm, the velocity-based algorithm, or the “Bidden Markov” algorithm [3] [4].

4 Proposal of Methodology of Measurement of Ergonomics of Educational Material

The aim of the proposed methodology is primarily to assess the ergonomics of the teaching material and thus its effectiveness with the use of eye tracking. In terms of results, we focus on two basic measured quantities. This is primarily the trajectory of the eye in the context of teaching material over time. From this trajectory, we infer the student's passage through the learning material in the order it was intended.

Additional criterion is then measured map attention to ergonomics in the context of the resource is able to indicate problematic areas in terms of understanding. The expected use of this methodology is applicable to both digital teaching materials and classical printed materials. There is a certain need to devote to teaching materials designed for frontal exposure of students, typically presentations and similar materials, and a slightly different approach to assessing the ergonomics of teaching materials designed for individual work.

4.1 PART A calibration

The first part consists of individual calibration of the device before each individual measurement and for each individual workplace. This step respects the individuality of each respondent and increases the relevance of the measured values. Individual calibration not only respects individual differences, but is able to cope with distortion in respondents who wear glasses or wear lenses.

4.2 PART B self-measurement

The methodology used for educational materials used in frontal exposure. In view of the nature of this type of material, it is necessary to perform two measurements. The first measurement is carried out individually and separately, the second group. In the case of group metering, the result of the learning group is captured as a result.

1. Individual measurement and determination of attention map in laboratory conditions
 - a) Convert material to form usable in OGAMA (Open Gaze and Mouse Analyzer) [7].
 - b) Recording of an audio record of the clock and its integration into the researched material in the OGAMA environment.
 - c) Exposure of selected samples of pupils.
2. Evaluate metrics
 - a) Group measurement
 - b) Connection of real-time camera recordings within the teaching unit to the OGAMA environment.
 - c) Exposure of selected sample of students.

- d) Evaluate metrics.
- 3. The methodology is designed for teaching materials that the student works independently with
 - a) Digitization of worksheets to allow interactive completion.
 - b) Use of touch devices with a pen to complete the worksheet for the pupil's own exposure.
 - c) Evaluation of acquired metrics.

5 Experiment

The aim of the experiment was to verify the relevance of the proposed methodology. The research focused on mathematics was used to assess relevance. Within this research, attention was paid to the application of the proposed methodology and the measured data were assessed in terms of their relevance to the verification of the methodology. The experiment was carried out on the following set.

The design and execution of the experiment was inspired by the publication of colleagues from the Palacký University Olomouc, who focus on the use of Eye Tracking in cartography [8].

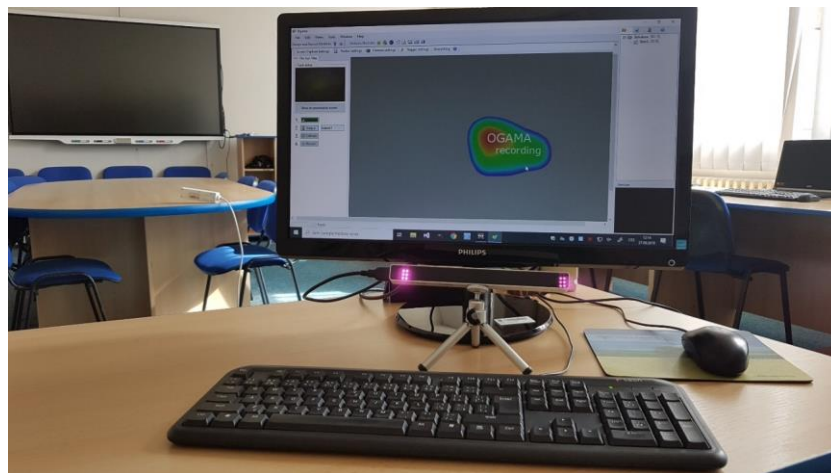


Fig. 1. Eye Tracker test set

Figure 1 shows the test station with the Eye Tribe ET1000. This device transmits the measured data directly to OGAMA 5.0. In this environment it is possible to perform an experiment evaluation. The Eye Tribe shows light sources of light whose reflection from the eyes is detected by the sensors. The correct position of the respondent is indicated by the panel on the left, which shows the correct eye catch, and which is shown in Figure 2.

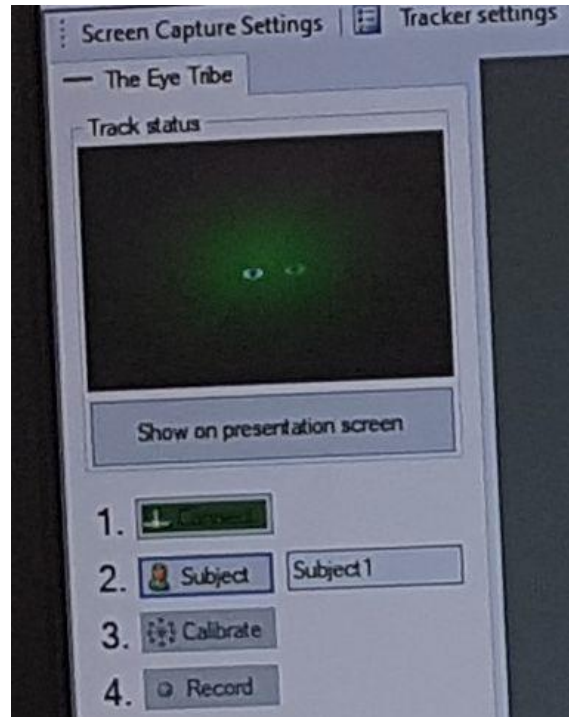


Fig. 2. Indications of caught eyes

Part of the software environment depicted in Figure 2 is also used to enter basic data about the respondent. Enter the name, surname, age, sex, optional class for classification and dominant hand in terms of use. Individual calibration is performed before entering this information.

5.1 Construction of a test task

In the experiment was used one test task in the field of mathematics, which was focused on understanding graphs. This task was represented by one film presented to respondents in Czech. The following image shows the English version of this image.

You can see three graphs in front of you, that show the same result of one survey. Find out which color represents 20% of the total. Say the answer out loud

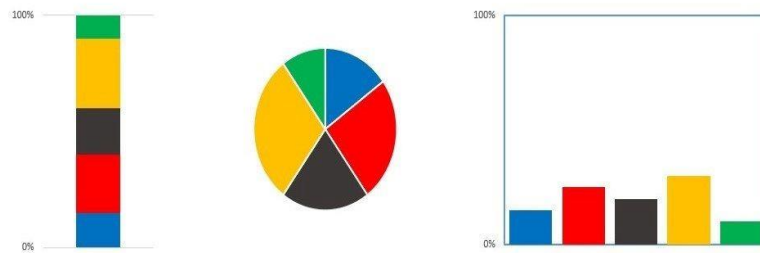


Fig. 3. The image of the test tasks

The recorded data in OGAMA 5.0 offers several types of output. The first type of output is an individual record of each respondent's behaviour, which is available as a video. A specific experiment can be viewed directly in the environment of the utility software and possibly consulted with the respondent. An example of individual output is shown in Figure 4.



Fig. 4. Trajectory of eye movement of a particular respondent

The green line shows the trajectory of eye movement. Figure 4 shows the static situation and does not show the overall trend in the same way as in the video. In the context of this paper, it is therefore somewhat problematic to demonstrate such a dynamic variable as the trajectory of eye movement in a static image. In terms of aggregation of measured values, however, we can focus on the issue of identification,

places where the respondent spent the most time - the so-called “attention map”. By focusing on this variable, we get the following graphic result.

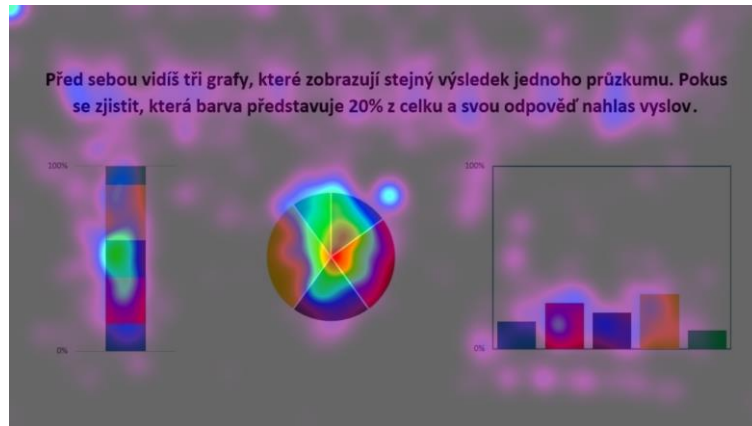


Fig. 5. Aggregated attention map

The bright spots of this map capture the attention of all respondents to the test images in each section. From the result it is clear that their attention corresponds with the task they fulfilled. In this case, the result is a time element that is crucial for our purpose. However, further processing is possible using a spreadsheet or database to which we transfer the measured data. Table 1 shows a sample of this data.

Table 1. Example of exported eye movement records in the test area

StartTime	Length	PosX	PosY
166	67	391,7549133	224,9015656
298	135	539,2806396	377,8653564
498	101	285,1253357	350,3421326
865	100	184,9478149	182,4914246
1065	133	918,6416016	201,9309235
1398	100	1122,663818	218,189621
3097	66	317,0426941	191,3897705
4594	68	931,2888794	440,2386475
5728	66	243,3781738	188,0801239
5928	66	573,2047729	239,1588898
6027	68	703,6199341	243,9441376
6427	67	329,857605	260,5488586
6561	266	201,6452332	348,8861084
9991	200	997,6365967	563,8207397
10757	100	970,8223877	505,5331726
11357	165	1024,460083	232,6972809
11722	68	523,4381714	344,3972473
11857	366	229,9851227	349,4264221
12290	166	542,4595947	435,069519
12490	266	552,8314819	422,7645874

Table 1 shows part of the exported records that map the eye movement of the respondent. For these records, we always identify the start time of the action, its duration, and the coordinates that are related to the task. Such data from all users can be aggregated and returned to a clean task in OGAMA for interpretation.

The above-mentioned experiment was carried out on a sample of 33 university students. The group was represented by 20 women and 13 men, then 28 right-handed and 5 left-handed. The average age of respondents was 22.43 years.

6 Conclusion

The proposed methodology proved its functionality within the experiment and I believe it is applicable in the testing of teaching materials in terms of ergonomics and arrangement. This testing is relatively simple and is able to reveal trends in the perception of teaching materials in individual populations, or even better, in years of education. Based on the research according to this methodology, general recommendations for ergonomics and the organization of educational materials can be drawn up. In this experiment, the methodology was based only on eye movements. In the future, it is also possible to incorporate the movements of the mouse or equivalent device and it is possible, especially in the tasks that students perform, to define the area or areas of interest.

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Article submitted 2020-10-14. Resubmitted 2020-11-13. Final acceptance 2020-11-15. Final version published as submitted by the authors.

An Analysis of Subjectivation Processes Mediated by New Digital Technologies

<https://doi.org/10.3991/ijet.v15i24.19315>

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Abstract—The new advent of digital, recurrently called by some authors as Web 2.0, Web 3.0 and Internet of Things, less than a mere technological change, consists of a new communicational paradigm. Mobile technologies, such as smartphones, have gained increasing prominence as means and tools of communication and mediators of interaction, in such a context. In this work, we intend to discuss mobile technology, especially smartphones, as mediators of social practices and modes of subjectivity today. For the analysis, the notion of remediation by the Spanish sociologist Amparo Lasén was used, which, in a general scope, concerns the reconfiguration of mediations on the self-practices due to the adoption of new technologies as mediators of social practices. Among the results, the subjectivity process mediated by mobile technologies can be divided into two axes of analysis: One referring to identification, knowledge sharing and self-awareness, and the other to control and dependence. The use of this type of digital mobile technology, such as smartphones, does not consist merely of just ‘one more’ media technology, which would minimally influence the processes of constituting subjectivities, on the contrary, it relates to an effective device for intermediating self and social-practices.

Keywords—Digital, Mobiles, Remediation, Self-Practices, Smartphones

1 Introduction

Nowadays, the use of digital technologies in the most different areas and contexts is becoming increasingly intertwined with social life. From the mid-90s to the 2000s, we would have the evolution of what many authors would call Web 1.0, characterized by publications of static content such as, for example, web pages (news sites, companies) developed by companies and accessed unilaterally by internet user. Around 1999 and 2004, Web 2.0 would start to be formed, which would be based on collaborative projects, such as blogs (‘digital diaries’ or pages for the publication of personal content) and wikis (consisting of a set of pages interconnected and that can be visited and edited by any internet user, such as the virtual encyclopedia Wikipedia). While on Web 1.0 the vast majority of users act as consumers of content, on Web 2.0 any participant can also be a creator (Cormode & Krishnamurthy, 2008).

According to O'Reilly (2005), some of the main characteristics of Web 2.0 consist of the participation of users as co-developers of the services, and also the configuration of software that does not have its use limited to a single device (can be 'run' and accessed on smartphone, computer, tablet, among others). Web 3.0 consists of the semantic web or intelligent web, whose main characteristic is the use of machines to perform more efficiently activities that previously depended on manual labour (for example, the use of algorithms to perform activities that, before, depended on manual labour - marketing automation). The internet of things consists of the digital interconnection of everyday objects with the internet, in order to communicate with each other, acting as communicating beings or entities (Hendler, 2009).

The emergence and convergence of two growing industries, the Internet and mobile communications, has provided the creation of an emerging market for mobile commerce (m-commerce), or wireless commerce and mobile e-commerce. There are several definitions in the academic and practitioner literatures regarding this phenomenon (Techatassanasoontorn & Kauffman, 2005).

Tarasewich et al. (2002), for example, defines m-commerce as any activity related to a potential commercial transaction conducted through communication networks that interface with wireless devices. Techatassanasoontorn & Kauffman (2005) think that this definition is overly broad and may, therefore, include the use of mobile phones for voice communication.

The extent of the diffusion of m-commerce activities in a country is related to the number of mobile phones, being that there are different patterns of diffusion in different countries. In particular, countries such as Finland, Japan, Korea and Hong Kong, have seen a rapid increase in mobile phone incorporation, while others, such as India and the United States, have seen a more gradual increase in mobile phone penetration (Foong, 2001).

Similarly, pan-European regulatory policy in support of a uniform Global System for Mobile (GSM) communications standard has been essential in the growth and penetration of mobile phones in several European countries. Communication technologies are subject to consumption network externalities, such as, external factors (government policies, mass media communications, the level of competition and the number of standards) and internal factors (word-of-mouth communications) (Foong, 2001).

Digital mobile technology and its expansion thus constitutes objects and devices that mediate social practices and the experience that the individual makes of himself. In this paper, we intend to discuss mobile technology, especially smartphones, as a mediator of social practices and modes of subjectivity today. To this end, a discussion was held based on the notion of remediation, by the Spanish sociologist Amparo Lasén, which, in a general context, concerns the reconfiguration of mediations in self-practices due to the adoption of new technologies as mediators of social practices. We will start from two axes of analysis to discuss the subjectivation process mediated by digital mobile technologies: one related to identification, knowledge sharing and self-awareness, and the other to control and dependence.

1.1 Remediation: Concept of analysis

According to Lasén (2014), new communication technologies are also, as Foucault would call them, ‘technologies of the self’ since they participate in conflicts and complementarities in the construction of themselves. In this sense, if subjectivity can be considered an active self-training process, never completely individual or collective, through actions and operations on our bodies, thoughts and behaviours, such information technologies would be directly involved in the mediation of these movements, during their exchanges and communication practices between individuals, groups and institutions.

Still according to Lasén (2014), in the specific case of mobile technologies (cell phones, smartphones, among others), this movement would act in two axes: one referring to identification, sharing knowledge and self-awareness, and the other to control and dependence. About the first axis, the emergence and performance of these elements in the midst of mobile technologies depend, to a large extent, on the power of enrolment (the storage capacity and performance of enrolments in software and hardware). The elements of the second axis, on the other hand, would be related to the demand for recognition, triggered and driven by these services and technological mechanisms, which would be understood, in such perspective, as modalities of subjection and dependence.

It was possible to observe that the use of this type of digital mobile technology, such as smartphones, does not consist of merely ‘just another’ media technology, which would minimally influence the processes of constituting subjectivities. On the contrary, just as subjectivity can be problematized in terms of self-practices or technologies of the self, as explained in Foucault (1978), there are currently unfolding of these agencies from concrete intermediation devices, also materialized in the midst of appropriations of said technological artefacts. Mobile communication, as a smartphone, contributes to the affective economy and the management of emotions (Lasén, 2011).

To this new aspect, which refers to the approximation and mediation of practices, techniques and relationships of the self through these new mobile technologies, Lasén (2014) would attribute the name ‘remediation’. In a general context, remediation concerns the reconfiguration of mediations in the self-practices and in the ways of acting in the world. Remediation consists of updating practices that will be translated into other means and terms, that is, the relationships that would previously be mediated in such and which ways, through the use of certain technological artefacts, would be (re) mediated in other ways, from the emergence of new mediation technologies (there is a re-mediation of these practices, from the advent of new ‘mediators’: Technological instruments of mediation) (Lasén, 2011).

Therefore, a remediation would be related to media environments that tend to allow some means to be translated by other means and contents, in order to force a changing repositioning in the individual’s actions. These are actioning whose characteristics are composed of multiplication, extension, hyper-mediation and immediacy (Lasén & Casado, 2012).

As an example, it can be said that ‘calls’ / ‘calls’ via telephones, or even sending SMS (text message), would come to remedy love rituals previously incarnated in landline calls and love letters. Such remediation would highlight new dimensions between dualisms, such as proximity / distance and absence / presence.

1.2 Remediation as discontinuity

Currently, the smartphone and instant messaging services such as WhatsApp remedy rituals of intimacy and connectivity previously embodied in landlines and SMS, constituting a repositioning in the ways of connections and establishments of contact.

According to Lasén (2004), mediation by mobile technologies transforms and reconfigures bonds, habits, forms of power, resources and ways of doing and perceiving. This points to the discontinuity of the practices that impose and configure these new mediations.

According to the author, amidst the remedied practices, it is sometimes very difficult or almost impossible for individuals to remember how they organized their lives before their existence of these artefacts (for example, before cell phones or smartphones existed, how did they communicate and organize themselves?).

For Lasén (2014), an example of these *discontinuity* relationships is in the contrasts of the recurrent use of these devices in current contexts and situations, in which their use conflicts with existing norms of etiquette or socially expected behaviours (these cases reflect elements of the ‘new’ in coexistence and tension with elements of the ‘old’, and not in a relationship of exclusion or absence).

In this sense, less than a simple ‘evolutionary line’ of these appropriations and behaviours, whose ascendancy would be proportional to the origins of new technological apparatuses, the ‘mediated’ practices tend to be updated, reopened and reconfigured in a relation immanent to the conjuncture or particular contexts. It is a hybrid movement that combines the organic with the inorganic (Di Felice, 2013).

The recent case that occurred in 2015 in which WhatsApp was blocked in Brazil, during 12 hours, at the request of a judge of the 1st criminal court in São Bernardo do Campo, in retaliation for the fact that the responsible company did not cooperate with the supply of user data for a police investigation, illustrates these notes made by Lasén (2014).

The initial punishment would be blocking for 48 hours; however, this prohibition was lifted according to the intervention of another judge, in order to last only about 12 hours. Same so, so promptly, many ‘memes’ began to emerge on digital social networks, alluding to the unusual and sudden blockade.

The following figures, for example, express supposed reactions of ‘despair’ due to the circulation of the news of the blockade for 48 hours, whose scenarios represent a person passed out in the bathroom after receiving the news; another astonished, feeling sick and receiving saline:



*Source: (Canaltech)

Fig. 1. Fainting: (translation of the caption: WhatsApp will be blocked for 48 hours from 00 hours on Thursday)



Source: (blog conecte)

Fig. 2. Feeling sick: (translation of the caption: "WhatsApp blocked for 48 hours and should not work on Wi-Fi")

The word "*Meme*" consists of a term coined by the British writer Richard Dawkins, in his book '*The Selfish Gene*' (The Selfish Gene, released in 1976). Dawkis (2007)

derived the ancient Greek term ‘mimema’, which designated ‘what is imitated’, for ‘memetics’, so that a ‘meme’ would be a unit of information that multiplies from brain to brain or between locations in that information can be stored, such as books, computers and the internet. On the internet, the expression ‘meme’ would be used to characterize ideas, concepts or even any information that would spread quickly through the web. A ‘meme’ can be a phrase, video, link, sound, and, recurrently, figures and illustrations assembled with real characters or imaginary in order to achieve different goals, such as fun, criticism, sarcasm, among others.

These figures (memes) show, on the one hand, the ‘dependency’ that the use of the application would have provided in their practices and, on the other, the eminent difficulty in rearticulating them or in rescuing other ways and strategies of ‘doing what they have always done before the existence of the digital application (however using other means and techniques) (Lasén, 2010a).

It should also be noted that the solution found by most WhatsApp users was not to spend those 12 hours of blocking without using the service, or even to replace it with other techniques and strategies, but, on the contrary, it was resorting to the use of VPN (Virtual Private Network) to ‘scam’ through the connection mediated in public networks (Ramos, 2016).

In the same trend, there were massive downloads registered on application sites competing with WhatsApp, which were downloaded in order to continue using this same way of exchanging relationships.

Still following examples of posts regarding the judicial block, in the next figures it is possible to observe ‘memes’ that refer to methods used:



Source: (Exame tecnologia)

Fig. 3. Post offices celebrate: (translation of the caption: “With WhatsApp blocked, postmen celebrate- I had not delivered letters for years. I missed it already, said Cleber”.)

The previous figures present ‘montages’ that ‘irony’ and allude to the use of personal paper letters, repeatedly sent by post (postman’s), which have already been one of the main methods for exchanging messages and correspondence. Below, memes refer to repositioning the dimension of intimacy, for example, regarding contact with people close or distant, due to their characteristics of ubiquity.

In the following figures, there are ‘memes’ that satirize the WhatsApp block by indicating that many people will be forced to relate face to face, offline:



Source: (Exame tecnologia)

Fig. 4. Meeting the people at home: (translation of the caption: “I’m finally going to meet the people who live here at my house”)

There are still *memes* that present satires to contrasting situations concerning the use application in contexts with specific rules and functions for social behaviour, such as in traffic and work environments.

In the following figures, reference is made to the constant use of WhatsApp in diverse contexts, which would even hinder ‘the country’s economic growth’ and ‘national public security’:



Source: G1 - technology and games

Fig. 5. WhatsApp in traffic: (translation of the caption: “With the blocking of WhatsApp, it is believed that at least 20,000 deaths from pedestrian accidents, stumbles and misunderstandings will be avoided”)

The first group of ‘memes’ (related to the situation of despair through the blocking of WhatsApp) express a feeling of anguish and irritation through the prolonged ‘abstinence’ from the internet. These feelings express not only the discomfort and concern about having to use it for work purposes (such as doing work and answering professional e-mails), but, above all, the fact that today, ‘being connected’ to the digital network is also ‘being connected’ to the social world. (Ramos, 2011).

This is best evidenced by the second set of ‘memes’ (those that refer to the oldest methods and means of written communication). What is at issue in the context of the ‘WhatsApp blockade’ is not to remember or rescue old ways and tools to replace the present technologies, but to re-enrol in this core of social connections and interactions of extreme relevance and representativeness in the current context. It is not just about giving up tools and means in search of others. The social being is the connected being, and in the current context, the maximum representation of this connection is presented in digital, since, whether at work, at school, with friends or family, conversations, in one way or another, they refer to facts, subjects and elements concerning the internet and digital (on a symbolic level), even when they are not effectively connected via hardware (digital artefacts) (Lasén, 2010b).

About the third set of ‘memes’ (which refer to the intimate relationship with people geographically close and distant), there is a repositioning of the dimension of intimacy and the establishments of contacts in digital. In this sense, it is common to plan and manage ‘channels’ and connection groups, according to interests, affinities, and, in line with the daily activities.

In this sense, there are times when interlocutors use the application to talk to people close to them, such as those who would be in neighbouring environments within a university, or distant, for example, with geographically distant interlocutors. This segmentation practice in types of groups (groups of friends to go out, friends childhood, college, family, among others) also requires, in some sense, a redistribution of forms of self-presentation and self-reveal to be guided, in each context of relationships, according to objectives (group intention) and looks (interlocutors in each channel), in addition to providing different effects in the constitution of an economy of pleasure (Ramos, 2011).

Finally, the fourth set of ‘memes’ (which refer to the continued use of application and that would present conflicts in contexts of practices, such as, at work and in traffic) make explicit how these digital technologies, due to the mobility character of the smartphone, would be incorporated in different contexts (including in particularly regulated places, such as work and traffic). In this regard, it is possible to observe that in a WhatsApp group, members tend to access the application, frequently, in the most different scenarios and environments, such as at university, work and hometowns.

2 Conclusion

The mobility of the smartphone, the low cost and the dynamism in sending different types of messages (video, text, audio), allow these contrasts and subversions to functions defined in specific territories. Such interpositions of the uses of the application in different environments, would constitute a heterotopy of deviation, since, if the social rule would be leisure (in appropriate and limited times and spaces), the use of the digital artefact in a daily work and study, constitutes a ‘forged space’ for leisure.

There is yet another development to be observed in the issue of ‘remedies’. In According to Lasén (2014), the term ‘remediar’ finds a parallel with ‘remedy’, which comes, etymologically, from the term ‘pharmacia’ (from the Latin), and which is a derivative of ‘pharmakon’ (from the Greek), whose meaning it would be ‘poison, drug and enchantment’. According to Lasén (2014), Derrida (1997), in his text ‘Plato’s pharmacy’, when discussing the opposition between speech and writing, resorts to the idea of pharmakon in its dubious sense and which can, therefore, be translated as ‘medicine and poison’.

These ‘remedy’ attributions (as medicine and poison), as expounded by author, find expression in the idea that, on the one hand, digital social networks are for ‘socialization’, but, on the other hand, this socialization is not necessarily desirable also in offline spaces (face to face). Remediation can also present a dubious feeling that there is satisfaction in talking and interacting via digital social networks, however, there is a feeling that the experiences of interrelationships could ‘be better’, or even that ‘there are better modalities of relationships’ than those expressed there.

Finally, the experiences and reports presented emphasize new appropriations and production of meanings concerning current modalities of ‘remedied interrelationships’ (using a digital technological artefact). These practices have a discontinuous character and comprise territories, surroundings, scenarios and spaces in a hybrid between online and offline, which are not isolated or excluded, but are corresponding.

Remediations, in addition to the mere acquisition of a new media artefact or technological, encompass practices that rescue and revalidate past performances, speeches, situations and interactions, so that we continue to do what we knew how to do (call, chat, date, meet) but with new participants (smartphones, WhatsApp), in a reconfiguration of different times, places and meanings, based on similar relationships and interactions.

3 Acknowledgement

I thank “Fapesp – Fundação de Amparo à Pesquisa do Estado de São Paulo” for funding this research.

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Article submitted 2020-10-23. Resubmitted 2020-11-26. Final acceptance 2020-11-26. Final version published as submitted by the authors.

The Effect of Stressful Factors, Locus of Control and Age on Emotional Labour and Burnout among Further and Adult Education Teachers in the U.K.

<https://doi.org/10.3991/ijet.v15i24.19305>

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Abstract—The literature reveals that there are associations between a large number of factors occurring in the classroom and at schools and colleges, and that these impinge on the wellbeing of teachers in terms of emotional labour and burnout. However, most studies are cross-cultural and there has yet to be reliable and valid research conducted into the major occurrences of stressful elements that impinge on teachers in Further Education (FE) and adult education. Furthermore, the extent to which stressors found in FE and adult education are associated with emotional labour and burnout has yet to be elucidated. The literature shows that age is a mediator of both burnout and stress among the older and more experienced teaching staff. Furthermore, locus of control (LOC) is discussed as an important individual difference in moderating stress levels of teachers. This paper investigates the extent to which teachers in FE experience emotional labour and burnout with respect to age and LOC, and how this moderates stress levels. From a survey and focus group interview, the results show that gender and ethnicity, as well as age, had an effect on what teachers found stressful, the frequency and kind of emotional labour they experience, and their particular experiences of burnout. It is suggested that results could be implemented when considering the design of working conditions for individual teachers.

Keywords—Age; LOC; U.K FE/adult teachers; wellbeing

1 Stress, Emotional Labour and Burnout

Some studies have examined the association between stress and wellbeing among teachers. They found many elements of the workplace to be associated with stress. However, the impact of workplace stressors coupled with age on emotional labour and burnout has yet to be fully elucidated among FE and adult education teachers in the U.K. Studies are mainly cross-cultural and research findings are examined in the light of these.

A study conducted by Naring, Briët and Brouwers [22] highlighted the link between job demands, stress and emotional labour. In line with other studies, job characteristics were found to be specifically related to emotional exhaustion. Surface

acting was significantly related to depersonalisation, and emotional consonance (the absence of emotional labour) was related to personal accomplishment. The researchers concluded that emotional labour provides an additional perspective for understanding work stress.

In another study, Yong and Rod [31] reported the results of a research project designed to measure the stress and the burnout levels of secondary school teachers in the Changchun region of Jilin Province, People's Republic of China, and to investigate whether particular demographic variables were related to stress and burnout. Teacher stress was measured using the Teacher Stress Inventory [11] and burnout was measured using the Maslach Burnout Inventory (MBI) [18]. The findings of this study indicated that a majority of the teachers experienced moderate levels of stress and a moderate level of emotional exhaustion. The study also found age and years of experience to be significantly related to stress and burnout. The findings reported that teachers in middle-age and mid-career suffered the highest levels of stress and burnout. This study also found that urban teachers and unmarried teachers were more vulnerable to both stress and burnout.

Others such as Skaalvik and Skaalvik [28] analysed how four potential stressors in the school environment (discipline problems, time pressure, low student motivation, and value dissonance) were related to teacher burnout. Although all the potential stressors were significantly related to emotional exhaustion, time pressure was the strongest predictor. In comparison, depersonalisation and personal accomplishment were not significantly related to time pressure but were significantly predicted by discipline problems and low student motivation. Teachers at the lowest grade levels reported more discipline problems and higher time pressure than teachers at higher grade levels, whereas teachers at the highest-grade levels experienced low student motivation as a greater problem than teachers at lower grade levels.

These studies show that most of the stress and burnout arising from factors such as emotional labour which teachers experience can be understood in terms of: job demands; location in which teachers are working; the extent to which they can manage their time effectively; whether they are married or not; student behaviour and age of teachers. This paper suggests that age is an important factor to consider in the analysis of stress and emotional labour among teachers in further and adult education institutions in the U.K. This is because most teachers in further education are above thirty years old.

2 Age, Emotional Labour and Burnout

The Education and Training Foundation (2017) in the U.K pointed out that teaching staff are older than staff working in other educational roles, with approximately 40% of teaching staff aged fifty years or older. Over half of the staff in the further education sector is over the age of 45 and this could be because further education is a second career for many, with the average age of trainee teachers in further education being 37. That is, new entrants to the profession are older than other teachers elsewhere. Research conducted in the service sector examining the

relationship between age and emotional experiences of employees may have implications for the teaching profession as both areas of work deal with social interactions with other people.

Differences in experiencing stress related symptoms between different age categories may be partially explained by the socio-emotional selectivity theory (SST). That is, older people will recognise goals according to their remaining life-span, while younger people have a more open view of future goals [5]. Older people focus on wellbeing [6]. Inevitably, older adults may be more motivated than younger adults to avoid negative emotions or will tend to get rid of them quickly [24] and to report more pro-hedonic motivation (maintaining motivation in gaining positive affect) than younger adults in everyday life [25]. In addition, older adults' long-term experience with emotional situations may make them more effective and efficient in regulating their emotional experience [21]. Older adults reported that they can control emotions more easily than younger adults ([12]; [15]). Some researchers believe that older employees could limit the negative effects of emotional labour. For example, in the service sector Tang, Seal, Naumann and Miguel [30] reported that customers were more likely to make a decision to buy items from older employees because they have more sales experience and it is expected they are better able to practice deep acting skills. In field studies, older service workers, compared to younger workers, reported using emotional labour strategies associated with less emotional dissonance; specifically, they experienced using more naturally felt emotions, more deep acting, and less surface acting [8] and [10]. There is further evidence from laboratory studies that older adults are as effective, but not more so, as young adults in implementing strategies aimed at modifying emotional displays when instructed to do so ([17]; [27]).

Service employees' age and emotional labour was explored by Dahling and Perez [10]. The authors examined how the age of employees influences the emotional labour process. Results indicate that age is positively related to deep acting and to expressing naturally felt emotions (NFE), and negatively related to surface acting. That is, older adults seek to maximise positive and minimise negative emotional experiences. Further, they found that some of the effects of age on surface acting and expressing NFE were mediated by personality characteristics that confer positive emotions. Support for this suggests that a reason that older adults are more likely to express NFEs and less likely to surface act is that they are more disposed to experiencing positive emotions when conducting service interactions. These findings suggest that many adults remain in the workforce well into their 60s and 70s and that older adults may fit jobs that require emotional labour and interpersonal interactions [1]. However, Dahling and Perez [10] cannot determine whether older adults will provide better service based on their results although it can be concluded that emotion regulation motives and abilities predispose them to regulate their emotional displays in effective ways (i.e. deep acting and expressing NFE versus. surface acting). As a consequence of their investigation, Dahling and Perez [10] assert that organisations may benefit from the emotional labour tendencies of older service employees. That is, research shows that employees who engage in more deep acting and less surface acting tend to experience better personal outcomes, such as less burnout, less work-

family interference, and greater affective well-being, for example, Johnson and Spector [14] and Montgomery, Panagopolou, De Wildt, and Meenks, E [20]. Research also demonstrates that deep acting indirectly reduces turnover among service employees, whereas surface acting indirectly increases it [7]. Others identified social support as important in reducing stress, hence emotional labour and burnout.

For instance, Kinman, Wray and Strange [16] asserted that social support mitigates the negative impact of emotional demands on emotional exhaustion, feelings of personal accomplishment and job satisfaction. Their research highlights the need for teacher-training programmes to raise awareness of the emotional demands of teaching and consider ways to enhance emotion regulation skills in experienced as well as recently qualified staff.

However, there may be early retirement due to negative consequences of stress. For example, Baurer et al. [2] reported that premature retirement of school teachers was due to burnout, psychological and psychosomatic symptoms. They evaluated the relationship between occupational burden and psychological strain of teachers who were still in work. According to the MECCA (measure of coping capacity) questionnaire, 32.5% of the sample suffered from burnout. This was significantly higher among women, divorced teachers and teachers working part-time. As part of the MECCA, teachers were also asked to rate what they regarded as the strongest factor resulting in occupational burden. Teachers indicated that, besides high numbers of pupils in one class, they regarded destructive and aggressive behaviour of pupils as the primary stress factor.

Teachers often find it difficult to cope emotionally after leaving classroom teaching for another post in the education sector. A study reported by Mawhinney and Rinke [19] suggested that teachers feel their professional status extends beyond the classroom and it is suggested that this may be age related. Mawhinney and Rinke [19] explored the use of emotions by former urban teachers. Specifically, their research captured the emotional aftermath of leaving teaching around two themes:

- a) Recognition of guilt
- b) Continued support for their students

They found that teachers who left their work continue to struggle emotionally with their choice to leave the classroom while remaining committed to affecting change in the educational system. Reasons for their struggle with emotions could be related to their age, the types of stressors they experienced and individual differences such as LOC.

3 Wellbeing, Age and LOC

The aim of Sünbül's [29] study was to gather how teacher burnout is related to LOC, job satisfaction and the demographic characteristics: - age and gender. A total of 290 Turkish school teachers responded to a survey. The "Job Satisfaction Scale" was used as one of the research instruments as well as the "Maslach Burnout Inventory" [18] which measures dimensions of teachers' burnout consisting of three

sub scales: emotional exhaustion, personal accomplishment and depersonalisation. External LOC and age were positively related to the emotional exhaustion dimension of burnout. Age was revealed to be significantly predictive of personal accomplishment.

In another study, Pavalache-Ilie and Ursu [23] identified the relation between burnout syndrome, LOC, job satisfaction and age. To establish the relationships, 113 Romanian high school teachers completed a three-part questionnaire which comprised: Oldenburg Burnout Inventory, Job Satisfaction Survey and Work LOC Scale. Results suggest that internal LOC employees are more likely to be satisfied at work than those who were external LOC. No link was reported between burnout and age. Other research considered the possibility of helping teachers to adopt LOC which buffers burnout.

For example, Bitsadze and Japaridze [3] discussed that intensive reforms taking place in the general education field in Georgia impose substantial stress to teachers. Bitsadze and Japaridze [3] proposed that this would lead to burnout of teachers. Their research showed that some teachers experienced burnout while others did not. Another purpose of the research discussed by Bitsadze and Japaridze [3] was to identify how LOC may have influenced the level of burnout in Georgian teachers. Two self-assessment instruments; Rotter Scale and Maslach Burnout Inventory (MBI), were used to measure LOC and level of burnout among Georgian teachers. Two questionnaires were distributed among 407 teachers at public schools in Georgia. After disregarding inaccurately filled out questionnaires, analysis was conducted using data received from 373 questionnaires. The research findings revealed that Georgian teachers with an internal LOC are less likely to suffer burnout. Bitsadze and Japaridze [3] further discussed the opportunities to change LOC from external to internal as a part of teacher professional development activities. It is proposed this would be overseen by school principals with the aim of redesigning teacher preparation programs so as to make teachers more resistant to professional burnout.

To further examine the relationship between stress, LOC and age on wellbeing, research was conducted with further and adult education teachers in the U.K.

4 Methodology

A qualtrics template survey was designed to capture:

- Factors which teachers find stressful
- Emotional labour measured by the Emotional Labour Scale [4]
- Teacher's Emotional Labour Scale [9]
- Locus of Control of teachers [26]
- Burnout of teachers [18]
- Age bracket (n=22) 41% 50-60, 18% 40-50 and 14% 21-40
- Gender (n=17) 71% female and 29% male
- Ethnicity (n=21) 89% white English/Welsh/Scottish/ N.Irish/British; (9% other white background and 6% other ethnic groups.

Teachers also took part in focus group interviews. All participants used pseudonyms and completed an ethical consent form. Interviews were conducted in three different departments.

5 Results

Focus group quotes

Researcher: 'To what extent does age affect how emotions are managed, in your view?'

Helen: 'I think with age comes experience and you get used to it – so we support lots and lots of learners every year but every year one or two parents will say “My child hasn’t achieved because of the support” and that would get me very upset years ago. But now I’m thinking right, which two parents is it going to be this year? Because you get, I wouldn’t say blasé but you become able to deal with stressful situations like that, because you’ve done it before.'

Dave: 'I don’t know. I’m 50-odd so – I mean the laptop has just gone off! And I couldn’t get all the way down to the bottom to put any more of these scores on. So, has that affected me? Sometimes things can affect you. You know you have to just keep it inside if you’re in front of a class and what I think is, sometimes things at home, you’ve got to keep at home. And because they expect you not to bring it in, but they expect you to keep taking stuff home with you from college basically so it’s not a fair, it’s not a fair work/life balance currently. And then when you look at say this emotional thing, we do deal with students who are in difficult circumstances, sofa-surfing, estranged from parents, they’re homeless, hungry, frankly smelling if they haven’t had a bath for a few days, not had a wash. So, all these things roll into it and you know you’re supposed to keep this front on that you know, that you know have this professional air. Sometimes you know it can just creep in and think sometimes it masks some of it but not all the time'.

Stephanie: 'You know I think, we’re all between 30 and 40'.

Sarah: 'Some 50, 60.

Sarah: 'I haven’t seen any difference in age categories in terms of showing emotions'.

Stephanie: 'Yeah, we’ve got, yeah, very few under 20, not under 20, under 30. Very few under 30. I don’t see there is a correlation'.

5.1 Locus of control

Participants completed the Locus of Control Scale (Rotter, 1966). The LOC for fifteen respondents were borderline internal locus of control.

5.2 Stressful factors

Survey data: Using thematic coding techniques, the following items were identified as stressful factors recorded by respondents to the survey and focus group interview.

Table 1. Stressful Factors Reported by Teachers

Main Themes	Examples
Duties outside school hours	Union duties
Time management	Set timescales for meeting targets and deadlines;
Resources	Not enough resources to meet students and teachers' needs such as working space for teachers.
Administration	Excessive administration such as marking
Students' behaviour	Challenging student behaviour (e.g. lack of punctuality, and respect for other learners and teachers); bad behaviour of students not sufficiently and consistently addressed by the college and lack of communication between teachers and students.
Management	Dealing with management especially when they are not well informed; lack of clarity of classes to be taught in the academic year; meeting budget requirements by the end of the academic year; expectation placed on learners; preparing for government changes- preparing for compulsory GCSE for learners; more junior staff than managers leads to stress
Work demands	Excessive workloads; lack of quiet working spaces; personal expectations and feelings of not meeting demands at work. Staff shortages put demands on teachers to deliver modules and conduct marking.
Ambiguity in work practice	Conflict of responsibility and expectations; insufficient/vague instructions from supervisors/management.

Other sources of stress: Another teacher noted that she becomes anxious in one-to-one learning situations as learners may not attend and so teachers may lose hours. A teacher also reported that she found things impossible to do when she lacks subject knowledge. Anxiety may also arise when trying to impart information to students and motivate them. Lack of student progress in examinations is also a source of stress for a teacher. The table indicates that the major sources of stress are student behaviour, management practices and work demand. Other evidence of the kinds of stressors found in the workplace is from focus group quotations.

Focus group quotes

Researcher: 'What are the sources of stress for you at work?'

Helen: 'The stress for me comes, not when I've got too much to do, but when I've got something impossible to do'.

Dave: 'My stress is how to motivate students. And a further one is exams when they're not able to do the exam and I get frustrated.'

Stephanie: 'Abusive language from students is not taken to higher levels and this is dismissed. I don't feel safe to leave the college at 5.30, and management doesn't take it seriously when I receive language abuse and physical threats. The majority of women suffer from anxiety and sleeplessness.'

Sarah: 'I don't cater for all of the mixed ability groups and many need extra attention one to one. Trying to get students to pass exams is stressful.'

5.3 Use of emotions in the workplace

When asked, 24 teachers noted on a survey scale they somewhat agree that they will work to reach goals, will seek help from colleagues and also agree that they manage emotions when interacting with others at work as this helps them to do their job well. Further to this scale, the emotional labour scale was completed by fifteen teachers.

5.4 Emotional labour scale

On a scale of 0 (never) to 5 (always) teachers were asked to rate how frequently they use emotions on an average day. A score between 3-4 indicates ‘most of the time’. Teachers agree they use emotions required and needed for their job frequently, and will use a variety of emotions with other people. They tend to display surface acting most of the time and will not show or express strong emotions.

Table 2. Emotional Labour Scale Statements, Mean Occurrences and Frequency

	Statement	Mean	Type
1	Express particular emotions needed for my job	3.20	Frequency
2	Use a variety of emotions in dealing with people	3.40	Variety
3	Display many different emotions when interacting with others	3.07	Variety
4	Display specific emotions required by your job	3.00	Frequency
5	Adopt certain emotions as part of my job	3.00	Frequency
6	Resist expressing true feelings	3.14	surface acting
7	Express intense emotions	1.47	Intensity
8	Show strong emotions	1.60	Intensity

Teacher’s emotional labour scale

On a scale of 0 (never) to 5 (always) teachers were asked to rate how frequently they engage in behaviours with students, co-workers, supervisors/line managers and heads of departments on an average day at work. Between 3 and 4 indicates ‘most of the time’. In terms of emotional display rules, participants were asked to respond to statements on a scale of 0 (strongly disagree) to 5 (strongly agree). The teachers engaged in naturally felt emotions, surface acting and deep acting. They tended not to hide or fake emotions.

Table 3. Teachers' Emotional Labour Scale Statements with Means of Frequency and Type of Behaviours shown by Teachers

	Statement	Mean	Type
1	The emotions I show to my students match the emotions I feel	3.27	naturally felt emotions
2	The emotions I express to students are genuine	3.93	naturally felt emotions
3	Even when I'm upset or angry, I make others think that I'm in a good mood	3.20	surface acting
4	Really try to feel the emotions I have to show as part of my job	3.07	deep acting
5	The emotions I show my students come naturally	3.33	naturally felt emotions
6	Part of my job is to make students feel satisfied with the work I do	3.67	
7	My place of work expect me to act enthusiastic in my interactions with students	3.73	surface acting
8	I know the emotional display rules I am expected to display to students	3.53	surface acting
9	Show emotions I don't feel	1.64	Faking
10	Hide emotions I feel to perform my job	1.53	Hiding
11	Pretend to have emotions that I don't really have	1.46	Faking
12	To do my job, I pretend to have emotions that I think I should display	1.69	Faking

Focus group quotes

Researcher: 'Do you feel teachers generally experience the emotions they show?'

Helen: 'Yes, I think as a profession, we're very open'

Claire: 'Yes I think to a degree. I think some people are more open. Some people don't always want to express how they're feeling and prefer to just deal with it by themselves.'

Sarah: 'I don't show my emotions.'

Stephanie: 'We have to suppress our emotions as we are being told we have to be extremely professional. We don't feel supported by management but we support each other in the classroom. Staff can vent their frustration or anger in the staffroom and then put on their happy face when going back to the classroom.'

5.5 Burnout scale

On a scale of 0 (never) to 6 (always) teachers were asked to rate the extent to which they experienced particular emotions, including frustration and exhilaration. They were also asked to rate the extent to which they agree with statements about their working experiences. Teachers tended to report personal achievements, the ability to deal with emotional issues calmly and effectively and positively influencing students. This infers that the exhaustion which they feel is from the intensity of the job rather than people interaction.

Table 4. Statements of Burnout Types and How Frequently these are Experienced by Teachers.

	Statement	Mean	Type
1	I can easily understand how my students feel about things	3.75	Personal Achievements (PA)
2	I deal very effectively with the problems of my students	4.13	PA
3	I feel I'm positively influencing other peoples' lives through my work	4.56	PA
4	I feel I'm working too hard on my job	3.60	Exhaustion
5	I can easily create a relaxed atmosphere with my students	3.43	PA
6	I feel exhilarated after working closely with my students	3.93	PA
7	I have accomplished many worthwhile things in this job	4.21	PA
8	In my work, I deal with emotional problems calmly	4.53	PA
9	Working with people all day is really a strain for me	1.92	Exhaustion
10	I've become more callous towards people since I took the job	1.42	Depersonalisation
11	I don't really care what happens to some students	0.62	Depersonalisation
12	Working with people directly puts too much stress on me	1.31	Exhaustion
13	I feel I'm at the end of the rope	1.69	Exhaustion
14	I feel students blame me for some of their problems	1.58	Depersonalisation

6 Conclusion

Students' behaviour and issues related to management were most frequently noted as stressful to teachers who engaged in surface and deep acting and NFEs. Personal achievements are important to teachers and they report not faking emotions but hide them in the classroom or when interacting with students. This is supported by quotes from teachers who said that they would show emotions in the staff room where there is support from other staff members. Older teachers are more adaptable in dealing with stressful encounters and may be able to manage their emotions as a result. Furthermore, older teachers tended to experience personal achievements in their job role more often and this may be because of older teachers' skills in interacting with students resulting in positive outcomes.

Of note, is that teachers score marginally on internal LOC. This suggests that older teachers on occasions will tend to externalise stressful situations out of their control. That is, the causes of stress are uncontrollable. However, teachers will in most instances take responsibility for occurrences which may be stressful and this may engender either surface or deep acting. Younger teachers who are unable to recognise how to use emotions effectively may leave their job.

Findings of this research suggest there are implications for the design of new working patterns for individuals who find their working conditions and interactions with students stressful due to the demands of the work place and individual differences in LOC, gender, ethnicity, age and use of emotional labour.

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Article submitted 2020-10-17. Resubmitted 2020-11-13. Final acceptance 2020-11-14. Final version published as submitted by the authors.

Determining Factors in the Perception of Cyberbullying in Victimized Adolescents: Psychoeducational Implications

<https://doi.org/10.3991/ijet.v15i24.19309>

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Abstract—The knowledge of the perceptual structure that victims have of the cyberbullying phenomenon favors the adjustment of prevention and intervention programs. However, there are few studies that try to find out what are the factors that influence the construction of a certain perceptual structure on cyberbullying, let alone those that focus on a population such as victimized adolescents. This paper aims to know the perceptual structure that victimized adolescents have about cyberbullying, as well as the factors that determine the construction or modification of this structure. The sample consisted of 2148 adolescents (49.1% girls) of ages from 12 to 16 ($M = 13.9$; $SD = 1.2$). The results have shown that in the victims' perceptual structure the key factor is the intention to harm, closely linked to the asymmetry of power and publicity. Anonymity, revenge and repetition are also present in this structure, although its relationship with cyberbullying is indirect. Likewise, the results indicate that victimization experiences, as well as the intensity of the aggressions suffered, play a mediating role in the formation and modification of this perceptual structure. These results allow defining risk factors that would promote the durability of the victim's role and the conversion of victims into poly-victims. Knowledge of this perceptual structure provides key elements for the design of psychoeducational prevention and intervention programs in cyberbullying.

Keyword—Digital violence; intentionality; prevention; risk factors; secondary education

1 Introduction

After its emergence, the use and popularity of the Internet has been extended to the point that it is difficult to conceive life without this virtual network. One of the main achievements that the Internet has brought is the creation of a space which, although it is not physical, is very real: cyberspace. Cyberspace surpasses physical and social limits, and blurs the norms defining when and how to interact. This virtual space has also created numerous cyberscenarios that have become the bases for the virtual relationships that have arisen in diverse and numerous social networks [1]. Social

networks and instant messaging applications allow users to interact socially either person-to-person or within groups. This is the case of the most popular social networks among teenagers and young adults: Facebook, Instagram, Twitter, and WhatsApp [2].

Access to these tools from an early age is also exposing children and teenagers to dangerous situations, both in physical and virtual contexts, which they often know little or nothing about. Inability to control the use children and teenagers make of the Internet, and the lack of supervision by caregivers and parents is directly related to a series of negative consequences which have a direct influence on the daily lives of young people [3].

1.1 Cyberbullying: A construct in continuous definition

During the last two decades, research on cyberbullying has multiplied and diversified so much that it seems to be a resolved topic. However, there are still many controversies around this construct nowadays [4-6].

Some authors consider the conceptualization of cyberbullying as the existence of certain characteristics or criteria that enable to differentiate between cyberbullying and other acts of aggression carried out through technological and cyber means [7]. Among these criteria, at least five can be mentioned: intention to hurt, imbalance of power, repetition of harm, anonymity, and publicity. Regarding the intentionality to hurt criterion, in the cyber context, the detection and application of this criterion involves certain difficulties related to the lack of face-to-face communication, the ignorance in many cases of the identity of the aggressor, or the aggressor's ignorance of the consequences that their actions have for others [8]. On the other hand, as stated in Ref. [9] for younger people who spend many hours connected to social networks and other digital platforms, they can interpret the aggressions as playful acts or jokes. In these cases, the intentionality of the damage is masked and may no longer be perceived.

A second criterion that defines cyberbullying is the repetition of the aggression. But understanding this criterion in a cyber world can take on some nuances. In cyberspace, the repetition of the aggression or the damage caused does not necessarily imply that it comes from the same person or groups of people. As stated in [10], in virtual contexts it is not as important the repetition of the aggression as it is on the victim to repeatedly feeling the abuse. When the aggression runs through social networks, it is stored in the cloud or on the peers' terminal and the material can be spread causing repeated damage to the victim. This fact may happen even if the material is not disseminated. The victim knows that other people have it and experiences fear and continuous harm [11]. understand that the criteria that define cyberbullying can be related and interdependent among them. In this sense, they point out that the repetition of abuse implies intentionality. An abuse that occurs repeatedly towards a person cannot be labeled as an isolated event, but as an intentional behavior [12].

As with the bullying construct, the imbalance of power is a distinctive characteristic of cyberbullying. As stated in [13], in cyberspace, the imbalance of power (which implies an emotional, social, or psychological superiority) is materialized mainly in

provoking situations in which the victims cannot defend themselves. For the creation of these situations, it is necessary for the aggressor to have knowledge, mastery and competence in technological means substantially superior to those of the victims [10]. This ICT domain can be used to impersonate the victim and disseminate private content, to hide the identity of the attacker, to exclude someone from distribution lists, etc. [14]. As stated in Ref. [13] imbalance of power acquires a social dimension to which adolescents attach considerable importance. Having more followers or more 'likes' to the uploaded content almost automatically makes them popular and, in some way, leaders of their peer groups. As with other criteria, the power imbalance has been linked to the intention to hurt [15] or to the concealment of the identity of the aggressor [11].

The anonymity of the aggressor is considered another identifying criterion of cyberbullying. Unlike face-to-face contexts where it is very difficult to hide the identity of the aggressor, in cyberspace it is very simple with minimal technical knowledge. Specifically, as stated in Ref. [16] being able to hide their own identity prompts some young people to initiate reprisals against their peers to prove to themselves their ability to hurt others, among other things. These actions are impossible to be done in physical contexts, but the possibility of not being identified opens the door to aggression in cyberspace. However, some studies suggest that despite attempts to conceal identity, victims know or intuit who their aggressors are. The type of aggression received, as well as the time and context in which it occurred, reveal important information about the perpetrator. This generally belongs to their most immediate social environment (group of friends, school, neighborhood) [10,17].

A fifth identifying criterion of cyberbullying corresponds to the uncontrolled dissemination of the abuses suffered by the victims. However, there are researchers who question dissemination as a defining criterion of cyberbullying [18]. Its importance is placed in its ability to contribute to the severity of the aggression [15].

1.2 What do teenagers understand by cyberbullying?

Previous studies warn that the perception that adolescents have of some phenomena such as bullying, or cyberbullying do not coincide with the definition researchers have [19]. These discrepancies contribute to the creation of two very different realities in which adolescents define an abuse as a joke that, in contrast, researchers describe as an episode of cyberbullying. Knowing the defining characteristics of cyberbullying for adolescents will allow to adjust the prevalence data, as well as reorienting prevention and intervention programs against violence.

Beyond the debate on the number of criteria that adolescents use to define cyberbullying, other research has focused on the analysis of the relationship that is established between some of these criteria and the hierarchical nature of these relationships. As stated in [20] analyze the link between intention and repetition in a sample of 287 children aged 11 to 12 years. These researchers conclude that children and adolescents do not have a clear definition of cyberbullying. In particular, they point out that the perception young people have regarding this construct is highly variable and arbitrary and it is very difficult to determine whether the relationship

between intentionality and repetition is a defining characteristic of cyberbullying. Other researchers recognize the complexity in determining adolescents' perception of cyberbullying but they also find that many young Europeans associate repetition and intention, since if aggressive behavior is repeated, there must be an intention to hurt the victim [21].

The greater relevance of certain criteria over others is also studied by [15] with samples from different European countries. Their results show that there are two criteria that adolescents attach particular importance to in differentiating a cyberaggression from an episode of cyberbullying: intent and imbalance. However, these conclusions are not shared by other researchers. As stated in [22] when analyzing the definition that young Australians give to cyberbullying, the intentionality and imbalance criteria are not the most characteristic and are sometimes absent. These researchers include a new variable to study in the definition of cyberbullying: the impact that aggressive behavior causes on the victim. Other criteria analyzed are anonymity and publicity. Although the researchers consider them the key factor in the definition of cyberbullying, adolescents highlight their importance in measuring the impact of aggression, but not in differentiating a specific aggression from an episode of cyberbullying [15, 21]. The evidence of ambiguity and arbitrariness in adolescents' definitions of cyberbullying is found in the contradictions among the different studies that have analyzed this topic. Studies using samples of Swiss adolescents conclude that the public dimension of the assaults is not only an essential characteristic of the definition of cyberbullying, but it is also a fact used to determine the severity of the harm caused to the victim [23].

The interest that this topic has provoked in the research community, it has led researchers from different countries to analyze the perceptions that their adolescents have of a phenomenon that threatens public health. As stated in Ref. [8] although adolescents include five criteria in the definition of cyberbullying, they do not apply them to all types of abuse. Specifically, they warn that these five criteria are only explicitly present in visual abuses related to the uncontrolled dissemination of compromised and harmful material, as well as identity theft. On the contrary, they point out that these five criteria do not appear simultaneously when it comes to including abuses linked to exclusion or verbal or written aggressions in the definition of cyberbullying. In these cases, the number of defining criteria decreases.

After a decade trying to determine how adolescents perceive and define cyberbullying, the results obtained do not offer a clear picture. The differences in the study samples, and in the data, collection instruments, among other factors, cause a huge disparity in the results that makes difficult to understand why adolescents sometimes classify the same cyber-aggression as an episode of cyberbullying and other times they do not [24]. The review of the scientific literature shows that there has been many studies focused on the analysis of adolescents' perceptions of cyberbullying. However, very few have included in these analyzes the application of these perceptions to the different modalities in which this phenomenon can manifest itself. Undoubtedly, a more complete study should include not only knowledge of the criteria that adolescents use to define cyberbullying, but also an exhaustive analysis of the aggressive behaviors to which these criteria apply and why other cyber-aggressions

are not included within this definition. Access to these perceptions and beliefs would provide very relevant information that would allow us to understand why the problem of cyberbullying persists and why the victims tend to increase the durability of their role. The present study aims to contribute new results to the analysis of this topic by focusing the study sample on victims of cyberbullying. The objectives pursued are:

- 1) To determine the criteria that victims use to define cyberbullying
- 2) To analyze whether the type of victimization suffered modifies the perception of cyberbullying and the modality in which it manifests itself

2 Method

2.1 Participants

The sample consisted of 2148 adolescents (50.9% boys and 49.1% girls; $SD=.5$) of ages from 12 to 16 ($M=13.9$; $SD=1.2$). To select the participants, we applied a stratified multistage, approximately proportional, sampling procedure with conglomerates and random selection of groups in public secondary schools in which Compulsory Secondary Education (ESO) is taught. The strata considered were the provinces and geographical areas of Extremadura (Spain), selecting towns in the north, south, east, and west of the region, and taking their different socio-cultural contexts into account. The conglomerates used were the secondary schools. In each school, one of the four courses making up the ESO (1st year, ages 12-13; 2nd year, age 14; 3rd year, age 15; and 4th year, age 16) was selected at random.

2.2 Instrument

The instrument used for the collection of data was a questionnaire of 28 questions grouped into nine blocks. The first block consists of three questions that allow one to identify whether the adolescents consider themselves to be aggressors, victims, or witnesses of cyberbullying. From this identification, we can analyse how they behave in the rest of the questionnaire, i.e., what perception they have of the phenomenon of cyberbullying. These first three questions also provide insight into how often during the last three months they had committed, been victims of, or observed cyberbullying episodes. The scale used comprised four values: 'never', 'once or twice', 'once a week', and 'several times a week'. This scale has been used in many studies analysing the prevalence of cyberbullying [25]. A respondent is considered to have played the role of aggressor, victim, or witness when they say they have been involved at least 1 or 2 times in some of the behaviours they are presented with. The item used to identify the victims is the following, for which they have to indicate indicate how often during the past three months they had suffered any of the following behaviours:

- 1) I have been insulted through the mobile phone or Internet
- 2) I have been threatened or blackmailed through the mobile phone or Internet

- 3) Lies and false rumours have been spread about me through the mobile phone or Internet
- 4) I have been removed from contact lists on social networks, group chats, or emails so as to exclude me
- 5) I have had someone pretend to be me, and my email, private chat rooms, or social network profile have been accessed without my permission
- 6) They have sent by mobile phone or Internet incriminating photos or videos, which are denigrating or demeaning to me
- 7) They have recorded fights in which I participated and spread them through mobile phones, social networks, or other cyber means
- 8) They have sent sexual or erotic type of content in which I took part

The items used to identify witnesses and aggressors are similar. For example, instead of asking them to indicate whether they felt threatened, we asked if they have threatened another student (in the case of the aggressors) or have seen another student threatened (for the witnesses).

A reliability analysis of the instrument showed satisfactory internal consistency of the blocks of items aimed at identifying the victims (Cronbach's alpha: $\alpha=.84$).

The questionnaire's 25 remaining questions aimed at determining the perception of cyberbullying and the modalities in which it manifests itself. The 25 questions are grouped into 8 thematic blocks corresponding to the different modes in which this phenomenon manifests itself in accordance with the "type of behaviour" criterion: Insults (including homophobia), threats (including blackmail), spreading false rumours, exclusion (from contact lists, social networking, etc.), identity theft, sexting, posting denigrating images or videos, and recording and disseminating physical aggressions [26]. Each but one of these blocks comprises 3 questions. The exception is the "insults" mode for which there are 4 questions to try to cover the great variety of types of insults that were encountered. With these questions, we can determine the perception adolescents have of behaviours regarded as manifestations of cyberbullying, and the criteria they use to define those behaviours. The scale comprises 5 values to indicate the degree of agreement with each of the items presented (strongly agree, agree, neither agree nor disagree, somewhat disagree, and disagree). Multi-item measurements help to minimize the perceptual bias of the respondent [27]. A reliability analysis showed satisfactory internal consistency in the block of items designed to access the perceptions of cyberbullying (Cronbach's $\alpha=.79$). We also calculated the degree of internal consistency for each of these 8 thematic blocks. The following are the results: insults ($\alpha=.82$), threats ($\alpha=.71$), spreading false rumours ($\alpha=.76$), exclusion ($\alpha=.78$), identity theft ($\alpha=.85$), sexting ($\alpha=.79$), posting denigrating images or videos ($\alpha=.77$), and recording and disseminating physical aggressions ($\alpha=.82$).

2.3 Procedure

Due to the study involving minors, it was necessary to have the parents' consent, and the approval of the Regional Administration's education inspectors and the different schools' management teams. To obtain the parents' consent, they were sent a

letter describing the nature of the study, the use of the data, and the commitment to confidentiality and anonymity. This letter was accompanied by a form that parents needed to send back to the school if they did not want their children to participate in the study.

The education inspectors and management teams were sent a report in which the objectives of the research, the procedures, and the guarantee of anonymity of the participants were detailed. This was thus in full compliance with the ethical standards governing secondary schools.

Once the consent from the parents and school authorities was obtained, the collection of data consisted in the researchers going to each of the selected schools in turn, where they distributed the questionnaires in each of the classes, and remained in those classrooms until all of the participants who had voluntarily wanted to take part had handed them back filled in.

2.4 Data analysis

From the data collected with the questionnaire, it was to identify the adolescents who define themselves as victim, and performed an exploratory factor analysis to determine whether their definitions of cyberbullying varied according to their role in the different cyberbullying situations they themselves experience.

3 Results

A total of 328 adolescents declared themselves to be victims of cyberbullying (131 boys and 197 girls). With respect to the variable corresponding to the type of aggressive behaviour, the descriptive results show that cybervictims are subject to more than one form of cyberbullying (see Table 1).

Table 1. Distribution of cybervictims in the different modes of cyberbullying

	Cybervictims
Threats	141
Spreading false rumours	198
Insults	136
Exclusion	93
Impersonation	87
Sexting	49
Physical attacks	58
Videoclip	167

The resulting KMO index of .85 and a significance level in the Bartlett sphericity test of .001, provided the sufficient guarantee of reliability of the results. The principal component analysis showed that, although in principle up to 7 factors were detected as present in the concept adolescents have of cyberbullying, only 4 explain

the variability of the responses and provide a closer approximation to the general perception that more than 88% of the participants has (see Table 2).

Factor 1. Intent to hurt. This factor groups together the responses of the victims in which they show the intention to hurt in the attacks described. This factor accounts for 43.77% of the variance (see Table 2), has an internal reliability of $\alpha=.83$, and a mean factor loading of .57.

Factor 2. Advertising. This factor includes the responses of the victims in which they warn that the uncontrolled spread of the attacks suffered is a key condition for identifying these attacks as cyberbullying episodes. This factor accounts for 23.17% of the variance (see Table 2), has a moderate internal reliability ($\alpha=.69$), and a mean factor loading of .55.

Factor 3. Imbalance of power. This factor includes the responses in which the victims evidence the imbalance of power in favour of the perpetrator and place it as a necessary criterion for such aggression to occur and can be classified as cyberbullying. This factor accounts for 13.78% of the variance (see Table 2), has high internal reliability ($\alpha=.77$), and a mean factor loading of .53.

Factor 4. Form of social relationship. This factor includes the responses of the victims in which the attacks described are interpreted as a form of harmless relationship and fun among adolescents. This factor accounts for 10.01% of the variance (see Table 2), has a moderate internal reliability ($\alpha=.78$), and a mean factor loading of .50.

Table 2. Total variance explained by the components

Component	Initial eigenvalues			Extraction sums of squared loadings		
	Total	% variance	Cumulative %	Total	% variance	Cumulative %
1	5.81	43.77	43.77	5.81	43.77	43.77
2	3.16	23.17	66.94	3.16	23.17	66.94
3	1.98	13.78	80.72	1.98	13.78	80.72
4	1.43	10.01	90.73	1.43	10.01	90.73
5	0.68	5.39	96.12			
6	0.42	2.82	98.94			
7	0.17	1.06	100			

Extraction method: Principal component analysis

The factor extraction indicates that there are three key criteria that the victims use to define cyberbullying: ‘intent to hurt’, ‘advertising’, and ‘imbalance of power’. Nevertheless, they only attribute all three criteria simultaneously to impersonation (see Table 3).

Table 3. Total variance explained by the four principal components: cybervictimism

	Components			
	1	2	3	4
Definition of cyberbullying	.742	.541	.529	
Threats	.529	.487		
Spreading false rumours	.453			.348
Insults				.364
Exclusion	.587	.391		
Impersonation	.615		.322	
Sexting	.628		.327	
Physical attacks	.503	.569		
Videoclip	.416	.488		.501

Extraction method: Principal component analysis

Rotation method: Varimax. The rotation converged in 8 iterations

The results for the intentionality factor show that victims perceive all the forms of cyber abuse considered in the present study, except insults, to be committed with the objective of causing harm to peers. Beyond the identification of isolated criteria, the results of this work confirm that victims establish very close relationships between pairs of criteria. This is the case, for example, of the intention to hurt and the spread of aggression when applied to abuses that take the form of threats. In this type of aggression, the imbalance of power is not a relevant criterion, nor it is related to intentionality. On the other hand, it is evidenced that victims do not classify the spread of rumours and insults as aggressive behaviours on many occasions, since they do not perceive intentions to hurt. On the contrary, they interpret them as jokes, playful forms of interaction or simply as mechanisms of interaction between young people. In other forms of aggression, the intentionality criterion is present in a very evident way. This is the case, for example, of exclusion and physical attacks. Regarding physical aggression, no one hits others except with the aim of harming them, especially in a society in which physical aggression is socially punished. Regarding exclusion, adolescence is an evolutionary stage where the relationship with peers is so important that the mere thought of feeling excluded causes fear. That is why they interpret that when someone wants to exclude them, he hides a desire to hurt them.

4 Discussion

This study has shown that adolescents and researchers have different ways of describing and interpreting reality. Of the 5 criteria considered identifiers of cyberbullying, the victims detected in this study only recognized three: intention to harm, imbalance of power and publicity. The absence of the repetition criterion may perhaps be justified by the relationship that this criterion has with advertising [15]. However, anonymity is not a key criterion, probably because victims intuit who their aggressors may be. For them it does not make sense that an unknown person knows their weaknesses and attacks them [22]. In addition, many of these attacks have already started in physical contexts [28]. What causes the virtual space to have great importance is

the proliferation of the aggressions both in quantity and intensity. In quantity not only because of the repetition of the aggression, but also because of the repetition of the damage caused. Every time an abuse is spread through social networks and it reaches the victim, the same damage is experienced as if it is for the first time.

In this sense, cyberbullying episodes are a continuation of aggression experienced in the school context. The creation of peer support groups can promote the learning of how to resolve interpersonal conflicts, and the development of a capacity for empathy. The establishment and consolidation of a safety net in the form of presential adolescent support groups in classroom contexts, so important at this stage of a person's development, can foster the acquisition of prosocial attitudes and behaviours, and reduce instances of cyberbullying as well as encourage the reporting of such instances.

For the victims, the criterion to which they place the greatest value is the intention to hurt. The factor load reached both in the definition of cyberbullying and in many of the modalities analysed is a proof of this. These results are in line with those of other researchers who state that the main defining criterion of cyberbullying is the intention to hurt [29]. But in a cybernetic context where the identity of the aggressor is not always known, it is difficult to interpret the intentionality of the attacks received. And if this abuse comes through the uncontrolled dissemination of material, victims could not ensure that those who disseminate it have the intention of causing harm. As shown, there are still many questions that remain unsolved regarding the delimitation of identifying criteria for cyberbullying. In this sense, as stated in [22] suggest that perhaps it is time to rethink the intentionality criterion and replaced it by another such as the impact that the aggression causes on the victim. Other studies indicate that for the intentionality criterion to acquire a relevant value, it must be linked to the imbalance of power [15]. These studies offer new perspectives of analysis where it is necessary to review and expand the list of criteria, but also to study the network of relationships that can be established between them.

Likewise, this study reveals that although intentionality is a key factor in identifying cyberbullying, advertising also occupies an important place. The use that adolescents make of social networks and the addiction that many of them have to these forms of relationship and communication, explains why the uncontrolled dissemination of harmful content is interpreted as an act of violence against the victims. However, the imbalance of power acquires less importance, perhaps due to the false belief of equality that social networks give. Instead, other studies insist on giving greater relevance to the power imbalance [21]. These studies insist that the imbalance represents a dynamic of action and reaction microprocesses, so that, as the aggressors become aware of the damage they cause to the victim, they reinforce their perception of power. However, in the case of the victims, these dynamics of action and reaction are not fulfilled. Finally, the explanation that can be attributed to the decrease in the scores obtained in the intentionality factor in some of the cyberbullying modalities is due to the normalization that adolescents make of their abusive behaviour or the aggressions they suffer. This normalization causes that aggressions, suffered or committed, tend to be justified and interpreted as harmless behaviour patterns characteristic of the young population [19].

In the analysis of the relationships between the criteria, as stated in [10] the link between anonymity and power imbalance. In the case of victims, the ignorance of the identity of the aggressor can generate a feeling of greater helplessness, placing him in a situation of inferiority with respect to his aggressor. The reduction of this asymmetry can occur due to the extent that the victim can know the identity of the aggressor to be able to face him/her or mitigate the effects of the damage. If the victim manages to face the situation of defencelessness, their perception of control increases and the asymmetry with the aggressor decreases.

This study highlights the existence of another factor related to the ‘forms of social relationship’ characteristic of adolescents associated with playful themes. Under this label adolescents includes verbal aggressions such as insults, spreading false rumours, or visual abuse such as the publication and dissemination of images or videos. Even victims come to interpret these types of abuse as mechanisms of social interaction that promote communication and interaction between young people. For this, they justify the possible pain they cause or suffer by alluding to the strength of the peer group. The fear of being excluded helps to strengthen this type of justification. Along these lines are the works of other researchers who point out that adolescents internalize and normalize offensive patterns, reducing the severity of the possible effects caused [30-31].

But the contributions of this study are not only limited to offering a description of the criteria that victims use to define cyberbullying. In fact, it also provides access to the interpretation victims have of different forms of abuse, which they sometimes do not consider harmful. From the results of this study, it can be deduced that victims do not have a single interpretation of a specific type of abuse, since they sometimes consider it as cyberbullying and other times as forms of social relationship. The experience of victimization, or the intensity of the damage, can explain this duality of interpretations. There seems to be no doubt in classifying identity theft as an intentional abuse, carried out by someone with greater technical mastery who has the aim of spreading compromised private messages or material. In other words, in this type of abuse, the three criteria that victims use to define cyberbullying coincide.

5 Conclusion

The contributions of this study show that there are still many questions to be addressed in the analysis of cyberbullying. The role played in this case by the victims, the experiences of victimization suffered, the intensity of the aggressions, and the need to belong to the peer group are variables that influence the perception adolescents have of both the concept of cyberbullying and the modalities in which it manifests itself. Technological development and the accessibility that young people have to these types of resources has caused social networks to be one of the main means of relationship and communication for adolescents. In this dual world, the cybernetic part acquires progressively more value and everything that passes through it acquires an overwhelming importance. The absence of face-to-face communication increases

many misunderstandings that adolescents interpret as failures, offenses or aggressions by giving it intentionality to harm.

Knowledge of adolescents' perception of cyberbullying will allow a better adjustment of prevention and intervention programs against violence. If young people do not interpret certain abuses as forms of aggression, or if they justify them by referring to their playful nature, we could encourage victims to become long-term poly-victims.

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Article submitted 2020-10-11. Resubmitted 2020-10-26. Final acceptance 2020-10-26. Final version published as submitted by the authors.

The Effect of Using Songs on Young English Learners' Motivation in Jordan

<https://doi.org/10.3991/ijet.v15i24.19311>

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Abstract—A song is a work of poetry that is typically intended to be sung by human voice many studies have tackled the importance of implementing songs in teaching English as a second language (ESL) showing that they can be very effective in developing student's grammar, pronunciation and vocabulary retention. This paper aims to investigate the effectiveness of using songs on young student's motivation in Jordan. The participants were two different groups from a private school in Jerash. Their motivation was examined with and without implementing music. Analysis of the data using a t- test suggested that using songs in teaching English for young learners was significantly effective in raising their motivation to learn the language. The study also concluded with some implications about the effective use of songs to enhance the effect of these results.

Keywords—Motivation, songs, Teaching English language, young English learner.

1 Introduction

English has become a very important language in the world since it considered to be the language of science, and people realize the importance of learning and teaching English for their kids as well as for themselves. In Jordan English enhances the role of education [5]. It has been introduced to students from kindergarten to university. Though the difference between public and private schools in presenting the language is different, but it still dominates teaching other courses such as science, math, technology and medicine. Because of this importance, children start learning English from kindergartens using different materials and games, and teachers try to imply strategies which make learning English interesting and enjoyable. Learning English starts from this early age to encourage student, to learn the language so that when they grow up, they will be confident to speak and to write.

1.1 Importance of songs

Songs are flexible. They are the product of culture, share values, commitment, responsibility, customs, love, traditions, history, and the characteristics of a spoken

language. They can be used for a number of purposes and there are many reasons why songs can be considered a valuable pedagogical tool. Songs can improve young learners listening, pronunciation and speaking skills as well as their grammar [14]. In addition to this, using songs is considered a type of the active learning strategy which proves to be really effective in teaching foreign languages.

Listening: Despite the different between curricula taught in public and private schools, teachers in both always try to carry out different strategies that will make language acquisition easy for young learners, and to motivate them to learn new vocabulary, pronunciation and grammar. Listening is the principle condition which working with songs relies on. It is represented by receiving and reproducing information. [4] stated that songs have a great effect in the practice of listening, because they are being used in meaningful contexts.

Pronunciation: It is very important for language learner to learn pronunciation of words through music, because most of these words are being sung by native speakers, which means that they are produced with no pronunciation mistakes. These words will be stuck inside their heads, and they will find different accents represented in these songs. [9] stated that it is not important for young language learners to sound like American or British native speakers, but they should be able to communicate in English and music helps them to become familiar with accents and presentation. It offers learners a way to look at contractions, elisions, sounds, words and connected speech.

Grammar: Grammar is an element that could not be ignored in language learning, and it is considered a necessary component of any language teaching program. Since students will be exposed to a great number of rules to learn in English class, it will be very effective if teachers provide students with real authentic condition and try to create a comfortable enjoyable atmosphere, and this is what can be achieved through performing songs. Songs can help students to learn and recall language [7].

Vocabulary: Singing traditional songs, nursery rhymes, and lullabies are essential for babies for their and emotional wellness, educational success [2]. Songs prepare the child's ear, voice and brain for language, and using traditional songs and lullabies can develop the child's ability to present his thoughts into spoken words. Songs teach children How language is constructed, and assist them to acquire it. On the other hand, it is important to use authentic natural language and vocabulary which suit the age they are intended to teach i.e., teaching a language for young learners implies that songs should use action, simple words, and including words of body movements will also be very effective and it will increase their motivation to learn [9].

Importance of motivation: Motivation is considered one of four major elements of learning which are:

- Curriculum
- Readiness
- Intuition
- Motivation [3]

Motivation is essential in learning languages. Educator's planning should use innovative tools that will ensure that the learners will set a task which is challenging

and realistic to keep them involved up to the end [6]. This paper tackles one of these types which is using songs and investigates its influence on young learner's motivation.

1.2 Research questions

1. Does using songs have any effect on motivation of young English learners?
2. Does the gender of young English learners have any effect on their motivation to learn the English language?

2 Literature Review

It is incontrovertible that teachers of foreign languages should implement all available resources and strategies in classrooms including audio, visual, and audio-visual materials to facilitate acquiring the language. Many studies have shown that playing songs while teaching a language could be of a great benefit to the learner.

[13] examined the way in which songs should be used in teaching English for young learners and he found that using songs as task will help learners to transfer words from these songs into daily use and can increase songs repertoire.

In [15] examined the importance of songs in EFL / ESL classrooms. He based upon his experience as an English teacher more than being based upon previous research and he concluded that appositve attitude and environment enhance learning the language and songs are supportive.

[12] examined the supportive influence of teaching English vocabulary learning and retention and they concluded that using songs had a positive effect on both vocabulary learning and vocabulary retention and these two items were not affected by the gender of participants.

[16] investigated the importance of songs in teaching pronunciation for EFL students. She found that listening to songs creates enthusiasm and challenge for learners. She also noticed that students prefer listening to songs to practice pronunciation because they have found them useful for this purpose. According to [8] we don't learn a language but we acquire it, and songs are great opportunity for students to be implemented in language learning.

[10] investigated the way in which a teacher can motivate his students through using activities such as singing, body movement, dancing etc. She carried out a systematic inquiry to collect the data from the subjects and she concluded that using songs can be used with other activities such as dancing and acting to increase student's motivation and confidence to learn the language.

[6] investigated the importance of using songs in teaching English for young learners in Peru. They used the observation and the questionnaire for two groups of students one with songs and the other without songs. They found that songs had a positive influence on student motivation to learn the language.

[1] examine whether songs, lyrics and poetry can improve English language skills, whether age plays a role in learning via these means. The study also aims to

investigate the possible factors that could encourage or discourage teachers from using songs and poetry, and whether teaching experience would influence teacher's use of songs as teaching method. The findings revealed that these ways of teaching could help learners acquire foreign language skills and that they are more widely used by less experienced teachers.

[18] Trying to consider the relationship between English songs and learning vocabulary by examining the effectiveness of using English songs in English foreign language classes, to improve learning and recalling the new words as a result of making happy classes and high motivated students. The study indicates that English songs play a magical role in teaching new vocabulary, and they should be used as a type of supplementary materials in teaching. Active vocabulary learning is an activity that is seldom paid any attention in most language classrooms. It is here that songs can be of great help. Numerous words that deal with a particular theme or emotion appear in a song. In some songs particular grammatical features occur with great frequency. Such songs, therefore, can be used as a form of reinforcement for the particular structural item.

[19] the research aims to know the perception of fourth year students towards Use animated songs to improve vocabulary acquisition. The results were based on data collected from school is in Bentulu, Sarawak. It shows that merge motion songs as the intervention strengthens the students' vocabulary leads to have good perceptions and positive reactions of the disciples. It shows that Lesson focus varies from Teacher - learner-centered, use of animated songs during the English language lesson, students are motivated and drawn to learn love the English language.

[17] conduct a study to find out the effect of the Google SketchUp application and the need for achievement on students' learning achievements of building interior design. The Google SketchUp application was used in the experimental group, while the PowerPoint Slides were used in the control group. The results show that the Google SketchUp application is more effective than the PowerPoint in the learning of building interior design. For students who have a high need for motivation, using the Google SketchUp application is more effective than using PowerPoint Slides.

3 Methodology

3.1 Participants

This study was conducted in Jerash. In Jordan the mother tongue language is Arabic. However, it is obvious that English is noticeably dominant in some fields of education especially in private schools such as science, technology and math. Education is a dynamic domain which enhances the role of English in Jordan because people are now aware of its special significance worldwide. This may be one of the most important reasons that give rise to the increasing number of private bilingual school where both languages English and Arabic are being taught.

This study was carried out at a private school in Jerash, Jordan. This school, Adam and eve private school.

The participants were students of third grade. In total, they were 24 students divided into two groups 12 students in a control group and 12 in an experimental group. They were almost at the same age – 8 years old. They were 5 males and 7 females in the control and 6 males and 6 females in the experimental group.

3.2 Materials

This study uses both qualitative and quantitative approach. The qualitative approach uses observation templates (appendix 1) filled by the research to collect the data about students' attitude and about students' attitude and behaviour toward the lesson with songs and the lesson without songs. These templates were divided into four sections which measure student's motivation, participation, attention and interest.

In the interviews, the questions were almost the same questions asked to students after two different classes one without using songs but using the traditional way of teaching for the control group and the second was after a class with songs performed.

Considering that the participants were children, the questions were asked to students in Arabic then they were translated into English. In the interviews the participants were asked individually and the researcher filled in the questions. These questions were meant to measure interest, importance and motivation of learning English in both traditional and untraditional class environment.

The aim of this test is to find out the differences in students' participation, interest and motivation in the two groups.

3.3 Procedure

Interviews were carried out after attending two English classes, a class in which songs were being performed and another without songs. To analyse the collected data in the observation a matrix in Microsoft word was created to compare the observers notes about the two groups performance.

The aim of the descriptive analysis was to generate frequencies and percentages, while observations provide the observers perspectives about students' attitudes and interviews provide students perspectives about using song in class rooms.

4 Results

The following table shows students perceptions and attitudes about classes in which songs were and were not used for each group. In most questions the difference in students' perceptions can be simply noticed between the two groups. Students in the experimental group liked English class where songs were performed, and their attitudes were positive.

Table 1. Attitudes of third grade students about their English classes with and without music .

Do you like learning English	Without songs	With songs
	Group A, N = 12%	group B, N=12%
No, or a little bit	5 (% 42)	2 (% 17)
I don't know	0%	1 (% 8)
I like it	7 (% 58)	9 (% 75)
Do you like participation in English classes?		
No, or a little bit	2 (% 17)	1 (% 8)
I don't know	2 (% 17)	0 %
I like it	8 (% 67)	11 (% 92)
How did you find this class?		
I did not like it	3 (% 25)	2 (% 17)
I don't know	1 (% 8)	0 %
I like it	8 (% 67)	10 (%83)
What is the most interesting thing about English classes?		
Reading stories	2 (% 17)	1 (%8)
Writing exercises	2 (% 17)	2 (%17)
Singing songs	2 (% 17)	4 (%33)
Watching videos	3 (% 25)	3 (%25)
Acting sketches and speaking	3 (% 25)	2 (%17)
Do you think English is important?		
No, or a little bit	1 (% 8)	1 (% 8)
I don't know	1 (% 8)	0 %
Yes, I do	10 (% 83)	11 (% 92)

4.1 Motivation

Analysis of observation templates shows that in class with no songs some students did some activities during the class such as talking to each other, taking a look at the English book and some of them started looking at the decorations in their classroom. Some of them were not following the teacher's directions and she had to call them by names to tell them the instructions individually.

On the other hand, in class with songs playing students were happy and they were following the teacher's instruction. students were happy to participate and to work together even without being given instructions to do so. The general environment in the class was positive and students were singing during and after the class.

4.2 Participation

In the class with no songs, students participated during the first 15 minutes, and then they started to feel bored. Sometimes the teacher had to repeat the question in order to get the correct answer and to motivate those who were not participating in the class.

In class with songs performed most students liked to participate in the class. It was noticeable that some students who had poor English and rarely participate in class

were happy to participate some of their answers were not correct but they were happy and singing songs.

4.3 Interest

Regarding interest, it was obvious that some students were not interested in the class where any songs were played. Some of them stopped the teacher and asked her about the exercise they were doing. Some of them were writing down answers from the board without trying to find out the way in which the exercise was done. While in class with songs playing students showed a great interest in class. They were following instruction and tried to be chosen by the teacher. They were singing happily even after the song had stopped.

4.4 Attention

In classes with no music, students were paying attention in the first 15 minutes, and then they started to be distracted. Some students who were sitting in the back were talking to each other and some of them were drawing. Even some of those who were not talking, they were absent minded. But in classes with music students were paying attention to everything the teacher said. Some of them tried to come up with innovative ideas to relate the song with their lesson and they were happy to listen to the teacher's comments because they want to get ready to listen to the next song. It was clear that students were quieter and paying more attention in classes with songs performed.

5 Discussion

To answer the first question which is:

Does using songs have any effect on motivation of young English learners?

The Independent-Sample t-test was used to examine the differences in the average between the experimental group and the control group towards the effect of the using songs on student's motivation toward learning English. Table 2 illustrates this:

Table 2. T-test results to examine the differences in the average between the experimental group and the control regarding the effect of the using songs on student's motivation of towards learning English.

Group	Number	Means	Std. Deviation	Df	T	Sig.
Control group	12	5.66	2.10	22	-1.65	0.01
Experimental group	12	7.00	1.86			

Table 2 shows statistically significant differences at the level of ($\alpha = 0.05$) between the responses of the experimental group and the control group towards the effect of using songs on student's motivation towards learning English. The value of the t-test (-1.65) is a statistically significant value (0.01), indicating differences between the

two groups and for the benefit of the higher arithmetic mean which is the experimental group, which means that using music in teaching English for young learners had a positive effect on their motivation to learn the language which is the answer to the first question.

To answer the second question which is:

Does the gender of young English learners have any effect on their motivation to learn the English language?

To answer this question, the Independent-Sample t-test was used to examine the differences between males and females average towards the effect of using songs on student's motivation to learn English. Table 3 illustrates this.

Table 3. The results of the t-test show the differences in the average between males and females regarding the effect of using songs on student's motivation to learn English.

Group	Number	Means	Std. Deviation	df	T	Sig.
Male	12	12.00	2.28	22	2.15	0.607
Female	12	11.33	2.19			

Table 3 shows that there are no statistically significant differences at the level of ($\alpha = 0.05$) between the mean responses of males and females with regard to the effect of using songs on student's motivation to learn English. The value of t-test (2.15) and the level of significance (0.607) are non-statistically significant, and this indicates that there is no difference between males and females. This means that there is no difference in motivation between males and females toward learning the English language because of using songs, and this is the answer to the second question.

6 Conclusion

The results indicate that using songs had a positive influence on student's motivation. This could be easily noticed through the results of the observation and the interview. There was a noticeable change in student's behaviour and attitude to learn English between classes with no music to the classes with music.

In the descriptive question "What is the most interesting thing about English classes?" the number of students who responded that they prefer music increased in the experimental group. This is because singing songs could be considered more interesting and enjoyable than other activities and the learners can find simple sentence structure and sentence pattern that can become set in his or her mind. It's also because songs can rouse students to sing and interact with action songs.

The results also indicate that there is no significant difference in motivation regarding the gender because both of them experience a positive influence with songs.

6.1 Pedagogical implication

The results of the study show that using music has a great effect on student's motivation. Teachers should take such results into consideration within the lesson plan. They should use different kinds of music in classrooms to improve student's pronunciation, grammar, listening and pronunciation. Songs should be part of our syllabus and textbooks.

Teachers can also use it in EFL teaching because their words can stick in their minds. There should be further research on the type of activity that can be used songs.

7 Acknowledgement

I acknowledge Dr. Richard Garret for his assistance in carrying out this research and Dr. Rajai Al-Khanji for his guidance and support.

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Article submitted 2020-10-04. Resubmitted 2020-10-29. Final acceptance 2020-10-30. Final version published as submitted by the authors.

10 Appendix 1

The song included with the third-grade curriculum to explain (the use of must and mustn't) rule. Action pack, Unit 10 page 41:

- On a bus trip, you must sit down. You mustn't stand up
- And you mustn't shout.
- On a school trip, you mustn't forget your lunch and water,
- and a hat for your head.
- Look for animals on a mountain walk.
- Listen to the guide and you mustn't talk.

11 Appendix 2

Table 4. Observer's notes

Behavior	Notes
Motivation	
Participation	
Attention	
Interest	

12 Appendix 3

Interview questions
Tick the correct answer.

1. General information

How old are you? -----

1. Do you like learning English?
 - (a) Nothing ☐
 - (b) A little bit ☐
 - (c) I don't know ☐
 - (d) I like it ☐
 - (e) I like it a lot ☐
2. Do you like participation in English Classes?
 - (a) Nothing ☐
 - (b) A little bit ☐
 - (c) I don't know ☐
 - (d) I like it ☐
 - (e) I like it a lot ☐
3. How did you find today's class?
 - (a) I didn't like it at all ☐

- (b) I didn't like it ☐
- (c) I don't know ☐
- (d) I liked it ☐
- (e) I liked it a lot ☐
- 4. What encourages you to learn English?
 - (a) Reading stories ☐
 - (b) Writing exercises ☐
 - (c) Singing songs ☐
 - (d) Watching videos ☐
 - (e) Acting sketches and speaking ☐
- 5. Do you think it is important to learn English?
 - (a) No, I don't. ☐
 - (b) Not very much ☐
 - (c) I don't know. ☐
 - (d) Yes, I do ☐
 - (e) Yes, it is very important. ☐

Four Reasons: The Garden and Its Double

Case Study

<https://doi.org/10.3991/ijet.v15i24.19323>

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Abstract—Analysis of an experimental educational methodology aimed at professional development in the field of visual arts. For this, it is based on the experimental and expository proposal consisting of the use of site-specific sculpture as a creative and methodological strategy for the exploration of the line of own research of students of plastic arts degree and pre-doctoral postgraduates. The selection of the students/artists was made based on the creative research lines they develop, examples of works that start from considering the sculptural as intrinsically related to the environment, and more specifically with the natural environment from a phenomenological and structural point of view in terms of artistic experience; and also, from a point of view of sculptural linguistic research based on the Kraussian foundations of the expanded sculptural field that formally arise from a Piaget's group.

On the other hand, the exhibition proposal is intended as a framework for deepening production and artistic diffusion oriented to immersion in a professional experience in which all aspects of the creative process can be addressed, from the mere idea to dissemination through from different means of artistic work, so that the training obtained by the artists/students is holistic in terms of the professional field of visual arts.

Keywords—Site-specific; sculpture; expanded field; environment; professional experience

1 Introduction

This contribution is made from the point of view of the analysis of a special case, the artistic exhibit presented on October 4, 2018 in a very special place given its unique characteristics, the Memorial Garden of the San Gabriel Cemetery Park¹ in the city of Malaga, Spain.

¹ This exhibit was one of the fruits of the agreement signed between the public company *Parcemasa*, manager of the cemetery and the University of Malaga in 2014.

The exhibition consisted of the participation of four authors, who have different relationships with the Faculty of Fine Arts of the University of Malaga as they are studying or have completed and have acquired different levels of academic training. Thus, at the time of the exhibition, Tessa Gill is a final year student and is preparing her Final Degree Paper. Samara Martínez is a recent graduate in Fine Arts with a magnificent record like Belén Liebana, and finally, Ana Isabel Angulo obtained her Master's degree in Interdisciplinary Artistic Production from the University of Málaga in the academic year 2015-2016.

The exhibit was configured from the experimental idea by which the selection of works and artists can be made using the concept of expanded field in the sculpture of Rosalind Krauss. art critic, researcher and professor at Columbia University. In other words, the scheme or group of Piaget that she elaborated to synthesize this idea can be an effective selector device with which to elaborate the argument that is articulated through the exhibited works.

2 Methods

The exhibit responds to artistic criteria in the first place, above all the quality of the works, the narrative discourse that emanates and the trajectory or coherence of the artistic production of the authors. But due to the nature of the environment in which the works are located, that is, the Memorial Garden of the San Gabriel Cemetery Park, the works must also respond to two other criteria: Firstly, a correct integration with the environment and secondly, an adequate relationship with the other sculptures.

In order to guarantee the response to these considerations, an open call was implemented for all students, both active and graduates, of the current degrees in the Faculty of Fine Arts. This call established that applicants had to present their work as sculptural intervention projects in a natural environment.

The selection of the proposals was made on the basis of their adaptation to the parameters described above and which, more specifically in terms of art, are a clear narrative and formal commitment to intervention and integration with the natural environment with the marked accent of belonging this reality to the vital human dimension such as the cemetery of the city.

2.1 The site-specific art

As a result of the necessary adaptation of the pieces to this peculiar environment, one of the methodological strategies established for the call for the exhibition is the idea of a work specially made and thought for a specific place, the site-specific artistic method, articulated in the 70s by Robert Irwin².

² Butterfield, J., MacHugh, J., Irwin, R., Turrell, J., Nordman, M., Wheeler, D., ... & Vogel, S. K. (1993). *The art of light+ space*. New York: Abbeville press.

As is already known, by means of this method, the works participate directly with the enclave where they are going to be placed to such an extent that even the narrative structure is determined by the place, and thanks to this, the sculpture returns to its paradigm or essence characteristic prior to the avant-garde, the statuary, although without losing the formal advances in terms of representation or formal language.

That is to say, the projects had to be conceived starting from the notion of a specific natural environment with a high semantic load, since it belongs to another major area that is the San Gabriel Cemetery Park. In this way, the students who wanted to participate had to have this fundamental starting parameter, the works and projects in one way or another would establish a dialogue with this special place, the works or stories that make them up would speak in some way of time, of life or its end, of human nature.

2.2 The expanded field of Rosalind Krauss³ as structure and organizing plot of the exhibition

The adventure of sculpture throughout the centuries has been paradigmatic to understand the different processes and advances of the artistic fact in regard to its first essence. The sculptural discipline has undergone dramatic changes since its academic conception, that is, when the plastic language was limited to the mere representation of forms, human bodies and things, in such a way that the sculpture was the thin layer, the skin, that covers the solid material of the marble⁴.

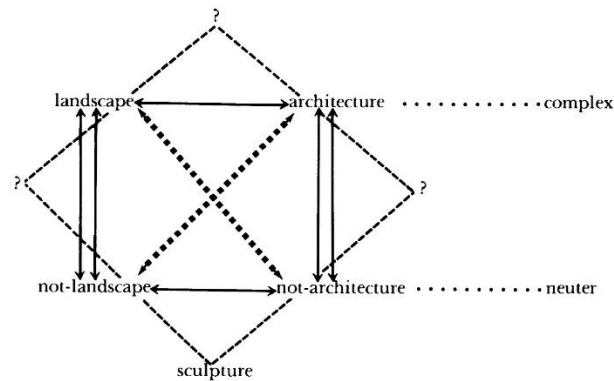


Fig. 1. Krauss scheme in a previous state of its result.

³ Krauss, R. (1979). Sculpture in the expanded field. *October*, 8, p. 33.

⁴ Wittkower, R., & Wittkower, M. (1977). *Sculpture: processes and principles*. New York: Harper & Row.

From the artistic experiences from which Rosalind Krauss builds her fundamental argument, which explain the role of postmodern sculpture in terms of the expanded field in which the fields of expression or scenarios where it is possible to develop them are related, the approach of art to the natural environment or the open environment, and above all, that which is contrary to the architectural interior space of the traditional “white box” museum, has become fundamental spaces where the sculptural can take place in a decisive way. Both for the artistic fact and for the advancement of the sculptural language itself.

For Krauss the situation of the sculptural during the 60s and 70s is extremely critical, because of its objectification, its nomadic character, loss of museum sense and once its form is blurred and dematerialized, the sculpture can be everything and nothing at the same time: [...] The very term we had believed to be rescuing sculpture had begun to be confusing. [...] We had fallen into our own trap, and we thought we were doing sculpture without knowing what the sculpture was⁵.

As was logical, the sculpture assumed its negative character until the maximum exploitation, which, as Krauss indicates, was the result of the combination of non-architecture and non-landscape. Taking logical calculation to its limits, Krauss deduces by means of a graphic “Piaget’s group”⁶ the new possibilities offered to sculptural experiences from the 1970s onwards, which, according to this new expanded field of sculpture, could be marked places, localized constructions and axiomatic structures. With these new options the new proposals that will be carried out in the field of earth works will be configured.

2.3 The classification of each piece according to the expanded field of Krauss

Starting from this phenomenological idea of Krauss’s sculpture, and using her Piaget’s group applied to this discipline, we could see that each of the four main options of the graphic, which Krauss deduces from the relations of the four concepts of the basic square (architecture, landscape, non-architecture and non-landscape) are related outwards two by two, in such a way that the sculpture can be understood as the confluence between the two negatives. The union between the landscape and its opposite generates the signposted sites; in the same way that architecture and its negative give rise to axiomatic structures; and finally, the relationship between architecture and landscape generates a category, the site constructions, which could be on the opposite side of what we understand as sculpture.

⁵ Krauss, R. (1979). *Op. Cit.* p. 37.

⁶ Krauss bases her Piaget group on the so-called Klein group or *Vierergruppe*, a structure devised by the mathematician Felix Klein, in which each element of the whole is its own reciprocal or negative, enabling its logical deductions from the relations of these with itself and with others. For further information: Arfken, G. (1985) *Mathematical Methods for Physicists*, 3rd ed. Orlando, FL: Academic Press, pp. 184-185 and 239-240. And: Robert, S., & Brisson, J. (2016). The Klein group, squares of opposition and the explanation of fallacies in reasoning. *Logica Universalis*, 10(2-3), 377-392.

Applying these results to the selection of the works presented, a selection is made in which each one of the chosen ones could occupy the four spatial options generated by Krauss's scheme, identifying their works with these spatial strategies.

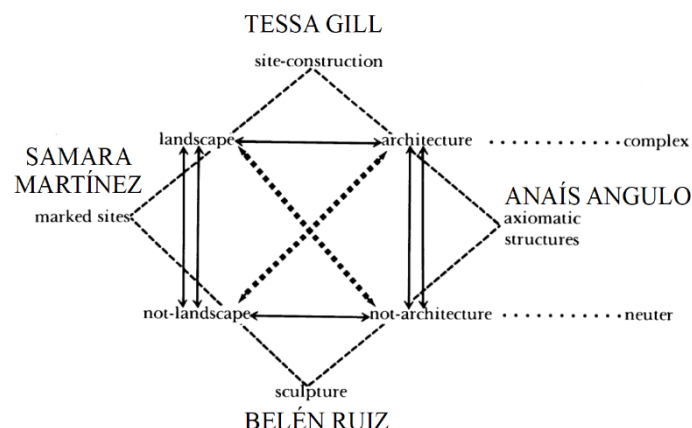


Fig. 2. The Krauss's schema with the results and the artist.

Thus, for the place occupied by the Sculpture, we select the proposal of Belén Ruiz Liébana; for the idea of construction-site we choose the site-specific installation of Tessa Gill; as an example of signposted location Sara Jiménez's installation is shown as the ideal one; and finally, as an example of axiomatic structure Anaís Angulo's work is the most suitable.

2.4 Anaís angulo

Anaís Angulo's piece 8 Desconocidos (8 Unknown) tells us how it is possible to investigate the sculptural language through the paradox of everyday reality and its representation through its most immediate objectivity. This piece becomes a conceptual spring that, through the physical inversion of the place, extracts the space from its base revealing its content while converting its own elements into layers of the subsoil in the way the mirror shows us our virtual and symmetrical image.

By decontextualizing its *povera*⁷ materials as well as the use of everyday objects, extracting them from their usual environment and introducing them into a totally alien environment, it forces us to place ourselves in different simultaneous reading planes, the mattress as a metaphor for the person, its metallic interior that reminds us of the industrial nature of the object and the artificial construction of our habitat.

⁷ The term *povera* corresponds to the meaning of the word associated with the European informalism movement, between the end of the 1960s and the beginning of the 1970s, of *arte povera*, in which artists such as Jannis Kounellis, Luciano Fabro, Richard Serra, Joseph Beuys or Mario Merz, elaborated their works often using humble or organic materials. Celant, G. (1985) *Arte Povera: Histories and Protagonists*, Milan: Electa, 1985.

All these levels intersect, crystallizing in the total relationship with the environment, forming an absolute block that integrates perfectly into this environment, on the other hand so foreign and close at the same time.

Her processual methodology throughout her intense work includes systems of analysis and substantiation of subliminal spatial structures that we find in our urban environment and that substance through the transformation of found objects. Underlying her work is an experiential narrative that takes us back to situationism⁸ and to povera authors such as Kounellis, in which a great personal and biographical plot is evident that transpires throughout her work and that solidifies through these materials and objects, both industrial and referential to memory.



Fig. 3. 8 *Desconocidxs*. Anaís Angulo.2018.

And it is here in this slippery terrain where the author situates her discourse, and does so by invoking the memory of so many forgotten bodies in the bloody crimes committed in the Spanish Civil War. However, it is impossible to avoid the universalizing character of any important plastic work, since the call is necessarily extrapolated to any known war.

As we can see, its narrative and formal corpus adapts perfectly to the consideration of axiomatic structure, above all from the most material and object point of view, the skeletons of the mattresses in the natural environment are placed on a plane that is at the same time stripped of the environment and perfectly adapted to it, in a critical ambivalence that confers it its decontextualization.

⁸ Situationism is the movement of analysis and critique of modern society that facilitated narrative exploration strategies that abound in the mid-20th century postmodern narrative, such as Guy Debord's concept of *détournement*. Debord, G. (1958). *Theory of Drift*. Situationist International, 1.

2.5 Belén ruiz

The work of Belén Ruiz is very different, consisting of various sculptures, *Metamorphosis* and *Transmutation I and II*, which belong to her line of plastic research framed in the concept of metamorphosis and evolution. Her works refer all to the form of an organic capsule or oval organic cover that in some cases is open and in others is not. Their technical implementation varies in the material in each case, varying from metal to methacrylate and white PVC that remind us of authors such as Moholy-Nagy^{9, 10}, but always building from the tape as the silk thread of the caterpillar that wraps itself up.

Like Anaís Angulo, this author uses materials that are artificial and foreign to the natural environment, although her formal allegory structured from the perfect chrysalis speaks to us of the indelible natural heritage to which we all belong. That is to say, her formalist narrative is eminently representative and metaphorical, A instead of B. Her essential concern is the construction of sculptures that amplify this germinal and transforming idea of life, even with her own personal identification with that message.



Fig. 4. *Metamorphosis and Transformations I, II, III and IV*. Belén Ruiz. 2018.

This proposal adheres to the purest sculptural paradigm by which the work is articulated as a purely three-dimensional entity of round bulge, that is, its limits are clearly defined both formally and from a narrative or symbolic point of view. It stands as what it is, it is transparent in its commitment and does not intend to go beyond the mere aesthetic presence as a sculpture itself.

⁹ Blencowe, C and J. (2018). *Moholy's Edit*. Zürich: Lars Müller Publishers.

¹⁰ Botar, O. A. I. (2014). *Sensing the Future: Moholy-Nagy, Media and the Arts* (Vol. 2). Lars Müller Publishers.

Both for the quality of its invoice and for the roundness of its shape, this work is perfectly suited to the place that Krauss determines for the sculpture in her scheme.

2.6 Samara martínez

This artist makes a magnificent ephemeral installation entitled *Ver de vida* (Green life) in which she establishes a dialogue between the everyday objects she uses and the natural environment that she uses as a support. As Otto Piene¹¹ explored in his extensive work from inflatable forms, Samara constructs her work with green balloons and her discourse lies in a veiled critique of the role of man in the natural environment. The destruction of the ecosystem is a basic concern in her work and, through plastic language, she defends nature through the contemplative reflection to which she invites us.

This work offers multiple methodological directions in the plastic, above all we find in this piece high performative capacities. The vital breath of the artist is the one that gives life to the work, as Manzoni¹² presents us in his series of balloons inflated by the artist's *Breath* of 1960. However, Samara makes her installation from innumerable human breaths with which he reconstructs the nature of the tree. This richness of multiple relationships between man and nature presented to us is based only on the humble but vital act of breathing, her own breath as an artist.



Fig. 5. *Ver de vida*. Samara Martínez. 2018

It is a firm defender of the natural environment, despite the industrial object, Samara's work does not end in her exhibition, as an ephemeral piece that is, the remains are collected minutely in order to use them in new proposals in an unfinished process of plastic generation that recalls the vital processes of nature.

¹¹ Piene, O., & Russett, R. (2008). Sky, scale and technology in art. *Leonardo*, 41(5), 511-518.

¹² Celant, G. (Ed.). (1992). *Piero Manzoni*. Milan: Electa.

But it is the skill in choosing the place and the indicative character of the objects that make up the installation that makes the work adapt to the figure of “marked places” deduced by Krauss. The object chosen by the author, the humble globe, is related to the place not only through form but also through color, adapting and camouflaging itself but pointing to the landscape that contains it.

2.7 Tessa gill

Finally, Tessa Gill’s work *Origin* tackles the problems of the environment from an inclusive perspective, as her work aims to take advantage of organic form to extract her own world, which she constructs by means of structured domes with parabolic linear lines. From this formal point of view, a certain parallelism could be established with Belén Ruiz’s work, but its intention is none other than the anthropological exploration of man’s need for the construction of niches-dome to serve as a shelter. Using such natural materials as esparto grass and plaster, her work is formally and conceptually integrated into the medium in which it is shown.



Fig. 6. *Origin*. Tessa Gill. 2018.

It is impossible for us to avoid the povera references of her work, both in the anthropological aspect that reminds us of Mario Merz¹³ and his igloos, and the gestural and processual one that reminds us of the interventions of authors like Eva Hesse in works such as *52 no title* (1969-70), since Gill’s constructions start from the same physical-conceptual presuppositions:

¹³ Museo Nacional Centro de Arte Reina Sofía [MNCARS], (2019). *Mario Merz. El Tiempo es mudo*. Madrid, Spain.

Thanks to the force of gravity of the earth, Gill makes, with primary materials and from nature, her structures which he later invests in the search for the primary habitat. This procedure was also used by Gaudí¹⁴ to calculate the tensile forces in his project for the Cathedral of the Sagrada Familia in Barcelona.

Undoubtedly this architectural reference is one that endows him to be the candidate work to represent the last of Krauss's scheme options, the category of "place construction", because not only are they literal constructive elements, but the installation constructs the place giving it a unique sense, to be the container of the work, the place that receives meaning according to its capacity to receive the construction elaborated by Tessa Gill.

3 Conclusion

As we have demonstrated, the structuring idea of the exhibition, the Piaget group developed by Krauss and its application to the selection of the works that compose it, in addition to the site-specific concepts and the environment as an active element in the reading of the exhibition, become an ideal device for the configuration of the exhibition, hence its name Four reasons: the garden and its double.

In short, there are four interventions of different characteristics but which are intrinsically related to the natural environment by means of various mechanisms to which we have tried to shed a little light. Thanks to these four authors we make the necessary relationship between contemporary art and the environment more evident and we bring the artistic experience closer in one of its noblest expressions, making the human also mean establishing a more enriching aesthetic relationship with the natural environment.

On the other hand, this exhibition strategy has enabled the authors to develop their artistic work in a professional dimension that enables them to tackle future projects. The need to project their work, to devise it according to established and specific parameters of a given place, provide them with experience and useful skills for their work as artists.

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Article submitted 2020-10-27. Resubmitted 2020-11-23. Final acceptance 2020-11-27. Final version published as submitted by the authors

Three Track Teaching Mode of Sports Anatomy Based on Innovative Theory

<https://doi.org/10.3991/ijet.v15i24.18959>

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Abstract—Sports anatomy is one of the compulsory courses in college. It is an important course for undergraduate students to complete the teaching link of practicing. This course is extremely practical and operational, and requires active learning. However, due to the limited classroom time, the increase in the number of students and the shortage of anatomical specimens, the traditional teaching of anatomy fails to inspire students' interest in learning and becomes unable to adapt to the requirements of the times. In this study, a three-track teaching mode was designed on the basis of combining the innovative talent training theory with the characteristics of sports anatomy. The teaching mode in this study is composed of eight learning stages: identifying problems, analyzing problems, generating hypotheses, confirming already-known knowledge, establishing required information, confirming resources, collecting new information, combining old and new knowledge. Meanwhile, case teaching method and team-teaching method were incorporated into this mode. In addition, before, during and after class, 3D anatomy software both in the mobile version and CP version was used to urge students to take the initiative to learn and complete the learning tasks. Finally, according to the purpose of training innovative talents in this study, a new learning performance evaluation system was constructed in accordance with the characteristics of sports anatomy. It was found in this teaching experiment that this new teaching mode is conducive to improving the teaching effect, lays a foundation for promoting the quality of the teaching link of practicing, and stimulates the innovation ability of college students.

Keywords—Three track teaching mode; 3D animation; Sports anatomy; Innovation

1 Introduction

Multimedia technology is the combination of modern teaching media and traditional teaching means, according to the characteristics of teaching and training programs and objects, to formulate the optimal theory and training plan, to achieve the best teaching effect [1]. Multimedia teaching is the product of the development and popularization of computer technology, and is the symbol of the progress from traditional teaching to modern teaching. The research points out that the ideal multimedia teaching has the following advantages: The perfect display of various art forms, the comprehensive realization of a variety of sensory stimulation, and the organic combination of various teaching means [2]. Throughout the current situation of multimedia teaching practice in Colleges and universities, the popularization rate of multimedia teaching is higher and higher, and more and more teachers use multimedia teaching. How to display the multimedia teaching perfectly in various art forms, realize the comprehensive realization of multiple sensory stimulation, and combine various teaching methods organically is a problem concerned in the field of educational technology.

Sports anatomy is the main compulsory course for students majoring in physical education in colleges and universities. It plays an important role in the curriculum system of sports majors. It can not only provide theoretical guidance for sports practice from the perspective of anatomy, but also be the basic course of a series of courses such as sports physiology and sports health science. As a future sports teacher or coach, only by mastering certain knowledge of sports anatomy can they provide more scientific and effective methods and means for sports training and health care [3]. However, the learning effect of the course is often unsatisfactory, and it is difficult to achieve the expected learning objectives. On the one hand, the teaching content of sports anatomy itself is huge and boring, and the professional terms learned are more abstract, which makes it difficult for students to have interest in learning. On the other hand, the students of physical education major have relatively weak theoretical basis, which leads to sports anatomy difficult to improve the teaching effect [4].

Therefore, based on the innovative talent training theory of college students, this study uses the three-track teaching method characterized by heuristic teaching, combines multimedia technology with network teaching platform, and carries out teaching experiments in the course of sports anatomy. At the same time, because the knowledge of anatomy is difficult to understand, a new 3D anatomy virtual technology software is introduced in this study, and the students are guided to use the software to complete the learning task in practice class. It is hoped that this teaching method can improve the teaching effect of sports anatomy through new network teaching technology and vivid teaching video resources, so as to cultivate innovative and qualified sports professionals.

2 State of the Art

Multimedia technology is a hot field of computer education application, which plays an increasingly important teaching aids role in modern education. At the same time, Web3D technology, as a form of virtual reality technology, provides a broad space for the application of virtual reality technology in classroom, serving students. Three-dimensional (3D) animation technology was developed earlier in western developed countries. Due to its high authenticity, feasibility, interest and rich application advantages, it has been widely used in many fields such as medicine, education and so on. For example, Adamovillani et al. [5] applied a computer animation tool of human-computer interaction in mathematics teaching to improve the mathematical skills of deaf children. Adamovillani et al. [5] designed and established a 3D virtual signer model by using the most advanced computer animation technology, and found that the mathematical ability of deaf students can be improved by using interactive 3D animation. Korakakis et al. [6] applied 3D multimedia technology in the learning process of science students, using interactive 3D virtual environment, 3D animations interface and 3D static illustrations interface. The research results show that in the above three ways, interactive 3D virtual environment has the best learning effect. With the continuous breakthrough and gradual improvement of 3D research, some 3D anatomy software focusing on medical education, especially anatomy teaching, came into being. Hoyek et al. [7] applied three-dimensional (3D) digital animation to the teaching of human muscle and skeletal system. The team combined two-dimensional (2D) drawings with three-dimensional(3D) digital animation in PowerPoint slides, and used multimedia technology to present knowledge information in anatomical specimens. The teaching results show that 2D drawing combined with 3D animation teaching technology is more conducive to improve students' interest in learning. Zhou et al. [8] discussed the application of three-dimensional technology in anatomy teaching and the production method of 3D animation. The team uses Autodesk software to 3D model the human body structure picture, uses the 3Ds MAX software to modify, render and set the light to form the three-dimensional structure or organ of the human body, and uses Unity to design the interactive operation interface, and finally presents the 3D structure on the computer or mobile phone. The results show that 3D digital model can improve the teaching effect and get the recognition of students.

With the rapid development of social economy, the requirements of modern society for talents are becoming more and more comprehensive and diversified. In order to cultivate talents to meet the needs of the society, the concept of school education has gradually changed and improved, that is, from the traditional mode of "taking teachers as the main body and students passively accepting knowledge" to the mode in which students can actively learn and accept knowledge. The three-track teaching mode is a teaching method of "student-centered". The three-track teaching mode combines TBL, PBL and CBL. Among them, PBL (problem-based learning) [9] refers to the problem-based learning mode, which is initiated by McMaster university to guide students to learn around the problems set by teachers; In addition, CBL (case-based learning) [10] proposed by German educators and the teaching method is to stimulate

students' thinking ability by proposing, analyzing and discussing cases; TBL(Team based learning) teaching method proposed by Professor Michaelson of Oklahoma university in the United States [11] refers to that through the guidance of teachers, students use team cooperation to complete relevant tasks. In short, the three-track teaching method is a combination of PBL, TBL and CBL. It is a new exploration in the teaching reform. The characteristics of this teaching method are based on constructivism and emphasize the dominant position of learners. For example, Sendag will adopt the OPBL (online problem-based learning) teaching method in the pre service teacher training course. The research collects data through open-ended questionnaire and analyzes the role perception of teachers and learners. The results show that the OPBL teaching strategy is more conducive to the acquisition of knowledge for learners. Similarly, the team-based learning method in the three-track teaching method has been continuously applied, optimized and improved in education, medicine and other fields. For example, Hrynychak et al. [12] applied (team-based learning) to health care knowledge training. Experiments have proved that this teaching method can improve learners' critical thinking ability and team cooperation ability. Wu et al. [13] applied the three-track teaching mode in pediatric teaching, focusing on team cooperation, and further applied the teaching mode to carry out pediatric practice teaching reform. The results showed that the teaching mode was an effective teaching mode conducive to cultivating innovative talents. Cai & Zhang [14] applied the three-track teaching method in the teaching of cardiovascular internal medicine. The experimental results show that the method can greatly enhance students' interest and initiative in learning and improve their comprehensive analysis ability. Although the three-track teaching method applies and research in different courses, the teaching method has also achieved satisfactory teaching effect and student recognition, but there is no relevant research report on the application of the three-track teaching method in sports anatomy course. Sports anatomy is a basic knowledge that a sports major must learn. But the anatomy content is complex and difficult to understand, and there are many and abstract terms. Therefore, it is difficult for students to learn this course well, which puts forward higher teaching requirements for teachers. In this study, three track teaching method is first proposed to be applied in sports anatomy course. At the same time, a new 3D anatomy learning software is introduced. According to the requirements of today's society for college students' innovation ability, the evaluation index of sports majors' innovation ability is formulated on the structure of PDCA (Deming cycle), so as to dynamically evaluate the training effect of students' innovation ability. It is hoped that through the application of new technology and new means in the course of sports anatomy, a new perspective and thinking will be provided for the corresponding teaching reform.

3 Three Track Teaching Mode Based on 3D Animation Technology in Teaching

3.1 Introduction of PDCA cycle in sports anatomy teaching

PDCA management method was a quality management system [15], which was first proposed by American scholar Hugh Hart, and then developed and applied by American statistician and quality management expert Dr. Deming. PDCA is the initials of the words Plan, Do, Check, and Action. The main characteristic of PDCA management method is that it starts from P, goes through D and C stages, and finally starts A stage, which is continuously circulating, rising in a ladder and circulating repeatedly. The details are shown in Figure 1 below.

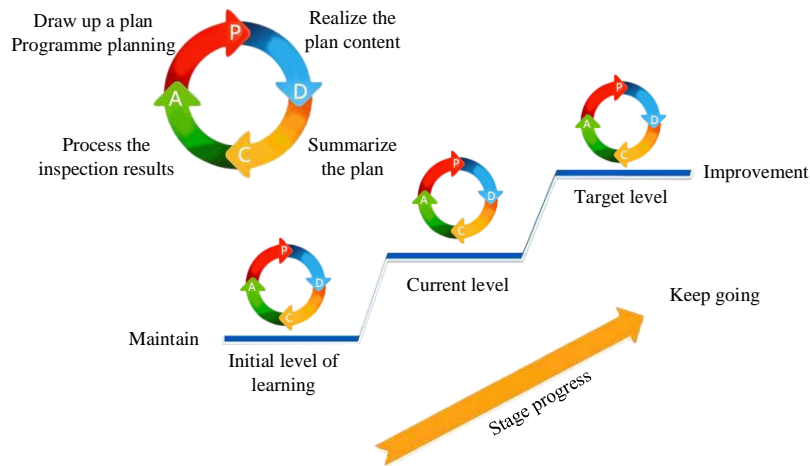


Fig. 1. PDCA cycle teaching mode

It can be seen from Figure 1 that sports anatomy is the core course of physical education. The basic task of this course is to explore and clarify the morphological characteristics and position of human organs and tissues, so as to lay a solid foundation for the study of other basic courses and clinical courses. The course has many knowledge points, complicated professional terms, and some theories and operation skills are difficult for college students to understand. How to strengthen classroom teaching management, improve students' initiative, improve students' innovation ability, actively participate in classroom teaching, let students "learn by doing, do while learning", is an important topic that needs to be studied in depth. As PDCA cycle method is the basic method of total quality management, it is also known as "Deming cycle method". The PDCA cycle is applied to classroom teaching management, corresponding to the teaching plan, teaching plan implementation, checking the implementation effect, and making the high-quality program teaching plan into the teaching standard, which needs to be improved and entered into the next

teaching cycle as the key to solve. Therefore, the classroom teaching management can be continuously optimized and improved.

3.2 Implementation scheme of 3D animation technology combined with three track teaching

On the basis of previous studies, some scholars put forward eight stages of PBL learning: identifying problems; analyzing problems; generating hypotheses; confirming known; establishing required information; confirming resources; collecting new information; connecting old and new knowledge. At the same time, combined with the knowledge to explain in the form of case teaching, and the students form a team to complete the knowledge task assigned by the teacher. The specific implementation scheme is shown in Figure 2.

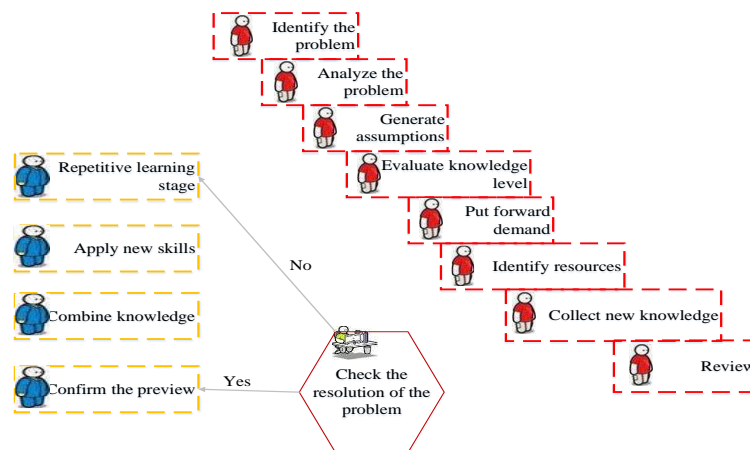


Fig. 2. Implementation scheme of three track teaching method



Fig. 3. Application Part 1 of three track teaching method in sports anatomy teaching



Fig. 4. Application Part 2 of three track teaching method in sports anatomy teaching

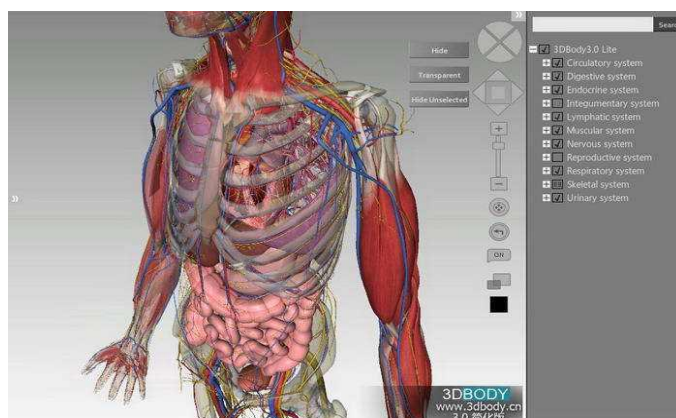


Fig. 5. Display of sports anatomy teaching design combined with 3D anatomy software

As can be seen from figure 3-4, the implementation plan of the three-track teaching method in the classroom mainly includes the following links:

- 1) Based on the full analysis of the curriculum system and structure, the teachers carefully design the curriculum in advance, prepare sufficient course materials such as cases, videos, and problems to be discussed, and sort out and organize the knowledge points of the course according to their own wishes
- 2) Before the formal opening of the class, teachers should familiarize with the class first, guide the students into groups and implement the team leader, arrange the teaching content 1-2 weeks in advance, and require students to read and digest the course content in groups
- 3) In the course of teaching, the students are seated in groups, and the students' mastery and application ability of professional knowledge are comprehensively cultivated through the methods of topic discussion, group display, simulation confrontation, practice design and so on

- 4) After class, with the help of 3D sports anatomy software and multimedia teaching platform, teachers and students can communicate, answer questions, exchange experience, and adjust teaching methods and contents in time
- 5) The corresponding system is formulated to evaluate the learning effect of students. The students' classroom performance, group speech, question answering level, final examination and other links are quantified and included in the total classroom score according to a certain proportion.

Figure 5 shows the application of 3D anatomy software in the teaching process of sports anatomy. In this study, the free version of 3D body of mobile phone is applied. The APP is installed in the mobile phones of teachers and students. The 3D body is often used as a medium for discussion or review between teachers and students

3.3 Establishing the quality evaluation system of three track teaching method based on innovation theory

The deepening reform of innovation education is not only the urgent need of the national implementation of innovation driven development strategy, but also an important driving force to promote the rapid development of economy and society, and is also a key measure for the comprehensive reform of university campus and the strengthening of talent training in colleges and universities. Compared with the developed countries which take the lead in innovation driven development, Chinese college students generally have the problems of insufficient innovation spirit and low innovation ability in innovation and entrepreneurship. The main reason is that in the process of theoretical research and practice in colleges and universities, the interpretation of the connotation of innovation ability and the setting of training objectives are still in the initial stage, and there is no unified standard. Therefore, according to the course characteristics of sports anatomy and the application effect of the three-track teaching method, this study established a scientific, reasonable and unified evaluation index system of college students' innovation ability. The mathematical expression of factor analysis method is matrix: $X = AF + B$, namely:

$$\begin{cases} X_1 = \alpha_{11}f_1 + \alpha_{12}f_2 + \alpha_{13}f_3 + \cdots + \alpha_{1k}f_k + \beta_1 \\ X_2 = \alpha_{21}f_1 + \alpha_{22}f_2 + \alpha_{23}f_3 + \cdots + \alpha_{2k}f_k + \beta_2 \\ X_3 = \alpha_{31}f_1 + \alpha_{32}f_2 + \alpha_{33}f_3 + \cdots + \alpha_{3k}f_k + \beta_3 \\ \dots\dots\dots \\ X_p = \alpha_{p1}f_1 + \alpha_{p2}f_2 + \alpha_{p3}f_3 + \cdots + \alpha_{pk}f_k + \beta_p \end{cases} \quad (k \leq p) \quad (1)$$

In the model, vector $X (x_1, x_2, x_3, \dots, x_p)$ is an observable random vector, that is, the original observation variable. $F (f_1, f_2, f_3, \dots, f_k)$ is common factors of $X (x_1, x_2, x_3, \dots, x_p)$. $A (\alpha_{ij})$ is the coefficient of common factor $f (F_1, F_2, F_3, \dots, F_K)$, which is called the factor load matrix, $\alpha_{ij} (i=1, 2, \dots, p; j=1, 2, \dots, K)$ is called factor load, which is the load of the i -th original variable on the j -th factor, or α_{ij} can be regarded as the weight of the i -th variable on the j -th common factor. α_{ij} is the

covariance of x_i and f_j , and is also the correlation coefficient between x_i and f_j , indicating the degree of dependence or correlation of x_i on f_j . The larger the absolute value of α_{ij} , the greater the load of common factor f_j for x_i . $B = (\beta_1, \beta_2, \beta_3, \dots, \beta_p)$ is the special factor of $X (x_1, x_2, x_3, \dots, x_p)$, is the part that cannot be included by the first k common factors, and this factor is also unobservable. The special factors and the special factors and all the common factors are independent of each other.

The common degree of variables is the sum of squares of the elements in row i of factor load matrix A . As follows:

$$h_i^2 = \sum_{j=1}^k \alpha_{ij}^2 \quad (i=1, 2, \dots, p) \quad (2)$$

Take the variance on both sides of Formula 1 and get the following result:

$$\text{Var}(x_i) = \alpha_{i1}^2 \text{Var}(f_1) + \alpha_{i2}^2 \text{Var}(f_2) + \dots + \alpha_{ik}^2 \text{Var}(f_k) + \text{Var}(\beta_i) = \sum_{j=1}^k \alpha_{ij}^2 + \sum_{i=1}^p \beta_i^2 \quad (3)$$

If the result of $h_i^2 = \sum_{j=1}^k \alpha_{ij}^2$ is close to $\text{Var}(x_i)$ and β_i^2 is very small, then the effect of factor analysis is better, and the transformation property from original variable space to common factor space is good. The sum of squares of the elements in the factor load matrix is denoted as:

$$g_j^2 = \sum_{i=1}^p \alpha_{ij}^2 \quad (j=1, 2, \dots, k) \quad (4)$$

g_j^2 is called variance contribution of the common factor $F (f_1, f_2, f_3, \dots, f_k)$ to $X (x_1, x_2, x_3, \dots, x_p)$. It represents the sum of the variances provided by the j -th common factor f_i for each component $x_i (i=1, 2, \dots, p)$ of x , and is an indicator to measure the relative importance of common factors. By transforming formula 2, we get the following results:

$$\text{Var}(x_i) = \alpha_{i1}^2 \text{Var}(f_1) + \alpha_{i2}^2 \text{Var}(f_2) + \dots + \alpha_{ik}^2 \text{Var}(f_k) + \text{Var}(\beta_i) = \sum_{j=1}^k g_j^2 + \sum_{i=1}^p \beta_i^2 \quad (5)$$

The larger g_j^2 , the greater contribution of the common factor $F (f_1, f_2, f_3, \dots, f_k)$ to $X (x_1, x_2, x_3, \dots, x_p)$, or the greater the influence and effect of $X (x_1, x_2, x_3, \dots, x_p)$. If all $g_j^2 (j=1, 2, \dots, k)$ of the factor load matrix A are calculated, sort them by size, we can extract the most influential public factors. Finally, three common factors with characteristic root greater than 1 are proposed, namely, three dimensions, with nine items in total, which are learning for application ability (learning ability, knowledge application ability, creativity ability), emergency cooperation ability (adaptability, team cooperation ability, interpersonal communication ability), and

organizational practice ability (organizational leadership ability, practical ability, and organizational coordination ability). The factor loads of 9 items are all above 0.4.

4 Teaching Example and Teaching Effect

4.1 Teaching example

Based on the background of innovative talents training, this study constructs the three track teaching model on the basis of input variables, intervention process variables and output variables in the “school learning model”. The input variables are named “the quantity of existing knowledge”, “the quality of problems” and “the performance of tutors”; The intervention process variable is the learning process variable of PBL - “tutor group effectiveness”; The output variables include cognitive results and emotional outcomes, namely, “students’ learning achievement” and “interest in subject content” determined by students’ “autonomous learning time”. Among them, the “learning time” changes from intervention process variable to output variable. The specific implementation model is shown in Figure 6, and the implementation steps are shown in Table 1.

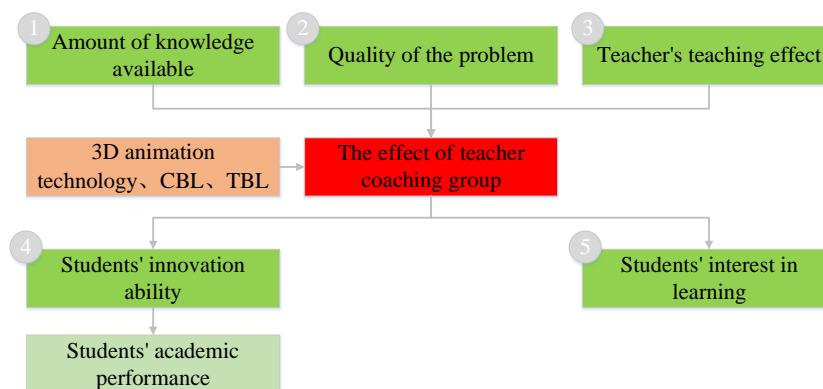


Fig. 6. Implementation model of three track teaching method based on innovation theory

Table 1. Implementation steps of three track teaching mode of sports anatomy

Step	Content	Skill
1	Describe the problem and clarify the unknown terms and concepts	Activation of existing knowledge; cooperation; information construction or reconstruction; organizational information; internal motivation
2	Define the problem and list the phenomena and events to be explained	
3	Analyze the problem: the first step is brainstorming. Encourage students to rely on existing knowledge and common sense to come up with as many explanations as possible	
4	Analysis of the problem: the second step, discussion. Judge the numerous explanations proposed and determine the one that best reflects the principle or mechanism contained in the phenomenon or event	Construction and reconstruction; application; problem solving
5	Determine the missing content of existing knowledge, and then determine the goal and content of autonomous learning	
6	Through self-learning to obtain the content needed to solve the problem	
7	In the tutor group, share and synthesize their own gains to form a final and reasonable explanation of the phenomenon or event. Test whether the knowledge and skills acquired by students are sufficient to explain the phenomenon or solve the problem	

It can be seen from table 3 that if the three-track teaching method wants to achieve the expected training objectives, the first thing to do is to carefully design questions. The problems here are not simple general questions. Students can find the answers by reading books, but design complex problems. The so-called complex problems refer to those involving more knowledge points, and the answers cannot be easily found. Moreover, the answers are not fixed but open. Students need to use a variety of tools to find out, and even to investigate and interview in order to obtain answers. In this study, students will be informed one or two weeks in advance about the design questions of each teaching unit. The students will learn by themselves in groups and work together to find the answers. The students form teams by themselves. The teachers encourage and urge them to actively communicate and discuss. Each member of the team is assigned tasks by the person in charge. The performance of each student in the team not only affects himself, but also affects his teammates, which is conducive to cultivating the team work spirit of students. After checking all the students' homework, the teacher should prepare the important and difficult points in class according to the students' self-study. Reasonable use of case teaching, for example, when focusing on the characteristics of the knee joint, the common knee joint injury in sports can be taken as a case, and the structure of the knee joint can be directly displayed through 3D sports anatomy software to stimulate students' interest and innovation ability. After the above work is completed, the teacher will have a summary and evaluation link, which will be arranged in the class we-chat group after class. Students' self-evaluation and peer-to-peer evaluation are required to give the score and the reason for the score. Finally, the teacher will give the final score based on the self-evaluation, mutual evaluation, oral report and written manuscript, which accounts for 30% of the final score of the course.

4.2 Teaching effect

From March to July in 2020, two classes of freshmen in physical education major of a university in Hunan province were selected and randomly divided into experimental class and control class. The experimental group of 52 people, using the three-track teaching mode for teaching, at the same time integrating innovative theory, applied 3D anatomy software in the teaching process. In the control group of 50 students, adopting the traditional teaching mode based on teacher teaching. Before the experiment, there were no significant differences in educational background, gender, age and academic performance between the two groups ($P > 0.05$).

The results showed that the average score of the experimental group was 83.00, as showed in Table 2. And that of the control group was 73.30. The comprehensive assessment score of the experimental group was significantly higher than that of the control group ($P < 0.01$). At the same time, the excellent and good rate of the experimental group was significantly higher than that of the control group, indicating that the three-track teaching mode has a great role in promoting students' learning. See Table 2 for details.

Table 2. Comparative analysis of comprehensive examination results of two groups

Group	Comprehensive examination results	Excellent	Good	Medium	Pass	Fail
Experimental group(n=52)	83.0	18	17	13	2	2
Control group(n=50)	73.3	4	17	17	8	4

In conclusion, the three-track teaching method based on innovation theory can effectively improve students' academic performance and improve their learning satisfaction. The main reasons are as follows: firstly, based on the sports practice, the three-track teaching method in this study timely applies the cases familiar to the students to conduct knowledge introduction before class, and constructs a teaching situation of sports practice, which is consistent with the characteristics of sports major, so as to improve the teaching effect and improve the students' academic performance. At the same time, in the teaching of abstract anatomy theory to students, help students to carry out team cooperation, to team knowledge competition, or to complete the task to stimulate students' interest, which not only improve students' innovation ability, but also improve students' interest in learning, learn how to apply theoretical knowledge to sports practice, cultivate students' practical problem-solving ability. For example, encouraging students to make and report PPT independently around the knowledge points of cases and learning tasks before class, it can also help to improve students' knowledge level. More importantly, this teaching method uses 3D anatomy teaching software, which can simulate anatomical operation and realize three-dimensional organ structure to the maximum extent, so that students can learn knowledge in the software operation. The software built with 3D virtual technology can also carry out exploratory operation on the model from any angle in the realistic scene, so that students can learn with a relaxed and positive attitude, and can learn knowledge unconsciously and improve their academic performance.

5 Conclusion

With the theoretical support of innovative talent training, this study constructed a three-track teaching model based on 3D anatomy software, and this teaching mode is applied to the course practice of sports anatomy. The results show that the organic combination of multimedia technology and traditional teaching is a teaching method to improve the teaching effect of anatomy, which is applied in the course of sports anatomy. It is very necessary and feasible. At the same time, the following conclusions are drawn in the teaching practice:

1. The teaching method of this teaching mode is vivid and easy to understand. In the teaching process, teachers can better listen to students' opinions, collect more realistic and diversified. There are also problems (cases) analysis that can cultivate students' innovative ability.
2. In the course, teachers should set up interesting and difficult teaching tasks, coordinate the distribution of course scores, create a better teaching atmosphere, increase students' awareness of the three track teaching method, and further improve the teaching effect of teachers.
3. In the process of implementing this teaching method, the teacher, as a guide, needs to coordinate the learning ability gap between students, support the students with poor learning ability to quickly integrate into the team learning atmosphere, and make the poor students integrate into the new teaching mode well.
4. In brief, the exploration of the three track teaching method based on innovative theory in the course of sports anatomy is successful, but this research needs to be further expanded in the future, hoping that the teaching method can be better implemented, avoid the disadvantages of the traditional mode, so as to promote the comprehensive quality of students.

6 Acknowledgement

A Project Supported by Ordinary Colleges Teaching Reform and Research Project of Hunan Province (HNJG-2020-1112).

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Article submitted 2020-09-30. Resubmitted 2020-10-27. Final acceptance 2020-10-29. Final version published as submitted by the authors.

Automated System Testing for a Learning Management System

<https://doi.org/10.3991/ijet.v15i24.12073>

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Abstract—Over the last years software development life-cycles have continuously been shortened and new releases are being deployed at a more and more frequent level. In order to ensure the quality of those releases, a strong shift towards automated testing at all testing levels has become noticeable throughout the software development industry. At system testing level, the scope of testing is the developed product as a whole, tested in a test environment that has a very close resemblance to the production system. Because of this system-wide scope and the many potential sources for failures, the implementation of automated tests at this level is challenging. Exhaustive testing is neither feasible nor maintainable, therefore proper designed test cases that cover important functionality are essential. Due to increasing laws and regulations on data protection and data privacy, proper management of test data used in automated testing is as important. This paper discusses how automated system tests for TeachCenter 3.0, Graz University of Technology's learning management system, were implemented.

Keywords—Automation, system testing, regression, learning management system, test data, test cases

1 Introduction

Graz University of Technology rolled out a new release of the university's Learning Management System (LMS) called "TeachCenter 3.0" in August 2019. In order to ensure that essential use cases can still be performed by teachers and students in the new release, automated tests were implemented. According to the International Software Testing Qualifications Board (ISTQB), test automation is defined as using software to either support or perform testing activities. In test automation, software is used not only for test execution per se, but also for activities like management of test cases, design of test cases or the evaluation and reporting of test results [1]. While initially seen as a possibility to increase efficiency and reduce costs, test automation has become an essential part of software development processes over the last years [2]. This paper focuses on the following research questions (RQx):

- (RQ1) How can the existing core functionality of a large software system be assured automatically in new versions of the system?
- (RQ2) Which test cases and test suites need to be designed to test a learning management system effectively?
- (RQ3) Which test data is needed to test a learning management system and how can the data be provided to automated test cases?

1.1 Testing level

Software development usually is conducted after a predefined development model like waterfall model, spiral model or various agile models. Each of those models contains an idea how tests should be performed, but testing according to the principles of the so called general V-model can be applied to the other models. Therefore, the general V-model holds a special position within the models. The general V-model is illustrated in Fig 1 and differentiates between following testing levels: Component testing, integration testing, system testing, and acceptance testing. Each testing level puts a different focus on the System Under Test (SUT). The test cases discussed in this paper were implemented at system testing level. At this level, the developed software product is considered in its entirety and tested in an environment that has a close resemblance to the production environment. Tests are conducted from the customer's or user's perspective and validate if the software has been implemented according to the requirements. Tests on system testing level are typically performed using the systems General User Interface (GUI) to interact with the system from a user's perspective [3]. Tests at system testing level should confirm the functioning of the GUI [4], ensure that the system meets business requirements, is stable and in a state for manual testing to be reasonable [5]. Furthermore, tests at system testing level can be seen as a second line of defence, as failures in higher testing levels additionally show that tests at lower testing levels like integration testing or component testing are incorrect or missing [6].

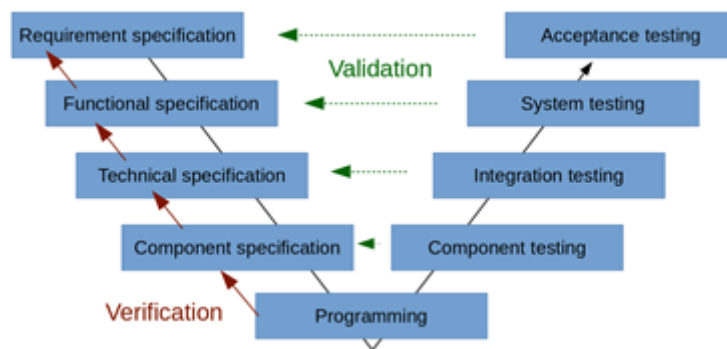


Fig. 1. General V-model (based on [3], p.42)

1.2 Testing type

Spillner and Linz [3] differentiate between four basic types of testing: Functional testing, non-functional testing, structural testing and testing related to changes.

Regression tests are categorised as a type of tests which are performed in order to ensure that already existing functionality of a software is still present after changes were made to the software [3]. Independent of the testing level, regression tests are suitable to be one of the first types of tests to be automated in a software project. One of the main advantages of automated testing compared to manual testing is the possibility to run a set of tests to ensure that the code changes made did not break any functionalities of the software [7].

Furthermore, the execution of automated regression tests is more reliable compared to a manual execution of regression tests [8]. As TeachCenter 3.0 is a new version of an already existing software system, regression tests were the focus of the test automation activities in order to ensure that changes to the software do not have a negative effect on the already present functionality and that essential use cases can still be performed after the application of the changes.

2 Test Cases for a LMS

An important aspect of test automation is the selection of the test cases to be automated. If this selection is not done properly, the automation of test cases would result in being able to quickly execute test cases, which have no value, on a regular basis. The following steps were performed in order to identify the test cases to automate for TeachCenter 3.0: A review of the literature of different LMS [9][10][11] was performed in order to identify important use cases. An interview with the first level support of TeachCenter 2.0 was conducted in order to find out whether important use cases at Graz University of Technology were similar to those of other educational institutions. The LMS that is used at Graz University of Technology supports the generation of statistics on which features of the LMS are used to what extent. Those statistics corresponded to the results of the interview. Despite the different LMS used by different universities, the use cases that are being considered important are similar. Those use cases contain activities like reading the course's contents, communicating with other participants or submitting material to the course. In total about 30 test cases were created based on those use cases and combined to test suites.

The test cases are written in a "Given-When-Then"-structure which is commonly used in Behaviour-Driven-Development (BDD) in order to strengthen the focus on the user and the system's behaviour: Given a certain precondition, when a certain action is performed, then the following results are expected. An example can be found in Table 1.

Table 1. Example of Given-When-Then Structure

Given	User is on a blank browser page
When	User opens index.php of TeachCenter 3.0
Then	TeachCenter front page is shown and fully loaded

This style is used in the creation of test cases without pursuing BDD in order to avoid a level of unnecessary complexity and overhead when implementing regression tests [12]. Frameworks for BDD serve the purpose of facilitating communication between people of different backgrounds (like customers, project managers, business administrators, developers or testers) when discussing new features in a software project. The resulting definitions of new features are used for validation once the new features were implemented. The type of tests discussed in this paper are regression tests – tests that ensure that given functionality is still present after changes have been made to the software. The features that are covered by those tests are already set and there is no need to use BDD in order to specify them with various stakeholders. This is also one of the reasons why Behat tests, which are part of Moodle LMS, were not used in the project.

3 Test Data for a LMS

Albrecht-Zölch [13] differentiates between two basic types of data that can be used for testing: real data and synthetic data. Real data is data which is taken from a production system and transferred to a test system. Synthetic data is data which is solely created for the purpose of testing.

Data protection regulations like the General Data Protection Regulation (GDPR) [14] have a huge impact on the usage of test data in software testing as they restrict the usage of real data in testing. All personal data that is present in the set of real data has to be anonymised before using real data in testing. The SUT in this paper is a LMS. A LMS basically contains data on courses, data on people involved in the courses as well as data that result from the interaction of people with the courses. In case of a LMS which typically contains teachers as well as student’s names, email addresses or identification numbers, personal data that has to be anonymised according to the GDPR. Data like course descriptions or learning materials usually does not contain personal data, although personal data is not always easy to detect and therefore not always easy to anonymise (e.g. if a student included personal data in an assignment that was submitted to the LMS as a PDF-file).

TeachCenter 3.0 is tested with a combination of real data and synthetic data. A test data generator was implemented by the development team using an anonymised set of data retrieved from TUGRAZonline 2.0, the university’s campus management system. With this test data generator, test data (e.g. courses or students) can be created on demand. Most of the test data used in the automated system tests was persisted on the SUT and used in the test cases by accessing a component that handles the access on the test data. This way test cases are also separated from test data, which is one of the best practices of using test data in automated testing [13]. Test data that is used exclu-

sively for automated testing is labelled as such in order to not be used in manual testing (e.g. test users for automated tests have names like “Student [TESTAUTOMATION_DO_NOT_TOUCH]” and mail-addresses like “student@ta_d_n_t.ta_d_n_t”.)

4 On the Implementation and Infrastructure

Typical phases in test execution stretch from ramp-up (setup, getting ready to run the test) to tear-down (cleanup after tests were run). Those phases are independent from the testing level and testing type and are commonly used across various frameworks in the field [15][16][17]. When structuring tests according to those phases, the tests are designed to be executed in a repeatable way. Besides designing test cases to be executed repeatedly, following other best practices were followed in the implementation of the test cases: Test cases were implemented in order of a breadth-first approach, they are executed in a continuous integration environment and tests have been split into test suits. Tests are kept small and they each test one certain aspect of the LMS. The test cases are stable, independent from each other and were implemented by developing reusable components using design patterns like the Page Object Pattern. Each test has a header that contains further information on the test case itself and each test logs the performed steps for traceability [18][19]. An important aspect of the implementation is the identification of objects in the SUT and the interaction with the SUT.

4.1 Identification of objects

According to Gundecha [20] one of the key success factors when automating tests using the GUI is the identification of the user interface’s elements in order to perform actions on those elements as well as verify the results of the actions performed. A stable way of interacting with the GUI is essential. This means being able to execute the tests regardless of screen resolutions, window sizes or language [21]. Elements of the GUI therefore need to be identified properly, using unique (at least in context of the object) and stable features. Features that fulfil that criteria are the ID of an element or the identification of an element via XPath expressions (setting an element’s feature in context to other elements of the Document Object Model (DOM)). Table 2 contains an example for identification of an element by ID or XPath expression.

Table 2. Identification of elements

DOM Element	<button type= "button" id= "btn1" data-role= "next "> Next </button >
ID	btn1
XPath expression	//button[@data-role='next']

4.2 Interaction with SUT

A commonly used design pattern in test automation is the Page Object Pattern. When adopting this pattern, components of web sites are being modelled into reusable objects which offer functionality to interact with the components of the web site [7]. Typical interactions with a web site include actions like clicking elements or entering values to input fields. When implementing a page object, one develops an interface to a web site. By modelling the properties and the behaviour of a web site, the developed interface serves as a layer that separates the actual test code from the code used to interact with the web site [20]. Fig 2 illustrates the creation of page objects from a web site. In this example three page objects are being created: One page object for the header, one page object for the body and one page object for the footer. Each page object bears the functionality to interact with the corresponding part of the site, e.g. the header page object allows the user to navigate to the login page or to switch between languages.

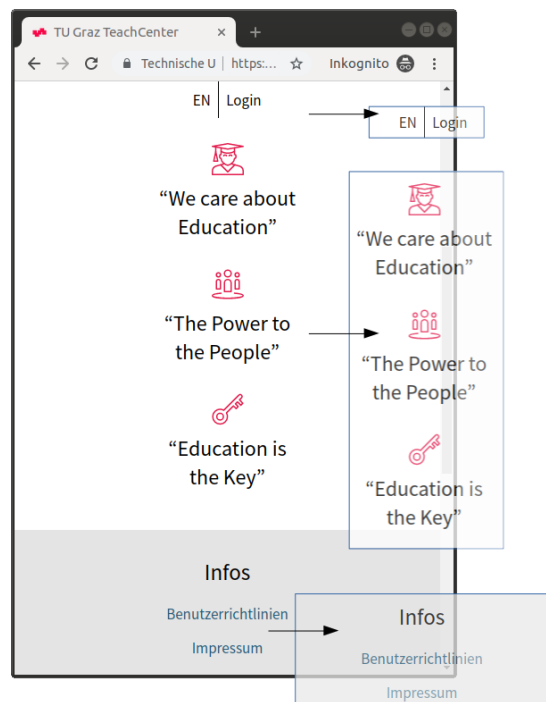


Fig. 2. Creation of page objects

4.3 Implementation

In order to implement page objects according to the Page Object Pattern, the PageFactory, a factory class to initialise the page objects, is being used. By using the PageFactory, all WebElements of a page object are initialised and can be accessed

during testing. `WebElements` represent elements in the DOM and are part of Selenium `WebDriver`. Selenium is a suite of tools for automating browsers. Amongst others, Selenium offers functionality to define interactions with elements of a website, e.g. what to click or type. All page objects extend the same superclass which contains functionality that can be used in all page objects like waiting for elements to be present on a page as well as checks if success messages are present. This class also implements the timeouts that are used for waiting for various events during test execution. The individual page objects are used in test classes for interacting with the SUT.

The test classes contain various annotated methods which orchestrate test execution. There do exist methods which are run before the tests (ramp-up) and methods which are run after tests (tear-down) as well as methods for the tests themselves. Altogether the typical phases of test execution are represented in the test classes.

The tests are built and run using Apache Maven. Multiple parameters can be set when running the tests: The test suite, the browser, a runner and the SUT to be tested. The test suite parameter specifies the test cases to be run as well as the level of the logging during test execution (little logging to extensive logging) and the level of parallelisation. The level of parallelisation can be defined by the number of parallel threads that should be used to run tests and by the level (e.g. methods, classes, suits) at which tests should be parallelised. The SUT parameter sets the system to be tested as well as the test data to be used. This allows the test cases to be developed on localhost and run against systems on another host using different sets of test data. Depending on the specified browser parameter, a different instance of `WebDriver` is created with different browser-specific options. The runner parameter is used to specify how the tests are run depending on the browser. This way different browsers like Firefox or Chrome can be used in different environments (e.g. open a browser window when developing test cases and starting the browser headless when running tests in a continuous integration environment).

4.4 Test infrastructure

Fig 3 contains an overview on the test infrastructure. A client (independent of the device) accesses TeachCenter 3.0 by using a web browser. This access can either happen via Internet or intranet if the device is part of Graz University of Technology's data network (TUGnet). Courses as well as students are synced from a generated test data set based on a clone of the campus management system TUGRAZonline 2.0. A Git repository is used to version control the source code of TeachCenter 3.0 as well as the source code needed for testing. An important part of the test infrastructure is a Jenkins server which pulls the source code of the implemented test cases in certain intervals, builds the tests, runs them against TeachCenter 3.0 and reports the results.

TeachCenter 3.0 is based on version 3.5 of Moodle LMS. A custom theme and plugins developed by Graz University of Technology, as well as additional plugins which are maintained by the Academic Moodle Cooperation are installed on top of the default installation. In addition, several core hacks (modifications of Moodle's source code) were applied. By applying core hacks, a developer changes Moodle's

source code to apply changes that would not be possible by using the ways provided by Moodle itself (e.g. installing plugins or adjusting the configuration). Downsides of core hacks are that they might threaten the stability of the LMS and might not be compatible with future updates.

The test data set must at least contain the following elements for the tests to be run: A course with a section to which resources (PDF-file and a page) and activities (groupchoice, forum, checkmark, scheduler for individual students as well as a scheduler for groups) are added.

Jenkins is used as an automation server. Without the use of an automation server, actions like triggering the automated tests or evaluating the test results must be done manually. Jenkins was chosen as it is a widespread tool that offers many plugins to support a wide variety of frameworks and applications.

As the source code of the tests must be in line with the source code of the SUT (when the SUT changes, tests must be adapted accordingly), also the code of the tests has to be version controlled in order to be able to execute the tests at the needed version. A Git repository was set up in order to achieve this task.

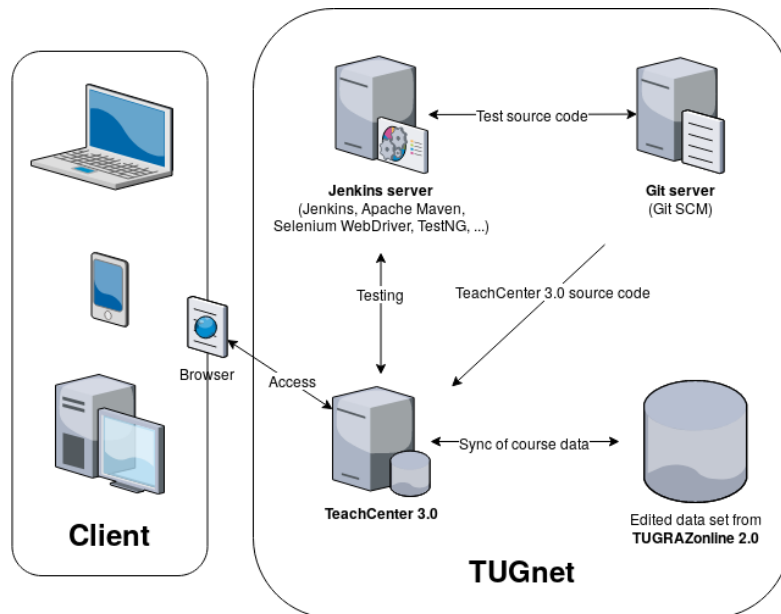


Fig. 3. Overview on test infrastructure

4.5 Operation and maintenance of automated tests

Once implemented, the automated tests must be used in an appropriate way. They must be run regularly, must be integrated into the development process and must be maintained. The implemented tests are run in different execution cycles according to

their test suite. Those execution cycles stretch from test suites that are only run once a week to test suites that are run twice a day.

Before new tests are added to a test suite that is being executed regularly, the tests are added to a test suite that resembles a kind of staging area where the tests are run without having any impact on further builds of the project. In this test suite, the tests must prove their functionality and value in order to become a part of any of the other test suites. This way tests are being refactored and improved until they are stable to advance into another test suite, which should also lower the level of flakiness of the test cases in use. Flaky tests are tests that might fail on one test run and pass on another without any changes to the SUT [22]. The automated test suits of this paper include a listener that listens to the results of individual test cases and if a test case fails it triggers a re-run of the test. Failed tests are re-run up to three times until they are considered as failed.

In order to facilitate the analysis of failed tests, a functionality to take screenshots at the moment a test fails has been implemented. Screenshots are stored with a timestamp, the name of the test method and the name of the browser in a directory that is accessible via the web interface of the Jenkins server. In case of failures in any of the test runs, the failures can be analysed using the test's log output, the stacktrace at the time of the failure as well as the screenshot. The analysis can lead to two possible outcomes: In the first case, the functionality on the SUT is as intended and the result of the test case is incorrect (false negative) which leads to an adaption of the test case. In the second case, the intended functionality on the SUT is not given any more and the test case is correct, which leads to an adaption of the software product.

5 Conclusion and Future Work

After review of the literature and the discussion of different testing levels and types, automated regression tests were implemented on a system testing level according to best practices. A large software system consists of many integrated components that interact with each other. In order to detect possible side effects of changes, a high test level (system testing) was chosen to ensure the stability of core functionalities as tests at this level consider the system as a whole rather than focusing on individual components. A continuous integration environment was installed for regular execution of the implemented tests as well as for reporting of the test results. (RQ1)

In order to identify relevant test cases, literature research was done to find out what essential use cases of systems like learning management systems are. The findings were matched with information provided by TeachCenter's first level support in order to verify the results but also to categorize the use cases according to their relevance. The list of use cases includes activities like providing course materials and submitting assignments. Test cases were implemented based on those use cases and combined to test suites according to their categorisation. (RQ2)

For implementing the test cases only the following test data is needed: A teacher's account, a student's account, a PDF-file and a course with a basic configuration to which both the teacher and the student are enrolled to. The test data in use is mostly

synthetic test data. Some data that exists on the system under test was created by a test data generator that creates test data based on a former set of real data that has been edited according to laws and regulations of data protection and data privacy. Parts of the test data are persisted within the system under test, using identifiers that clearly mark them as test data to be used in automated test cases. Other parts are provided to the test cases by JSON-files that reference the persisted data. This way the implemented test cases are separated from the test data. (RQ3)

ISO 25010 differentiates between eight characteristics that should be considered when evaluating the quality of a software product: Functional Suitability, Performance Efficiency, Compatibility, Usability, Reliability, Security, Maintainability and Portability [23]. This paper only discussed tests for the characteristic of “Functional Suitability”, but the established infrastructure could also be used to include tests for other characteristics of software quality. Examples are automated performance tests or automated security tests for a LMS. In general, the level of automation can be increased even if automated tests have already been implemented. One example is the automated creation of page objects. The subject of test data management was mentioned briefly in this paper but contains much more areas to be considered than those that have been covered in this paper. Further research could be done on the application of a whole test data management framework to a LMS. Another step to enhance the automation of tests in general could lie within the omnipresent buzzword “artificial intelligence” or “AI”. Bots and machine learning could be used to automatically create basic test cases and could be used to maintain created test cases (e.g. for identifying which tests are not relevant anymore and should be removed from test suites). An advancement in test automation could lead to a focus on improving manual testing activities for complex human behaviour [22].

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Article submitted 2019-10-28. Resubmitted 2020-01-04. Final acceptance 2020-01-10. Final version published as submitted by the authors.

A Study on the Impact of Anxiety on the Perception of Communication Engineering Teachers about Self-Efficacy

<https://doi.org/10.3991/ijet.v15i24.18211>

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Abstract—The anxiety felt by teachers stems from the stress caused by teaching, life and learning. It affects not only their teaching performance, but also their teaching efficiency. Therefore, an in-depth study on how the anxiety felt by teachers affects teaching efficacy helps researchers better understand the underlying mechanism of teaching efficacy and enables teachers to improve themselves over the course of teaching. By adopting both quantitative and qualitative research methods, this study takes the communication engineering teachers participating in the communication engineering professional meeting as the research object, to analyze the relationship between the anxiety felt by teachers and their teaching efficiency, and to explore the influencing factors in the self-effect of communication engineering teachers. According to the results of empirical analysis, teaching experience has a positive effect on the perception towards self-efficacy, while life and work experiences have a negative effect on the perception towards self-efficacy. Finally, some suggestions are made in light of the empirical conclusions.

Keywords—Anxiety, teaching self-efficiency perception, Teaching_experience

1 Introduction

With regard to higher education, the role played by communication engineering in advocating the core literacy of the subject and the value of scientific education is what students are required to develop through the study of communication engineering. The core literacy of communication engineering includes scientific thinking, theoretical concept, social responsibility and scientific inquiry, all of which could provide guidance on how to explore the laws of communication and physics. To resolve the practical problems, prioritizing the development of education will have a direct impact on the further development of a country [1]. Thus, a problem facing the country is to cultivate talents with comprehensive capabilities.

The anxiety felt by teachers stems from the stress caused by teaching, life and learning [2]. It affects not only their teaching performance, but also their teaching efficiency. Teaching efficacy plays a vitally important role in the improvement of education [3]. Whether teachers can be successful in imparting cultural knowledge is affected by many factors, including the subjects taught, the content of textbook, school conditions and classroom environment. The in-depth study on the impact of the anxiety felt by teachers on the sense of teaching efficacy helps researchers better understand the underlying mechanism of the sense of teaching efficacy and enables teachers to improve themselves over the course of teaching. Meanwhile, it will also enhance the training and management of teachers. In order for the career development of teachers, what matters most is to preserve the concept of education system, improve the morality of teachers, update their professional knowledge and improve the teaching ability of teachers [4].

2 Theory and Hypothesis

2.1 Self- efficiency theory

The premise of self-efficacy theory is that people usually believe in their ability of producing the effects as predicted, which is one of the most significant factors in the behavior of implementers. Self-efficacy theory plays an irreplaceable role in addressing various mental health problems. In addition, it is also indicated that the theory of self-efficacy does not necessarily mean that the sense of self-efficacy is the only crucial factor in promoting behavior [5]. That is to say, it is impossible for even a person with a strong sense of self-efficacy to develop the subsequent behavioral ability in the absence of the corresponding ability. Therefore, it can be considered that only when an individual feels motivated and realizes the need to develop the corresponding skills, can the sense of self-efficacy become an influencing factor in individual behavior and produce expected results [6]. From the theoretical implication of the self-efficacy theory and its background of development, it can be seen that the sense of self-efficacy in essence is a pattern of behavior and thinking that make individuals regard themselves as objects [7]. For themselves, it will be a vitally important factor. It reflects the assessment made by an individual of his or her own ability [8]. Accord-

ing to the viewpoint held on the completion of the task, it can be determined whether the task can be completed smoothly [9].

In 1984, Gibson and Dembo continued previous studies by turning their attention to the sense of self-efficacy, and created the structural connotation of teaching efficacy from a theoretical perspective. Based on the conclusion about the self-efficacy theory, they adopted literature analysis, teacher interview and other research methods, to launch a project known as Teaching Effectiveness Scale (TSE). From the perspective of psychological structure, the sense of self-efficacy that teachers have mainly involves two dimensions and four aspects [10]. First of all, the sense of self-efficacy among teachers involves two dimensions, which are general teaching efficacy and individual teaching efficacy. Herein, general teaching efficiency refers to the position of education in the development of students, while individual teaching efficacy refers to whether teachers exert a positive influence on students and deliver effective education, so as to cultivate self-cognition, subjective feelings and beliefs for students [11]. The research into self-efficacy of teachers plays a key role. It is considered that the sense of self-efficacy is determined by four elements, including personal achievement (direct experience), verbal persuasion, alternative experience (indirect experience), as well as emotional and physiological state. In some studies, however, it has been indicated that the direct experience, simple experience, emotion and physiological state of teachers are associated with the relevant variables to teaching experience [12]. As teaching experience increases, the sense of teaching efficacy that teachers have is enhanced as well.

Therefore, the following hypotheses are proposed:

H1: The teaching experience of teachers has a positive impact on their sense of self-efficacy.

H2: The title of teachers has a positive impact on their sense of self-efficacy.

H3: The experience of teachers as class adviser has a positive impact on their sense of self-efficacy.

2.2 Anxiety theory

The anxiety-related study has attracted much attention since the detailed explanation made by Freud as to the principles of the anxiety [13]. According to the definition given by Horwitz (1986), an involuntary response of the nervous system is the subjective feeling of tension, anxiety, anxiety, etc. In 1983, Charles D. Spielberger proposed the Trait-StateAnxin theory that anxiety may be a long-term development of personality, or a temporary subjective state, to break the long-standing anxietyholism. Anxiety is also divided into general and specific anxiety [14]. Based on this, teaching anxiety has drawn attention from the academic circle since the 1980s [15]. In 1986, Horwitz and others designed the Classroom Teaching anxiety Scale (ClassroomAnxin).

H4: The anxiety felt by teachers has a negative impact on their perception about teaching efficacy.

H5: The anxiety felt by teachers adjusts the impact of teaching experience on teaching efficacy negatively.

H6: The effect of anxiety felt by teachers adjusts the impact of title on teaching efficacy negatively.

H7: The effect of anxiety felt by teachers adjusts the impact of work experience as class adviser on teaching efficacy negatively.

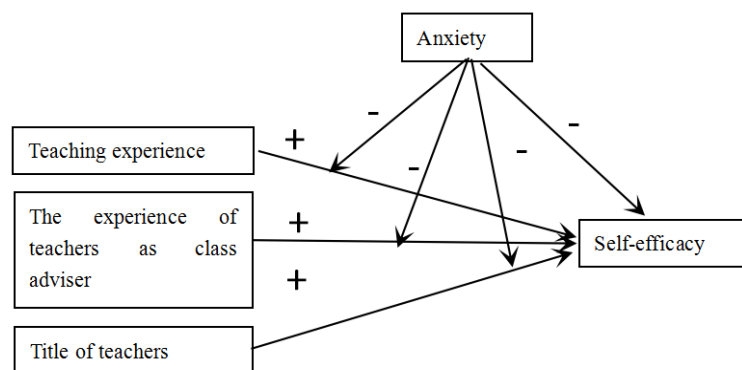


Fig. 1. Research Model

3 Research Methods, Data and Analyse

3.1 Research ideas

The purpose of this study is to explore the sense of self-efficacy felt by teachers majoring in communication engineering. In order to facilitate the research, the ideas and methods involve the following aspects:

Firstly, based on the understanding of self-efficacy among teachers, literature review is conducted to better understand the relevant research carried out both at home and abroad will be conducted [16].

Secondly, from the practicalities of communication engineering teachers, and based on the existing scale, a number of problems are discussed to highlight the characteristics of communication engineering subjects [17].

Thirdly, the current state of teaching anxiety and the sense of self-efficacy among communication engineering teachers are investigated and analysed, while the impact of different factors on the sense of self-efficacy among communication engineering teachers is analysed [18]. Through the analysis of the survey results, the effective strategies to improve the sense of self-efficacy among communication engineering teachers are proposed [19].

3.2 Research tool

In the process of compiling the teacher anxiety scale [20], the author draws lessons from the teaching anxiety scale proposed by Dong Yanping et al. (2013) and the anxiety scale of teaching cognitive processing suggested by Deng Yuan et al. (2018). The

former not only describes the teaching anxiety from three dimensions, including the difficulty of teaching, the service nature of teaching and the general confidence of teaching with regard to the teaching process as an overall task from a macro point of view, but also explores how teachers feel about the teaching task. Based on the cognitive load model suggested by Jill (2009) and the teaching working memory theory proposed by Baddeley (2003), the latter divides the teaching cognitive processing process into three parts, including information input, processing and output, corresponding to learning anxiety, using anxiety and imparting anxiety, respectively [21]. The three-factor model proves scientific through two tests. Therefore, when the teaching anxiety scale is compiled, the author also draws lessons from the scale framework presented by Deng Yuan and others, and divides the teaching process anxiety into three stages, which are learning, memory and imparting. Each part includes 5 questions, and the scale involves 15 questions [22]. The questions related to Learning anxiety are numbered 1 to 5, the questions related to memory anxiety are numbered 6 to 10, and the questions related to imparting anxiety are numbered 11 to 15 [23]. The teacher effectiveness questionnaire, abbreviated as TE, is generally premised on the teacher self-efficiency feeling scale revised by Yu Guoliang from Beijing normal University, which mainly refers to the methods developed by Gibson and Dembo. Besides, the scale is also compiled according to the practicalities of domestic education. This scale involves two dimensions, which are personal self-efficiency and general self-efficiency. There are 27 multiple choice questions contained in the questionnaire. Among them, the questions related to the general level of the sense of teaching efficacy among teachers are numbered 1 to 10, and those related to the level of the personal sense of teaching efficacy are numbered 11 to 27, involving a 5-level scale. The total score of each question is accumulated. The higher the score, the stronger the sense of teaching efficacy felt by teachers. The questionnaire also includes the characteristics of the subjects, for example, gender, education, age, teaching experience, professional titles and current position. The scale shows excellent reliability and validity, while all the indicators basically meet the psychometric criteria [24].

3.3 Data

In this study, totally 90 questionnaires were distributed to the teachers majoring in communication engineering during the training on communication technology. A total of 85 valid questionnaires were recovered after screening, and the effective recovery rate was 94%. Of the participants, 58.8% were male and 41.2% were female.

The data is shown in the table below.

Table 1. Variable descriptive statistics

variable	NUM	MIN	MAX	AVG	SD
Age	85	26	47	34.93	4.911
Local person	85	0	1	0.52	0.503
Sex	85	0	1	0.59	0.495
Teaching experience	85	1	22	9.51	5.191
Class adviser	85	0	1	0.4	0.493
Professional titles	85	1	3	2.27	0.662
Anxiety sense	85	2.3	5	3.706	0.668
Self-efficiency	85	2.4	5	3.76	0.6

4 Empirical Analysis

4.1 Non-model analysis

Before the formal statistical model is analysed, the variables of interest are displayed in a statistical pattern, and the direct relationship between the variables is observed [25]. The figure showing the distribution of teaching experience and the sense of self-efficacy is shown as follows.

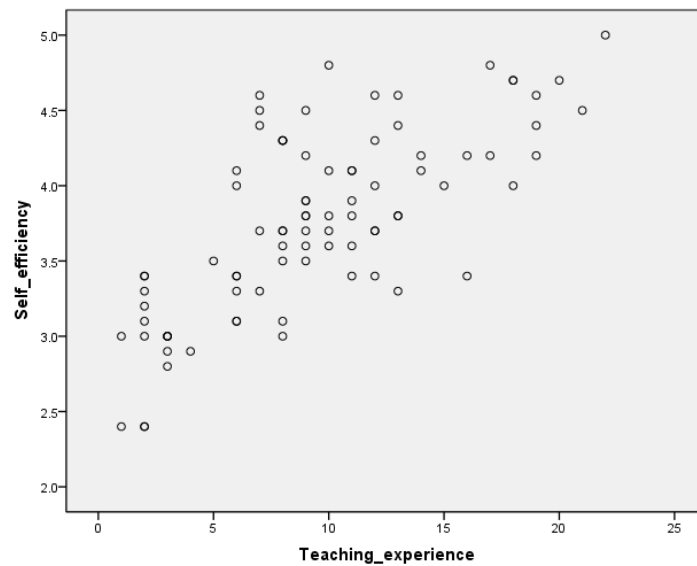


Fig. 2. Scatter Graph of Teaching _experience and self-efficiency

As shown in the above figure, as the Tagging period is extended, self-efficiency is enhanced, which means the Tagging period is directly associated with the self-efficacy [26]. It is assumed that H1 is supported. The distribution of work tiles and self-efficacy is shown as follows.

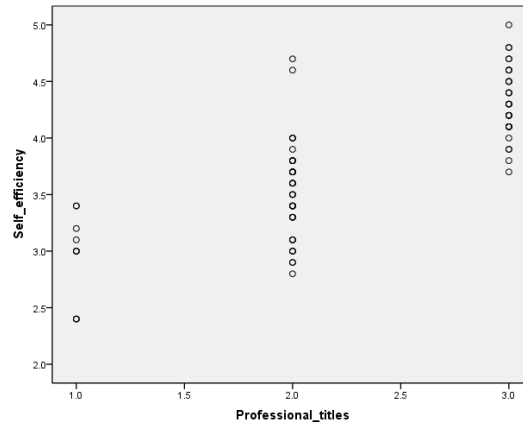


Fig. 3. Scatter Graph of Professional_tiles and self_efficiency

As can be seen from the figure above, with the promotion of professional titles, the self-efficacy of teachers increases, which means, work titles are associated with self-efficacy. Therefore, H2 is supported.

The figure showing the relationship between class adviser and the sense of self-efficacy is presented as follows.

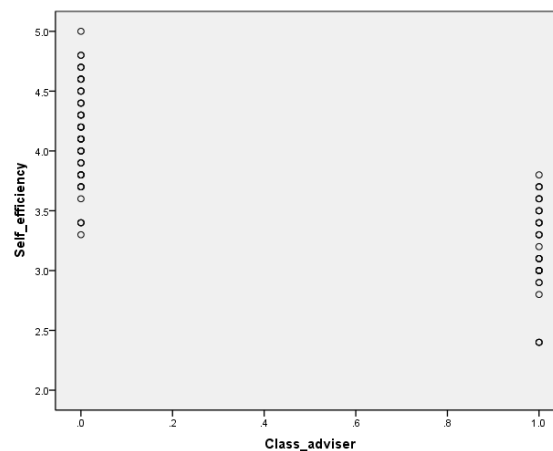


Fig. 4. Scatter Graph of Class_adviser and self_efficiency

As can be seen from the figure above, the self-efficacy of class adviser is lower, which means, the experience of class adviser is negatively correlated with self-efficacy. Thus, H3 is rejected.

The figure showing the relationship between the sense of anxiety and self-efficacy is presented as follows.

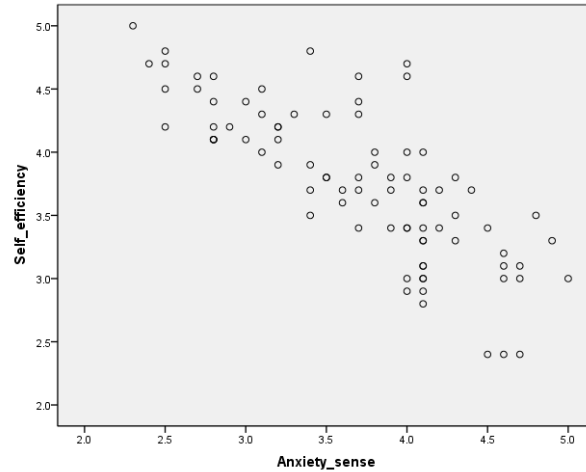


Fig. 5. Scatter Graph of the Sense of Anxiety and Self-efficacy

As can be seen from the figure above, the sense of anxiety is negatively correlated with self-efficiency. It is supposed that H4 is supported.

4.2 Modelling

Although a general conclusion is drawn from the above statistical graph, there are no control variables involved in the analysis [27]. In consideration of the existing research practices, the impact of their respective variables on classroom self-efficiency perception is calculated through the econometric model.

$$y_i = x_i' \beta + u_i \quad (1)$$

Where y_i represents the sense of self-efficacy of the teacher i . x_i' indicates a co-variate matrix that affects the sense of self-efficacy of the user, which in the present study mainly includes professional titles, teaching experience, class adviser, the sense of anxiety and control variable such as age, place of origin and gender. u_i denotes an error term, and it conforms to a normal distribution expected to be 0. We are interested in the estimation factor β , where β represents the magnitude and direction of the respective variables and the adjustment variables on the dependent variables. The expectation of our u_i is not equal to zero, as certain factors of the user's individual, such as living habits and personality will affect the sense of self-efficacy of the individual. For example, the fixed effect of individuals is changed with i . Therefore, the random error term u_i can be split into two parts, namely, the fixed effect C_i of the

individual and the random error term ε_i , which is subject to a normal distribution expected to be 0, that is,

$$u_i = c_i + \varepsilon_i \quad (2)$$

Therefore, the model is set to

$$y_i = x_i' \beta + c_i + \varepsilon_i \quad (3)$$

4.3 Analysis of data

Based on the questionnaire data, the sense of self-efficacy among teachers is analysed. The software used in the analysis is SPSS19, while the method of hierarchical regression is applied in the regression model. This method is characterized by the addition of independent variables to the regression equation in steps, as a result of which the change of the influence exerted by some independent variables on dependent variables under different conditions can be judged. For example, one of the more commonly used methods is to incorporate the control variables into the regression, and then the main independent variables into the regression, so as to determine whether the impact of the independent variables on the dependent variables is consistent. In this study, this method is mainly used.

Table 2. The result of data analysis

IV	Hypothesis	Model1	Model2	Model3
Age		0.412(2.11) ***	0.32(1.56) **	0.29(1.23) ***
Local person		-0.47(-2.54) *	-0.22(-2.35) *	-0.21(-2.71)
Sex		0.586(3.23) **	0.252(2.58) *	0.255(2.56)
Teaching_experience	H1		0.159(1.89) *	0.195(1.96) *
Professional_titles	H2		0.293(3.01) **	0.312(2.13) **
Class_adviser	H3		-0.246(-2.86) **	-1.87(1.22) **
Anxiety_sense	H4		-0.256(-2.67) **	-0.254(-2.1) **
Teaching_experience *Anxiety_sense	H5			-0.11(-1.32) *
Professional_titles *Anxiety_sense	H6			-0.09(-1.21) **
Class_adviser *Anxiety_sense	H7			0.12(1.32) *
Adjusted R2		0.34	0.46	0.51

*p<0.05, **p<0.01, ***p<0.001

It can be concluded from the above table that hypothesis H1/H2/H4/H5/H6/H7 are supported. Besides, H3 is invalid. Now, the causes for the result are analysed. As class adviser usually faces a lot of trivial things, it distracts teachers from teaching. When teachers are unable to dedicate themselves to teaching, their perception of self-

efficiency will decline. Therefore, the sense of self-efficacy among teachers is affected negatively by the experience of working as a class adviser.

5 Conclusion

1. The sense of anxiety that communication engineering teachers have is inversely proportional to teaching experience and professional titles. That is to say, with the increase of teaching experience and the promotion of professional titles, the sense of anxiety will decrease.
2. The perception that communication engineering teachers have is proportional to teaching experience and professional titles. That is to say, with the increase of teaching experience and the promotion of professional titles, the sense of self-efficacy among teachers will increase.
3. The experience of class adviser reduces the sense of self-effectiveness teachers have. Since the work undertaken by class adviser requires attention to be paid not only to the students, but also to their life, there are a lot of trivial things that prevent the teacher from concentrating on teaching.
4. Anxiety has a negative effect on the sense of self-efficacy among teachers. Besides, it will make a difference to the impact of teaching experience, work titles and the experience of working as class adviser on the sense of self-efficacy. Reducing the sense of anxiety is significant to improving the sense of self-efficacy.

6 Management Suggestion

The self-efficacy of teachers is reflective of their teaching efficiency. Based on our research, teachers shall be encouraged to focus on teaching, strive to improve their own professional competence and accumulate teaching experience. The tasks performed by class adviser can be assigned to dedicated teachers, such as counsellors. The management in school should take a series of measures to reduce the sense of anxiety felt by teachers, for the improvement of self-efficacy perceived by teachers.

7 Acknowledgement

This work is supported the following fund:

National natural science foundation: Research on panoramic and prescriptive marketing management and decision driven by big data in consumer market (NO:91746206); Omni Synchronous Marketing Paradigm in the Mobile Era: Tripartite Synchronous Interaction and Product-driven Integral Affect (NO, 71672132).

2017 Guangxi education science 'ten-three-five' planning project: Based on zte's ICT education platform of fusion, work-integrated learning education training mode research (No, 2017B107).

Research Initiation Project of Ph.D., for GUET: Research on the Incentive Mechanism of Knowledge Sharing in Online Medical Community (No, US20001Y).

2018 Guangxi Young and Middle-aged Teachers' Achievement Project: design and implementation of picking Robot based on Internet of things (No, 2018KY0556).

2018 Guangxi higher Education Teaching Reform Project: Exploration of cultivating Mechanism of Teaching characteristics of Communication Engineering Specialty based on ICT Education platform of ZTE(No,2018JGB322).

2018 Guangxi Vocational Education Teaching Reform Project: Reflections on the course setup of English majors in Private Vocational Colleges in Guangxi under Market demands Taking Guangxi Talent International College as an example (NO,GXGZJG2018A035)

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Article submitted 2020-09-02. Resubmitted 2020-09-20. Final acceptance 2020-09-22. Final version published as submitted by the authors.

Multimedia-Assisted Learning in a Flipped Classroom: A Case Study of Autonomous Learning on EFL University Students

<https://doi.org/10.3991/ijet.v15i24.14017>

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Abstract—This current study aims to investigate the use of multimedia-assisted learning in a flipped classroom for fostering the students' autonomous learning at EFL University. The students are encouraged to learn independently by having multimedia learning sources and they are also stimulated to find their difficulties in the learning process. Meanwhile, the teacher and students are discussing the solution from the students' difficulties during their independent learning in the classroom. The successful completion of pre-learning depends on the students' responsibilities and enthusiasms. 15 students of the English Education department were involved as the participants in this study. The data were collected through observation, questionnaire, and semi-structured interview. The finding of this study showed that a flipped classroom by using multimedia-assisted learning helps the students stimulate their autonomous learning because the students feel free to explore their creativity through an independent learning atmosphere without any tension.

Keywords—Multimedia-assisted learning, flipped classroom autonomous learning

1 Introduction

In the last decades, the teaching and learning process by using technology and applications have become a necessity for the teachers to respond the changes of teaching from face to face teaching learning to online teaching. The development of technology requires a change in the teaching and learning environment. Although technology does not replace existing conventional methods, its emergence will enhance the process of learning [1]. The education systems have principal responsibilities to mitigate the demands generated by the technology development. For this purpose, the system of education quality not only limited to transform the traditional method but also emphasizing the uses of technology in appropriate situations.

To achieve the target of language teaching, language teachers as well as other people who are participating in language learning, have to be able to include information and computer technology (ICT) and to explore its diversity in the

language classroom [2]. For instance, the students of today grow up immersed in a wide range of digital devices. They may also have different styles of learning, motivation, and engagement in the learning process [3]. These developments, therefore, require the development of modern pedagogical models and trends to achieve the skills, needs, and preferences of students in the 21st century.

In particular interest to this present study is the feasibility of using flipped classroom in the teaching and learning process for the EFL University students. The flipped classroom as one of the models that have been introduced through technological techniques or commonly called as multimedia-assisted learning such as video, online books, websites, and learning management systems (LMS) in today's teaching and learning practices which can be reached through electronic devices or media [4], [5]. Multimedia-assisted learning as a tool for the students to find the sources of learning. It combined with the strategy of teaching which is called a flipped classroom model. The flipped classroom has been increasingly regarded as an important model to make the quality of teaching and learning outcomes better so that it is considered as an alternative instructional model for teachers to implement [6]. The use of online materials and sources also should be supported by sufficient various sources. Furthermore, the students' attitude toward autonomous learning is a crucial aspect in determining successful learning by using online sources. The students need to keep their motivation and their other work consistently during the teaching and learning activities.

The purpose of a flipped classroom is to reverse the main stages of teaching and learning including classroom activities and homework [7]. That is to say, students study theoretical material individually through the multimedia learning sources, for instance, the visual of video lectures recorded or downloaded from the internet sites, then, during classroom activities that are devoted to practical tasks.

2 Literature Review

In educational institutions around the world, the flipped classroom method has become a common pedagogy and has been widely studied in higher education contexts [8], [9]. The lessons are given in advance to the students through online videos in the classroom that uses a flipping method to provide them some times to have their active and problem-solving learning. It is an innovative learning concept that aims to increase students' active learning, collaboration, and scaffolding through a better allocation of teaching time during the learning process [7]. This notes that the time spent at face-to-face classrooms should not be focused on instruction, but that students should instead be provided different learning experiences in interactive activities with their peers and be supported with their teachers [10]. Emerging technology in the context of learning environments and instructional content (e.g., online tutorials or videos) can be used to enable students to study and self-assess before the classroom sessions [11]. This helps teachers to substitute the teachers' teaching by these resources and requires the necessary opportunity to take part in the learning process.

Multimedia-assisted learning is one of the tools to enhance the students' independent learning in the flipped classroom model. Multimedia resources are essential in delivering the information from the teacher to the students as the solution to refresh the conventional teaching-learning strategy. The process of teaching by using sufficient visual media such as multimedia and various online learning can attract the students' attention and make their learning performance better [12]. The application of multimedia and various online learning sources help the students to comprehend what they learn easily. Thus, by using technology make the learning environment more enjoyable and fun. It is in line with Dale [13] who stated that the students achieve good learning results through the use of online presentation, video, and other sources of online learning. Multimedia learning proposes miscellaneous learning lanes for the students especially in implementing flipped classrooms, offers opportunities, and flexibility for students to manage their time of learning and space.

The implementation of the flipped classroom and the use of multimedia-assisted learning cannot be separated each other. Conducting flipped classroom in the teaching and learning process, the teachers need to enhance students' cooperation and their knowledge through the use of various online sources. The flipped classroom focus more on students centered learning. Then, it should be supported by the students' motivation and responsibility. In the flipped classroom, the students are trained to be independent and autonomous learners. The teachers continuously observing the students' process of learning, giving evaluation and valuable feedback. Garrison and Kanuka [14] stated that the flipped classroom approach "is a combination of face-to-face and online learning experiences not a layering of one on top of the other" (p. 99). The flipped classroom approach changes the responsibility of the teacher to the students [7]. The approach helps raise learner autonomy through online video lessons and class activities at school.

It is in line with Holec [15] who observed that today's education is based on more personalized and self-driven learning with the term 'take control of one's own learning'. The students are increasingly expected not only to implement the teacher's instructions but also to understand the curriculum's objectives to identify their own learning goals, prepare and organize their learning and evaluate their success. A new paradigm has been brought toward addressing these challenges and demands emerging the aspects required to encourage the autonomy of learners. The advantages of autonomous learners are expanded in Little [16]: (1) When you reflect on your learning it will be more effective and efficient because the learner is precise and based on what the student needs, (2) When learners are interested in learning, the low motivation problem is solved immediately, and (3) When language learning relies on language usage, it is easier to find efficient and spontaneous contact with learners who are already socially independent.

The crucial part of the students' perception during the implementation of a flipped classroom focusing on the quality of teaching and learning in the classroom. Some researchers investigating the students' perception in the implementation of online learning, and the conclusion that the teachers who implemented online learning in their classroom should also understand students perception during the implementation of online learning [17]. Furthermore, the students' satisfaction during online learning

having a fundamental part in deciding the success of online learning itself. Pollard [18] found online study using a web 2 portal had a constructive influence for students' in terms of building their motivation and provided a valuable chance for autonomous learning. The study conducted by Wright [19] described that the online learning class should be supported by sufficient exercising in the use of online platforms and how to integrate the tool for online learning must be made available to language professional and sufficient internet quality. This condition really helps the students to stimulate and build their autonomous learning without any serious obstacle. The previous studies also proved that students' autonomy and confidence will appear perfectly when the students have their independent way to learn through online learning. This condition happens because the students are less of tension to immediately respond to the questions. It also gains the benefit that the place for the study is more flexible and the self-management and time arrangement in doing their task fully depends on their own responsibility [20].

As the flipped classroom is interesting to be applied in the teaching and learning process in the classroom, it is required to conduct more research in this area, in both theory and practices, particularly for the EFL University students. Some previous research about the flipped classroom model, it is needed to explore more information about the application of this strategy in relation to the students' motivation and perception during their experience in online learning. Considering these issues, this study aims to offer some understanding into students' perception of learning autonomy toward the application of the flipped classroom. The research question is formulated as follows: How multimedia-assisted learning in a flipped classroom revealed the students' learning autonomy?

3 Research Method

This qualitative study was conducted in the reading class of the English education department. In order to gain the appropriate data, observation (pre-classroom and during the classroom), questionnaires, and interviews were implemented in a natural setting. 15 undergraduate students in the fifth semester of the English education department who took a reading class were chosen as the participants of this study. The reading class was taught by using the flipped classroom model. Besides engaging with the in-class activities, the students were also required to get involved in online self-learning activities by reading online materials and other online sources. This study was designed to explore how students perceive the implementation of multimedia-assisted learning in a flipped classroom model for their learning to promote their autonomous learning. The students were observed during the implementation of the flipped classroom model and at the end of the semester, the students answered 6 questions in the questionnaire form related to the implementation of the flipped classroom in the teaching and learning process. In order to get brief clarification and information related to the implementation of the flipped classroom model and students' perception of autonomous learning which is taken from some points of the questionnaire, then the semi-structured interview was implemented. It is important for

the students to determine what they have learned with the flipped model in their classroom.

4 Findings

Students' autonomy can be seen through their effort and motivation in fulfilling all the requirements given by the teachers during the implementation of the flipped classroom model in the reading class. Autonomous students have high initiatives and motivation in finding the solution from the problems they faced. The students could find and read relevant literature from internet sources, watch the video, discuss with colleagues and consults with teachers. In the implementation of the flipped classroom, the students also showed their high motivation, self-management, commitment in doing the task from the teachers, the students' participation in the discussion, language literacy by writing their report and difficulties found during pre-classroom activity, and also language proficiency that can be seen through their reflective essay and their presentation in front of the class. The indicators of the students' autonomous learning can be seen in Table 1:

Table 1. Factors and indicators influence autonomous learning

Factors	Indicators
Self-management	Always submit the assignments on time and complete all the tasks.
Active Participation	Responding to all the learning sessions actively by giving a comment, posting the idea in LMS and class presentation, and participating actively in questions and answers session in all the process of discussion.
Commitment	Provide enough time to learn online, do all the instruction given by the teachers, and attending all the class session (at least 14 meetings in a semester)
Digital Literacy	Select appropriate sources and include citation sources in all the task
Language Proficiency	Have good writing skills based on reflective essay projects and have good speaking skills in presenting the task by providing a clear and accurate opinion.

From table 1, it can be described that the students' autonomous learning can be categorizing based on the indicators that suitable for the factors relevant to autonomous learning. Mostly the students were actively involved in the flipped classroom model. They do all the instructions given by the teachers. Their cooperative learning was also improved because they have active online learning outside the classroom and also have an active class discussion. The feedback from the teachers is given at the end of the classroom session in every meeting.

The results of observation in the flipped classroom model also described some important points. Firstly, in the pre-activity stages, the students are given the responsibility to read a particular topic decided by the teacher. The learning materials can be accessed through relevant internet sources, videos, and other online media. The flipped method to the classroom has greatly improved student autonomy by learning material at home before getting involved in the class. Students were more confident in the classroom with a video lesson and reading printed materials. Secondly, the

students were ready with the learning materials, they get involved and participate in the classroom easily. The students with high motivation and self-management completed all the tasks on time and do not find a serious problem in their independent learning. Further, they also participate actively during the teaching-learning process because they have sufficient knowledge through the online sources before they attend the class. Thirdly, the student who found difficulties during the pre-activity discuss and consult actively with the teacher and their colleagues.

In the interview, for example, students explained:

“Through searching online materials from the literature online sources, I can practice the topic outside of the classroom and this exercise allows me more comfortable for class activities and discussions.”

“I prepared the topic being discussed in the classroom through the multimedia resources in the form of the video which is shared by the teachers in LMS. I could also watch the video when I wanted, when I slept on my bed or when I woke up in the morning, and also watch the video many times when I did not understand.”

“Sure, whenever I watch the videos outside the classroom, I can study it by myself. I will post a question and discuss it with others during the online forum conversation when I don’t understand. Such activities allow me confident and ready to participate in the learning.”

The flipped classroom model is designed by combining the activity inside and outside of the classroom. The students are encouraged to joining online learning by using multimedia-assisted learning (various online sources and LMS) before they come to the class. The students’ preparation related to the topic given by the teachers is conducting through online activity, so the students enjoy the teaching-learning process without any pressure. The flipped classroom activity is designed as shown in the Table 2.

Table 2. The activity in the flipped classroom

Stages of Flipped Classroom	Activity
Before class activity (outside of the class)	Read or learn a particular topic given by the teacher through multimedia online sources and joining LMS provided by the teacher
During class activity	Opening the class, brainstorming (10 minutes)
	Practices in pairs (10 minutes)
	Students presentation, questions and answer (35 minutes)
	Summing up and teacher’s feedback (20 minutes)
	Writing the reflective essay project and teacher’s explanation about the next topic (25 minutes)

From table 2, it can be described that the design of flipped classroom activity brings the students actively in independent learning. Their motivation for learning is also one crucial factor in determining the success of the students in joining a flipped classroom model. During the teaching-learning process in the classroom, the students were actively sharing ideas, problems, comments and questions and the teacher also provide valuable feedback related to the students’ difficulties and their questions in completing all the tasks.

The above activities provide several opportunities for students to cooperate with their peers and teacher in class time depending on the flipped learning environment. This result showed the strong social connections among students in flipping classrooms. This encouraged students to inform each other and share knowledge. Flipped classes have also supported students with poor ability to learn and answer their classmates' questions. The use of relevant online learning sources in the alternating classrooms has been noted in particular by all the interviewees as contributing to their positive experiences with other students during class hours. A constructive response was verbalized and shown by the students:

"During the class activity, we develop cooperation with all the students not only inside the classroom but also conducting during the online session when we have interaction in media online forum."

"I never talk to my friends outside the classroom otherwise; just face-to-face are we talking inside the class. I get difficulties to connect with my friend for discussing the assignment."

The multimedia online sources like LMS also designed to make learners more closely associated with each other. It shows that the LMS has been accepted as an engaging, connecting and learning environment for students. The students stated, for instance:

"I can learn my friends' behavior, such as their analytical thoughts, proper or supportive students, through comments and postings even from students on the online media."

"Preferable online sources are a good way for online learning and interaction outside the class. With this web and LMS, every day after class I can communicate with my classmates. I could also know them personally by reading their statements and questions through their comments."

This flipped learning provided 60 minutes of classroom conversation activities. Many students also realized that class activities are very useful for student-centered practices such as English conversation and dialog in a small group. The students noted how the flipped classroom provided valuable time to interact with other students in practicing English writing outside the class and speaking skills during the class discussion.

"We will share our English with others outside of the class and listen to the native speakers on film, learn writing and reading as well as learning new vocabulary."

"With the online application outside the classroom, I may practice English and learn English through my friends and improve my experience of listening, reading, and writing in English. Although I did not speak in English outside of the class, I can be posting my idea and comment in the chat forum. And I feel not worried about making a mistake in my English."

The flipped learning class with the use of various online learning sources and multimedia-assisted learning often improved student-teacher engagement. The engagement was determined not only in class but also outside of class time. The teacher may engage more directly or communicate individually with each student in order to enhance the performance of the student by received immediate feedback.

Interestingly, the teacher did not stand in class anymore, but she engaged in and assisted in the discussions with the students. They expressed their comfort and enjoyment by having interactive times with their teacher through LMS during and after class. The student mentioned:

“In learning through online activity, I can communicate with the teacher anytime even though not inside the class.”

“The posts of my friends really help me better understand the subject. The video tutorials sometimes were unclear so my friends shared more information from other sources.”

Finally, by the end of the activity, all the interviewees acknowledged that the classroom assignments gave them an opportunity to assess their progress as well as their peers. It also allowed them to understand the topic at the level of their peers. The student said that he checked regularly if his peers made mistakes in their online interaction. Students may fix their peers’ errors, along with their own mistakes, by means of peer assessment. By means of self-assessment, students also stated that compared to others, they could identify their weaknesses.

“I understand my ability level after considering the comments and performance of the students in and outside of the classroom. I realize my skills in the classroom.”

In addition to an online assessment, students could also evaluate themselves and their face-to-face meetings. In the class, small group debates provided peer feedback on their work. At the end of each class meeting, the teacher was provided an engaging feedback session. This session enabled the teacher to evaluate the entire activities in the classroom including the practice, group discussion, dialog and online activities, including viewing a video lesson, the use of multimedia, and online discussion. The students have shared their opinion that the teacher could provide immediate feedback outside the classes and throughout class hours. The teacher provided some remarks, explanations, suggestions, and highlights related to the topics discussed for an in-class assessment. The student mentioned:

“The teacher would immediately correct my wrong comment, she would never tell me wrong, and she will always comment and suggest my improvement.”

“The teacher asked students to provide input on our class activities prior to the class conclusion and eventually evaluated our practices by presenting remarks, clarifications, recommendations and updates on topics.”

The teacher also completed the lesson with an assessment during the face-to-face class session. During a group discussion, it was necessary for the students to write a short reflective essay of the text or resources and to submit it to their teacher within 5 days. The teacher gave a few recommendations and responses to student errors.

Students can learn and appreciate material at their own pace by providing online lessons. They have reported that online sources have become the habit of learning each night before going to bed. Here the online sources including video, website, and LMS group has helped effectively integrate the academic experiences of students including face-to-face class meetings and outside online learning. They also said that

seeing a video lesson outside the classroom presented them with plenty of time to listen to, compose and take notes in English. For example, the students stated:

“The teacher’s video lessons were provided in English and I could learn to listen to my English through watching the video which shares through LMS.”

“Through making a note of the video I watched and asking a question about the materials of learning, I might learn English writing.”

Moreover, the results of the observation and interview also are supported by the results of the questionnaire that shown 47% out of 15 students are categorized into the students who have high readiness to joining the flipped classroom model, while the rest 52% have moderate motivation to joining the flipped classroom model, it means they only joining the flipped classroom model because of the demand from the teachers. 48% out of 15 students used their smartphone and laptop to find relevant literature from internet sources, accessed relevant video, and searching relevant online books or articles related to the topic given by the teacher. From this condition, 43% out of 15 students strongly agree that the flipped classroom implemented in the teaching-learning process, because it encourages them to be independent learners with an enjoyable learning atmosphere. They can learn freely without any tension. The more students enjoy the learning atmosphere the more likely they were to be autonomous. Meanwhile, 40% out of 15 students agree that flipped classroom implemented in the teaching and learning process, but it still need to have detail and clear explanation from the teacher related to the material being discussed. And 17% out of 15 students were disagree to the implementation of flipped classroom in the teaching and learning process, because they think that the implementation of flipped classroom make them difficult to understand the materials being discussed without the teacher explanation like in face to face class. The also argued that by the implementation of flipped classroom they get difficulty in finding the sources of materials for learning, they prefer to have face to face or conventional teaching learning process. Through the implementation of the flipped classroom in the teaching and learning process, 53% from 15 students are performing better in their assignments given by the teachers. The students are having higher motivation, initiative, and commitment related to the assignment given by the teachers. They also have high motivation in discussing and consulting their difficulties with their colleagues and teachers. It means that the students have high autonomous learning, and it can be proved from the results of the questionnaire that 73% from 15 students agree that the flipped classroom encourages and stimulate their autonomy learning. It also supports the results of the questionnaire which describes that 47% out of 15 students are never found serious difficulty in following the flipped classroom model implemented by the teacher. Futhermore, it can be described that students with high motivation and good self-management are able to complete all the assignments. This is probably because the flipped classroom allows for more independence in learning than the traditional classroom.

5 Discussion

From the previous finding, it can be explained that the knowledge is not only the main goal to reach, but how to learn is another important thing they should know [21]. This condition was also supported by Kanelopoulos, Papanikolaou, and Zalimidis [22] who explained that the perspective of the flipped classroom method promotes students' effective participation in the classroom and increases the students' self-confidence. The students were actively preparing the learning material before attending the class, and also actively participating in the activities on solving some problems in the class.

The first topic discusses the performance of learning which was measured in the classroom through students' experiences. The involvement of the student is quite satisfactory, as the flipped model suggested in this study verified its performance. It is probably due to the learning processes that appropriate with the students' background of study. Before they attended the class, the students started with a preview of online lessons which helped them to understand and recognize difficult concepts. They got a summary of the topics as they took part in the course. The peer interaction approach was then used during face-to-face sessions to encourage the active engagement of students and deeper understanding through group discussion and in-class activities. Throughout presentations and discussions, you should take advantage of the information. Instead, the post-class process has helped them extend their previous knowledge. The teacher could measure their performance in order to see how much they might benefit from this method. The results were similar to previous studies in which students enhanced their performance in the flipped classroom [23].

The flipped classroom combines the use of collaborative technologies with traditional teaching techniques, which improve the influence over students' own learning and encourage further experiences and cognitive involvement. The teacher in teaching lessons utilizes multimedia-assisted learning includes LMS and various online sources as the technology tool for her process. The results showed that students are pleased with their benefits and effectiveness. It is likely because the students found the material easy to understand. Furthermore, they could share content, talk about topical issues and ask questions quite quickly with the features of the tools which encouraged shared learning. Communication among peers and teachers that arise during class at their convenience. The results show that students were pleased with the LMS as equivalent to previous ones [24], [25]. It is supported by Yao [26] who stated that online learning will help in forming learning teams guided by the teacher to establish an effective and efficient learning environment by improving the students' interaction and cooperation.

Focusing on students' comments on the flipped classroom, the students feel enjoy in the implementation of the flipped classroom model in the teaching and learning process. They thought that they were gaining many advantages. The flip-class environment encouraged better engagement, communication, and cooperation among the students and the teacher. The findings were aligned with many previous studies that suggested the encouragement of self-regulating learning environments, class

engagement and peer participation [23], [27], [28]. Positive results have also shown that both online assignments and classroom activities can be managed.

The last discussion was about the expectations of autonomy which developed after the procedure. This may be because the flipped classroom enables further learning autonomy than the traditional method. In the implementation of this model, knowledge is not just the main goal, it is important to know how to learn. We had more chances to handle themselves. It is possible to conclude the students tend to have more independent learning responsibilities. Although this is their first experience in the flipping classroom they adapt easily and look happy with it. This finding was compatible with other studies in literature review which seem to demonstrate that after the flipped classrooms the students acquired the level of autonomy [29], [30].

Autonomous learning before class, the teacher divides the instructional contents into several small tasks, each containing new points of information. The teacher offers an online material in advance, shares to the students on the LMS and applies the autonomous learning task which the students will write short reflective essays or relevant papers to the material, helps them to understand the problems and key issues so that students can verify if they have mastered the information points or not. Appropriate teaching technique and multimedia should consist of media such as online books, YouTube, and LMS to develop online learning that can enhance the students' communication and collaboration skills. [31]. Simultaneously, students are asked to recognize related or relevant ideas in Indonesia in order to facilitate communication and sharing between teachers and students.

The teacher determines the teaching goal and offers students' opportunity for autonomous learning results, according to the content feedback of the autonomous learning phase before the class. Students participate actively in classroom activities, inform autonomous learning outcomes before lessons, and things that they cannot solve. Presentations including lectures, role play, competitions, discussions, etc. may also be as diverse as possible. According to the autonomous learning report, teachers identify shortcomings and offer solutions to enhance students' curiosity in learning and explore them. The students' oral performance should be enhanced and the use of English should be strengthened in the classroom. Student discussions and collaborative experimentation will solve the problems that students do not solve before class. The teachers can make a comprehensive evaluation and summary, point out problems in learning to new information by students and promote internalization of students' knowledge according to students' attitudes, learning ability and learning style.

Autonomous learning after the class, students can learn individually from different information sources and master main points of knowledge with the aid of a range of digital network equipment by streaming video, learning time, material and location. The teachers can lead students to explore and think consciously about the issues encountered during the learning process so that they can learn how to analyze and finding the solution for their obstacles. In the meantime, the teacher offers timely instruction, meaningful and supportive feedback for the students, in order to promote autonomous learning through different forms of online collaboration with students.

6 Conclusion

Flipping the classroom that integrated the use of multimedia-assisted learning methods is an alternative to potential English courses as it is a worthy learning experience for students. The students' positive feedback indicates they are open to new things. This way of learning helps the students to monitor their education better. Teachers might need to choose the model that serves the context and supporting objectives of the class to make the teaching more beneficial and meaningful. The materials from video is an important part in the implementation of flipped classroom because they help students learn the content and understand the right concept of the lesson. The development of videos is thus a time-consuming part; teachers should have enough time to complete assignments and allow other teachers to reflect before the course begins. Both learner interactions and language performance should be enhanced in classroom practices. Besides that, it is necessary to select a learning platform. The use of efficient technology must be reviewed prior to use because it helps facilitate outside-class engagement amongst students and teachers.

Therefore, we may draw the following referential conclusions that flipped classrooms can be successfully encourage the development of autonomous learning abilities, improve the performance of English, and help to develop the potential of students' collaboration and creativity. Under the flipped classroom model, students' enthusiasm for knowledge and creativity is strongly encouraged, and they are more relaxed and get a challenging learning experience. The new learning model makes students more comfortable in English learning. Flipping teaching helps students to develop an understanding of autonomous learning and promotes enthusiasm for learning. The more students feel satisfied with their learning atmosphere, the more they will increased their autonomous learning.

7 References

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Article submitted 2020-03-01. Resubmitted 2020-07-26. Final acceptance 2020-08-22. Final version published as submitted by the authors.

Implementation Strategies for Improving the Teaching Quality of Foreign Language Courses

<https://doi.org/10.3991/ijet.v15i24.19031>

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Abstract—The teaching quality of foreign language courses is constrained by various factors. It is no easy task to improve the teaching quality or evaluate it in a reliable manner. To solve the problem, this paper attempts to design feasible strategies for improving the teaching quality of foreign language courses. Firstly, theoretical analysis was carried out on the development of foreign language teaching and the factors affecting the teaching quality, revealing the key obstacles to improving the teaching quality. On this basis, several strategies and paths were put forward to improve the quality of foreign language teaching. In addition, a novel evaluation indicator system and a multi-attribute fuzzy evaluation model were established for the teaching quality of foreign language courses. The research results provide strong supports to the teaching optimization of foreign language courses.

Keywords—Teaching quality, foreign language courses, implementation strategies, multi-attribute fuzzy evaluation

1 Introduction

Teaching quality is an important feature of the teaching level of modern education, and it is also the focus of attention in the implementation process of quality education at present. Since teaching quality plays an important role in modern education, discussion on the improvement of teaching quality and its corresponding internal logic and correlations is of great research significance [1-4]. As an important part of modern education, foreign language teaching has an extremely important catalytic effect on the cultivation of students' comprehensive qualities. Therefore, discussion on the development of foreign language teaching and the improvement of teaching quality has gradually become a research hotspot for educators [5-8]. However, foreign language teaching is restricted by a variety of conditions, resulting in shortcomings in the improvement effects of teaching quality. To solve this problem, many scholars have carried out a series of research and analysis on the improvement of the teaching quality of foreign language courses, and achieved good research results. For example, targeting at the fuzzy problem existing in the evaluation process of the teaching quality of college English courses, CAI proposed a method for evaluating the teaching quality of college English courses based on language phrases and triangular fuzzy

numbers [9]. WANG built a model for the teaching quality of foreign language based on Analytic Hierarchy Process (AHP), and gave factors affecting the teaching quality of English courses, and this study has a certain guiding significance for the improvement of the teaching quality of English courses [10]. Gore et al. discussed the impact of professional development on teaching quality and provided a reference for the improvement of the teaching quality of foreign language courses [11]. Nithyanandam proposed a framework to improve the quality of teaching and learning processes through the analysis of specific cases, which offers a good guidance for the improvement of the teaching quality of foreign language courses [12]. Wang and Song discussed a fuzzy comprehensive evaluation method of English teaching quality based on the Bat Algorithm, which provided a reference for the fuzzy evaluation and analysis of foreign language teaching quality [13]. However, because the improvement of the teaching quality of foreign language courses is a systematic project, with the continuous development of modern education technologies, the factors affecting the improvement of foreign language teaching quality are constantly changing, and the improvement of the teaching quality of foreign language courses shows more dynamic features. At the same time, although existing research results have certain promotive effects on the improvement of foreign language teaching quality, the different perspectives and starting points of the research make the category of corresponding applications has certain limitations. To this end, this paper further analyzes the problems existing in the processes of the development of foreign language teaching and the improvement of teaching quality, from the perspective of the integration of theoretical analysis and practical application, the paper comprehensively adopts the entropy method [14-15] and the gray theory [16-17] to study the methods and strategies for improving the teaching quality of foreign language courses, as well as the evaluation system and the models.

The research content of this paper consists of 5 parts. The first part gives an overview of relevant research results on the development and improvement of teaching quality in modern education. The second part discusses the constraints of the development of foreign language courses and the improvement of teaching quality. The third part proposes strategies and paths to improve the teaching quality of foreign language courses. The fourth part discusses a multi-attribute fuzzy evaluation model for improving the teaching quality of foreign language courses. The fifth part gives the research conclusions.

2 Constraints of the Development of Foreign Language Courses and the Improvement of Teaching Quality

There are many types of foreign language courses, including the widely used English courses, as well as other minority language courses such as German, French, Spanish, and Japanese, etc. Meanwhile, for the courses of each language type, the forms of teaching content are diverse, including the teaching of listening, reading, speaking, and writing, etc. It can be seen that the teaching of foreign language courses of different types and forms is a complex systematic project. In the teaching

implementation process, it is often restricted by various conditions, which further affect the teaching quality of foreign language courses. In this paper, multiple analysis methods such as literature review, questionnaire survey, expert interview and statistical analysis were adopted to conduct a preliminary analysis on constraints that may affect the development of foreign language courses and the improvement of teaching quality, in summary, they are mainly reflected in the following aspects:

2.1 Outdated teaching mode of foreign language courses

As a language learning method, the teaching of various forms of foreign language courses should pay more attention to the quality education of students. Through the comprehensive application of various teaching methods and tools, a teaching atmosphere and environment that is more conducive to language teaching can be created, so that students can quickly blend in the foreign language learning atmosphere, and students' enthusiasm and potential for language learning can be stimulated to the greatest extent, and their foreign language listening, reading, speaking and writing abilities could be effectively improved. However, judging from the implementation process of foreign language teaching, current foreign language teaching still focuses on traditional language teaching methods, lacking innovativeness in teaching methods, tools and forms; often, foreign language teachers just repetitively teach language knowledge according to existing teaching models, mechanically explain various knowledge points such as grammar, sentence patterns, and tenses, more attentions have been paid to the exam scores while the teaching process is often ignored. It can be seen that, essentially, the current foreign language teaching model is still the traditional exam-oriented teaching model, and there is still a gap between current education and quality-oriented education, resulting in a disconnection between the requirement of the times and the development of quality-oriented education, making it difficult for the existing foreign language teaching concepts to effectively adapt to the development of the times, and the teaching quality of foreign language can hardly be improved. For this reason, effectively and reasonably applying a variety of teaching methods and intelligent tools to improve current foreign language teaching modes in a targeted manner so that it can adapt to the development of the times will have a positive promotive effect on the teaching quality of foreign language courses.

2.2 Weak faculty of foreign language courses

Teachers are the basic guarantee for the improvement of the teaching quality of foreign language courses. A high-quality faculty is conducive to the improvement of the teaching quality of foreign language courses and the cultivation of foreign language professionals. Compared with other science and engineering disciplines and majors, language disciplines and majors are often not the mainstream in the school, and their status in the school is relatively low. In the construction process of school majors and disciplines, the emphasis on language majors is usually insufficient, and schools generally have limited investment in foreign language courses, therefore the

construction of faculty is difficult to carry out effectively. Insufficient investment in faculty construction makes it difficult for the software and hardware conditions of foreign language teaching to keep up with the requirements of the development of foreign language teaching, in particular, intelligent education technologies cannot be applied to construct advanced foreign language teaching infrastructure, such as multi-functional language teaching laboratories, multimedia classrooms, key language teaching and research offices, and modern computer centers, etc., and these facilities can provide a solid guarantee for the smooth implementation of foreign language teaching. The inability to carry out faculty construction effectively makes it impossible to introduce high-level professionals in foreign language teaching, meanwhile it has an impact on the training of professional teachers, then it'll be difficult for them to enhance their professional skills, which would result in a low faculty level of foreign language teaching, greatly affecting the teaching ability of teachers and the teaching quality of foreign language courses. Therefore, effectively improving the faculty level of foreign language teaching and building a high-quality faculty for foreign language major will play an indispensable role in promoting the teaching quality of foreign language courses.

2.3 Inadequate ability to reform and innovate foreign language courses

Teaching reform and innovation is a trend in the development of modern education, and it is also an important feature of modern education to be able to adapt to the social development. Especially with the rapid development of modern society, the demand for teaching reform and innovation of modern education is becoming more and more urgent. As an important part of modern education, the teaching of foreign language courses also has a problem with teaching reform and innovation, which is reflected in a few aspects such as the teaching content of foreign language courses, the teaching management system of foreign language courses, the curriculum planning of foreign language courses, and the evaluation mechanism of foreign language courses. In terms of the reform and innovation of teaching concept of foreign language courses, through the analysis of the implementation of foreign language teaching, it can be seen that for the foreign language teaching in some schools, the teaching materials, syllabus, teaching plans, training objectives and teaching tasks haven't changed a bit in many years; obviously, under this situation, such teaching concept can hardly meet the requirements of modern education, and the cultivated foreign language professionals can hardly adapt to the requirements of modern society, which means that foreign language professionals cultivated by such teaching concept are not competitive. In terms of the reform and innovation of the teaching management system of foreign language courses, a common problem is the redundant teaching management organization settings, which makes the processing procedure of foreign language teaching affairs extremely complicated, and the implementation process of foreign language teaching tasks and teaching management is fuzzy, the responsibility subjects of foreign language teaching are overlapping, the division of rights, obligations and responsibilities is not clear enough, and all these can affect the quality and efficiency of the teaching management of foreign language

courses. Obviously, low-level teaching management will directly affect the smooth implementation of foreign language teaching, and it is unable to provide good support for the improvement of the teaching quality of foreign language courses. Moreover, because the reform of foreign language teaching concepts is a systematic project, it cannot be completely transformed overnight; however, the outdated foreign language teaching management system also makes it difficult to implement the improvement of foreign language teaching concepts, thereby forming a vicious circle. In terms of curriculum planning of foreign language teaching, sometimes the current foreign language teaching has the problem that the teaching content of foreign language courses does not match with the student's absorption and acceptance abilities, meaning that there're certain limitations with the logicity, systematicness and hierarchy of the curriculum setting of foreign language courses. In terms of comprehensive application of modern teaching methods, tools and forms, to organically combine the teaching content of foreign language courses with students' cognition, further improvement and discussion are required. In terms of the assessment mechanism of foreign language teaching, the current assessment mechanism has certain problems with the supervision and assessment of the implementation process of foreign language teaching, it's difficult to discover weak links in the teaching process of foreign language courses. Especially, under the condition that the talent cultivation goal and standards of modern foreign language teaching are changing constantly, establishing a good assessment mechanism of foreign language teaching is of important significance. Therefore, effectively promoting the teaching reform of foreign language teaching and enhancing teaching reform and innovation abilities are quite meaningful for improving the teaching quality of foreign language courses.

2.4 Inadequate ability to integrate professional foreign language abilities

The teaching of foreign language majors needs to pay attention to the cultivation of students' abilities in listening, speaking, reading, writing and translating; and language learning often involves professional background knowledge of different fields. Therefore, from this perspective, the teaching of foreign language courses requires the integration of professional knowledge, skills and abilities of multiple aspects. However, it can be seen from the implementation process of current foreign language teaching that there are still some limitations in the ability to integrate the professional foreign language abilities, which are mainly reflected in the following aspects: first, the integration of theoretical knowledge and actual practice of foreign language teaching is insufficient, current foreign language teaching mostly focuses on the teaching of basic concepts and theoretical knowledge, while less emphasis has been laid on practical exercises, which makes it difficult to effectively practice and verify the theoretical knowledge, and theoretical knowledge that hasn't been verified in practice is not conducive to students' absorption and learning, and its comprehensive improvement effect on students' language abilities is not very obvious. Second, the integration of industry-university-research of foreign language teaching is insufficient; from the perspective of the development level of modern

society, modern education, social industries and scientific research are closely interrelated, mutually supportive and mutually promotive. However, the current foreign language teaching focuses more on the courses, ignoring the integration of the three, thereby weakening the promotive effect of the integration of the three on the development of foreign language teaching. Third, the integration of foreign language teaching and social service is insufficient, as an important part of quality education, the ultimate goal of foreign language learning is to serve the society, contribute to the society, and adapt to the requirements of social development. However, usually, modern foreign language teaching only considers the exam scores or certificates, while ignoring the communication and social service features of foreign language learning. Therefore, enhancing the integration of professional foreign language abilities can provide a new solution to the improvement of the teaching quality of foreign language courses.

3 Strategies and Ways to Improve the Teaching Quality of Foreign Language Courses

Due to the constraints and limitations of various conditions, the improvement of the teaching quality of foreign language courses requires to comprehensively consider these influencing factors, and take targeted, scientific, and reasonable measures and strategies for the corresponding influencing factors. This study holds that works can be carried out from the following aspects:

3.1 Increase basic investment in foreign language teaching

The basic investment in foreign language teaching is an important guarantee for the smooth implementation of foreign language teaching and an important supporting condition for improving the teaching quality of foreign language courses. Increasing the basic investment in foreign language teaching can be carried out from two aspects: one is to increase investment in the construction of foreign language majors and disciplines, and provide more financial support for the implementation of foreign language teaching; the other is to improve the software and hardware environment of foreign language teaching, build various facilities such as multi-functional language laboratories, teaching and research offices, multimedia classrooms, intelligent teaching platforms, and intelligent teaching management systems, etc., and provide a solid hardware support for the implementation of foreign language teaching.

3.2 Enhance the teaching ability and level of the faculty of foreign language majors

The teaching ability and level of the faculty of foreign language majors is the basic condition for the smooth implementation of foreign language teaching, and it is also the most direct factor to improve the teaching quality of foreign language courses. Enhancing the teaching ability and level of the faculty of foreign language majors can

be carried out from three aspects: the first is to introduce high-level foreign language professionals with senior professional titles and high academic qualifications, so as to supplement the teaching force by introducing senior talents; the second is to cultivate young faculty for foreign language teaching so that they can grow and become senior talents with high-level professional abilities, thereby achieving the optimization of the faculty team of foreign language teaching; the third is to enhance the training and academic exchanges of foreign language teachers, and improve the comprehensive professional abilities and teaching level of foreign language teachers.

3.3 Improve the reform and innovation ability of foreign language teaching

The reform and innovation ability of foreign language teaching is the driving force for the development of foreign language teaching, and it is also the catalyst for improving the teaching quality of foreign language courses. Improving the reform and innovation ability of foreign language teaching can be carried out from three aspects: The first is to encourage foreign language teachers to undertake or participate in more projects that are related to teaching reform of foreign language courses, so as to enhance their ability in teaching reform through the implementation of teaching reform programs. The second is to plan the foreign language courses combining with the characteristics of the times, and construct a curriculum system with the features of foreign language majors. The third is to encourage foreign language teachers to participate in the construction of foreign language majors, so as to enhance their teaching reform awareness and ability by promoting the development of foreign language majors.

3.4 Improve the management system and mechanism of foreign language teaching

The management system and mechanism of foreign language teaching has strong directional and instructional features for the implementation of foreign language teaching, a good management system and mechanism of foreign language teaching is more conducive to the implementation of foreign language teaching and the improvement of teaching quality of foreign language courses. Improving the management system and mechanism of foreign language teaching needs to be carried out from three aspects: namely do a good job in formulating rules and regulations of foreign language teaching management; do a good job in formulating rules and regulations of foreign language teaching assessment; and do a good job in formulating rules and regulations of foreign language student management.

4 Multi-Attribute Fuzzy Evaluation Model for Improving the Teaching Quality of Foreign Language Courses

Under above-mentioned measures and strategies, to effectively measure the improvement of the teaching quality of foreign language courses, a corresponding multi-attribute fuzzy evaluation model needs to be established.

4.1 Principles for selecting evaluation indicators

The selection of evaluation indicators directly affects the scientificity and reliability of the evaluation of the teaching quality of foreign language courses, therefore, this paper holds that the selection of evaluation indicators should follow certain principles.

Scientific principle: The evaluation indicators must have specific scientific meanings, which can reflect the connotation and essential characteristics of the evaluation of teaching quality of foreign language courses.

Objective principle: The evaluation indicators should be selected based on objective facts, not on individual subjective choices, they should be able to reflect the objective evaluation information of the teaching quality of foreign language courses.

Overall principle: The evaluation indicators should be able to achieve the evaluation of the teaching quality of foreign language courses from an overall perspective, the evaluation should not be limited to partial links.

Hierarchical principle: The evaluation indicators should have a hierarchical structure, and the constructed evaluation indicator system should have very clear hierarchical relationships.

Independent principle: The selection of evaluation indicators should avoid information redundancy as much as possible, so that the evaluation structure of the teaching quality of foreign language courses could be more accurate.

Quantified principle: The evaluation indicators should be able to obtain numerical values for the evaluation, so that the evaluation process of the teaching quality of foreign language courses can be quantified and analysed more easily.

4.2 Construction of evaluation indicator system

Table 1. Evaluation indicator system for the teaching quality of foreign language courses

Indicator system	First-level indicator	Second-level indicator
Evaluation indicator system for the teaching quality of foreign language courses	Ability to guarantee foreign language teaching	Financial input in teaching
		Faculty construction level
		Ability to form talent team
		Software and hardware teaching facilities
		Professional qualities of teachers
		Rationality of rules and regulations
		Rationality of organization setting
		Teaching reform ability
		Teaching integration ability
	Ability to carry out foreign language teaching	Accurate teaching goals
		Suited syllabus
		Scientific teaching scheme
		Intelligent teaching tools
		Advanced teaching methods
		Rich teaching content
		Diverse teaching forms
		Reasonable curriculum planning
		Atmosphere and environment of classroom teaching
		Timely interaction after class
		Comprehensive teaching assessment
		Correct teaching attitude
	Implementation effect of foreign language teaching	Pass rate of students
		Excellent rate of students
		Autonomous learning ability of students
		Innovation ability of students
		Social service ability
		Practical application ability
		Number of awards from student competitions
		Number of teaching reform programs undertaken
		Number of excellent teaching material and courses compiled
		Number of teaching reform papers published
		Number of teaching awards received by teachers
		Completion of teaching tasks

Following the above-mentioned principles, this paper constructed an evaluation indicator system for the teaching quality of foreign language courses from three aspects of the ability to guarantee foreign language teaching, the ability to carry out foreign language teaching, and the implementation effect of foreign language teaching, the specific content is shown in Table 1.

4.3 Standardization of evaluation indicators

It can be seen from the above-established indicator system for the evaluation of teaching quality of foreign language courses that, the evaluation indicators have diverse types and different measurement standards, therefore, to make the evaluation results reliable, all evaluation indicators should have a same measurement standard. In this paper, it's assumed that there're n evaluation indicators, then the initial value of evaluation object Q with respect to evaluation indicator j is $V_j(Q)$, and the value range of evaluation indicator j is $[V_j(\min), V_j(\max)]$, $1 \leq j \leq n$.

If evaluation indicator j is a positive indicator, that is, the larger the value, the better, then the standardized value of evaluation object Q with respect to evaluation indicator j is $U_j(Q)$, namely:

$$U_j(Q) = \frac{V_j(Q) - V_j(\min)}{V_j(\max) - V_j(\min)} \quad (1)$$

If evaluation indicator j is a negative indicator, that is, the smaller the value, the better, then the standardized value of evaluation object Q with respect to evaluation indicator j is $U_j(Q)$, namely:

$$U_j(Q) = \frac{V_j(\max) - V_j(Q)}{V_j(\max) - V_j(\min)} \quad (2)$$

It can be seen that after the standardization process, the value of the evaluation indicator j of evaluation object Q is a standardized value, and all the evaluation indicators have a unified measurement standard and they satisfy $0 \leq U_j(Q) \leq 1$.

4.4 Obtaining the weights of evaluation indicators

According to information theory, entropy can reflect the stability of a complex system based on the amount of information of system indicators. A stable complex system contains less information, and its corresponding entropy value is smaller, which means that the indicators have a smaller impact on the system [18-20]. Therefore, based on this principle, the indicator entropy values can be calculated based on the acquired evaluation indicators, the degree of dispersion of the evaluation indicator system can be analysed, thereby the weights of different evaluation indicators could be obtained.

Suppose there are a total of m evaluation objects, and the standardized value of evaluation indicator j of the i -th evaluation object is $U_{ij}(Q)$, then the entropy value H_j of evaluation indicator j is:

$$H_j = -\frac{1}{\ln m} \sum_{i=1}^m \left(\left(U_{ij}(Q) / \sum_{i=1}^m U_{ij}(Q) \right) * \ln \left(U_{ij}(Q) / \sum_{i=1}^m U_{ij}(Q) \right) \right) \quad (3)$$

And there is:

$$\lim_{\left(U_{ij}(Q)/\sum_{i=1}^m U_{ij}(Q)\right) \rightarrow 0} \left(\left(U_{ij}(Q)/\sum_{i=1}^m U_{ij}(Q) \right) * \ln \left(U_{ij}(Q)/\sum_{i=1}^m U_{ij}(Q) \right) \right) = 0 \quad (4)$$

Thus, the weight w_j of evaluation indicator j is:

$$w_j = (1 - H_j) / \sum_{j=1}^n (1 - H_j) \quad (5)$$

The corresponding weight sequence W of the evaluation indicators is:

$$W = \{w_1, w_2, \dots, w_j, \dots, w_{n-1}, w_n\}, \quad 1 \leq j \leq n \quad (6)$$

4.5 Construction of evaluation model

By seeking the opinions of experts in the field and combining the actual needs of the evaluation of the teaching quality of foreign language courses, this paper divided the teaching quality levels of foreign language courses into five degrees: excellent, good, average, qualified, and unqualified. Based on the gray clustering analysis method, gray clustering functions of the five degrees can be established separately [21-24].

The excellent teaching quality level is marked as $LEV1$, the corresponding gray clustering function $f_{LEV1}(U_j(Q))$ is shown in Figure 1.

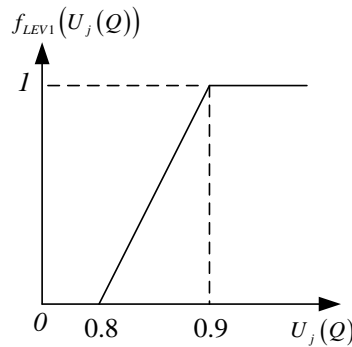


Fig. 1. Grey clustering function $f_{LEV1}(U_j(Q))$

Then the corresponding calculation model of $f_{LEV1}(U_j(Q))$ is:

$$f_{LEV1}(U_j(Q)) = \begin{cases} 1 & U_j(Q) \geq 0.9 \\ \frac{U_j(Q) - 0.8}{0.1} & 0.8 \leq U_j(Q) \leq 0.9 \\ 0 & U_j(Q) \leq 0.8 \end{cases} \quad (7)$$

The good teaching quality level is marked as *LEV2*, the corresponding gray clustering function $f_{LEV2}(U_j(Q))$ is shown in Figure 2.

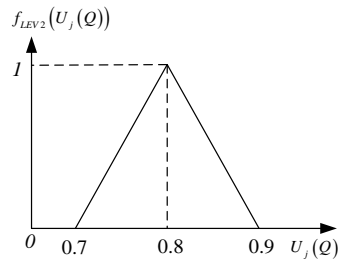


Fig. 2. Grey clustering function $f_{LEV2}(U_j(Q))$

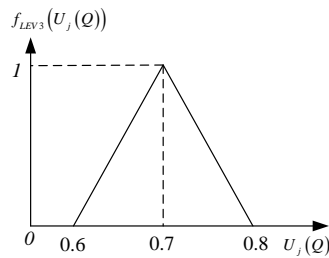


Fig. 3. Grey clustering function $f_{LEV3}(U_j(Q))$

Then the corresponding calculation model of $f_{LEV2}(U_j(Q))$ is:

$$f_{LEV2}(U_j(Q)) = \begin{cases} 0 & U_j(Q) \leq 0.7 \text{ or } U_j(Q) \geq 0.9 \\ \frac{U_j(Q) - 0.7}{0.1} & 0.7 \leq U_j(Q) \leq 0.8 \\ \frac{0.9 - U_j(Q)}{0.1} & 0.8 \leq U_j(Q) \leq 0.9 \end{cases} \quad (8)$$

The average teaching quality level is marked as *LEV3*, the corresponding gray clustering function $f_{LEV3}(U_j(Q))$ is shown in Figure 3.

Then the corresponding calculation model of $f_{LEV3}(U_j(Q))$ is:

$$f_{LEV3}(U_j(Q)) = \begin{cases} 0 & U_j(Q) \leq 0.6 \text{ or } U_j(Q) \geq 0.8 \\ \frac{U_j(Q) - 0.6}{0.1} & 0.6 \leq U_j(Q) \leq 0.7 \\ \frac{0.8 - U_j(Q)}{0.1} & 0.7 \leq U_j(Q) \leq 0.8 \end{cases} \quad (9)$$

The qualified teaching quality level is marked as *LEV4*, the corresponding gray clustering function $f_{LEV4}(U_j(Q))$ is shown in Figure 4.

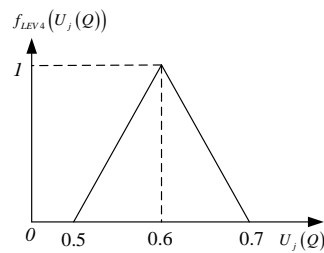


Fig. 4. Grey clustering function $f_{LEV4}(U_j(Q))$

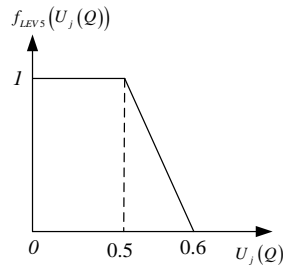


Fig. 5. Grey clustering function $f_{LEV5}(U_j(Q))$

Then the corresponding calculation model of $f_{LEV4}(U_j(Q))$ is:

$$f_{LEV4}(U_j(Q)) = \begin{cases} 0 & U_j(Q) \leq 0.5 \text{ or } U_j(Q) \geq 0.7 \\ \frac{U_j(Q) - 0.5}{0.1} & 0.5 \leq U_j(Q) \leq 0.6 \\ \frac{0.7 - U_j(Q)}{0.1} & 0.6 \leq U_j(Q) \leq 0.7 \end{cases} \quad (10)$$

The unqualified teaching quality level is marked as *LEV5*, the corresponding gray clustering function $f_{LEV5}(U_j(Q))$ is shown in Figure 5.

Then the corresponding calculation model of $f_{LEV5}(U_j(Q))$ is:

$$f_{LEV5}(U_j(Q)) = \begin{cases} 0 & U_j(Q) \geq 0.6 \\ \frac{0.6 - U_j(Q)}{0.1} & 0.5 \leq U_j(Q) \leq 0.6 \\ 1 & 0 \leq U_j(Q) \leq 0.5 \end{cases} \quad (11)$$

Therefore, based on the above calculation models, the gray correlation coefficient $f_{LEVk}(U_{ij}(Q))$ of the i -th evaluation object with respect to evaluation indicator j and the k -th evaluation degree could be obtained; at the same time, considering the weights of different evaluation indicators, the gray correlation degree $\varphi_{LEVk}(U_i(Q))$ between the i -th evaluation object and the k -th evaluation degree can be obtained, namely:

$$\varphi_{LEVk}(U_i(Q)) = \sum_{j=1}^n (w_j * f_{LEVk}(U_{ij}(Q))), \quad 1 \leq k \leq 5 \quad (12)$$

If it satisfies:

$$\varphi_{LEVl}(U_i(Q)) = \max_{1 \leq k \leq 5} (\varphi_{LEVk}(U_i(Q))), \quad 1 \leq l, k \leq 5 \quad (13)$$

It means that, for the current evaluation object i , its teaching quality of foreign language courses is evaluated to be the l -th degree.

5 Conclusion

The research work of this paper had achieved some results in the following three aspects: first, it analysed the relevant factors restricting the development of foreign language teaching and the improvement of teaching quality, and discussed the internal reasons that affect the improvement of foreign language teaching quality; second, the paper explored strategies and ways to improve the teaching quality of foreign language courses, and provided a good support for effectively improving the teaching quality of foreign language courses; third, the paper proposed an improved evaluation indicator system of foreign language teaching, and constructed a multi-attribute fuzzy evaluation model for improving the teaching quality of foreign language courses, thereby achieved quantitative analysis of the teaching quality of foreign language courses, and offered an effective measurement tool for evaluating the teaching quality of foreign language courses, the research of this paper is of important application value.

6 Acknowledgements

This work has obtained the funding from “Research on ICC Cultivation of Non-foreign Language Majors from the Perspective of “Third Space Theory” and

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7 Reference

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Article submitted 2020-10-03. Resubmitted 2020-11-17. Final acceptance 2020-11-18. Final version published as submitted by the authors.

Blended Teaching Strategies for Art Design Major Courses in Colleges

<https://doi.org/10.3991/ijet.v15i24.19033>

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Abstract—The blended teaching has not been well implemented in art design major courses of colleges. Neither has the performance of this teaching mode in course teaching been correctly evaluated. To solve the problem, this paper attempts to design suitable blended teaching strategies for art design major courses in colleges. To this end, a theoretical analysis was carried out on how blended teaching promotes the effects of modern art design education and course teaching. On this basis, several strategies were presented to implement blended teaching in art design major courses of colleges. From the perspective of engineering application, the authors established an evaluation index system and an evaluation analysis model for the performance of blended teaching in art design major courses, and thereby managed to quantify the teaching performance. The research results provide a theoretical basis and a practical solution for the implementation of blended teaching in art design major courses.

Keywords—Blended teaching, art design, colleges, course teaching

1 Introduction

Following the continuous development and in-depth application of modern intelligent education technology, the blended teaching has played an increasingly important role in modern education [1-3]. Research on the implementation and improvement of the blended teaching model in modern education is of great research significance for promoting the quality of modern education in terms of the strategies, methods, and approaches [4-6]. As an important part of modern education, art design has a promotive effect on the implementation of quality-oriented education. It is also a vital link in the training of professional art talents, proposing unique requirements for the blended teaching. Therefore, it has gradually become a hot issue in modern education to study the blended teaching of art design major courses [7-9]. Some scholars have carried out a series of related research, and obtained certain research results. For example, Rasheed Abubakar Rasheed et al. systematically analyzed and summarized the current problems and challenges of blended online learning [10]. Marciulyniene et al. [11] studied the practical teaching of art students, and discussed the interdisciplinary teaching mode among computer science students. Hallam et al. [12] took the English Waldorf Steiner school as a specific case and analyzed the art teaching methods. Yang et

al. [13] researched and analyzed the quality evaluation of MOOC/SPOC-based hybrid teaching, and established a corresponding evaluation index system. Qi [14] conducted research and analysis on the training mode of teaching talents for art design majors in colleges, and explored the new mode for applied talent training in many aspects. Tu [15] applied a mixed method of quantitative and qualitative research to analyze the teaching mode of art courses, which provides a reference for the implementation of the blended teaching. However, the blended teaching is a relatively new modern education model, and faces multiple constraints during its implementation. Especially with the continuous development of modern intelligent education technology, the blended teaching shows a dynamic development trend, thus causing some systemic problems inevitably in this process, that is, the difficulty in selecting an appropriate implementation strategy and effectively evaluating the blended teaching performance, etc. To this end, the authors first summarized the existing research results, and discussed the blended teaching strategies of the art design major courses in colleges from the comprehensive perspectives of theoretical analysis and engineering application. Based on entropy method [16-19] and information axioms [20-23], the corresponding performance evaluation system and model were established.

This study consists of 5 sections. Section 1 introduces and analyzes the blended teaching in modern education, as well as related research issues about the application of blended teaching model in the art design major course; Section 2 discusses the promotion effect of the blended teaching on modern art design education and course teaching; Section 3 studies the implementation strategies of the blended teaching for art design major; Section 4 further explores the evaluation system and model for the performance of the blended teaching in art design major course; Section 5 gives the research conclusions.

2 The Promotion Effect of Blended Teaching on Modern Art Design Education and Course Teaching

The blended teaching is a comprehensive teaching mode, providing support for modern art design education and course teaching from a multi-faceted perspective. Therefore, the rational use of the blended teaching is non-negligible. Specifically, it's manifested in the following aspects.

2.1 Promoting the reform of modern art design education

In essence, the blended teaching in the art design major means to redesign and consider the relationship between teaching and learning. This teaching-learning relationship has always been a field involved more in the modern art education reforms, and needs to keep up with the pace of modern education. In the teaching of art design major courses, the traditional teacher-oriented teaching model has always been criticized, while the blended teaching is teacher-led and student-oriented, emphasizing the enthusiasm and initiative of art students in the learning process, and combines various teaching methods such as group cooperation to cultivate their creativity, cooperation,

and independent learning. Meanwhile, the development of modern smart technology also provides supports for the reform of modern art education. The implementation of a blended teaching model in art design major courses can give full play to the advantages of modern intelligent technology, combine art design offline teaching with online network teaching, and maximize the teaching effect of art design courses. This is also in line with the trend of modern art design education reform. In addition, judging from its application scope, the blended teaching model can not only be applied to the field of vocational education and training, but also is valued by international research institutions and widely used in higher education. It conforms to the values of traditional higher education institutions, and tends to be one of the important trends in promoting higher education reform in the coming years due to the provable potential and meaningful learning experiences. The research report issued by the U.S. Department of Education also stated that, compared to pure classroom face-to-face teaching and distance online learning, the blended teaching is the most effective way. Thus, the blended teaching is much conducive to the implementation and development of modern art education reform.

2.2 Improving the classroom teaching effect of modern art design major

The core of the classroom teaching reform in art design major courses is to ensure the learning initiative of students, thereby changing the traditional lecture-style teaching method of art teachers. The art teachers in classroom are responsible for inspiring and guiding students to think and explore problems. The blended teaching in the art design course can change the traditional classroom teaching-centered model, and emphasizes the combination of dominant and subject roles. Traditional classroom teaching of art design courses is mostly based on simple teaching, i.e., teachers play a dominant role in the teaching and transmission of knowledge, only as the porter of art professional knowledge. Whereas, under the blended teaching mode, the main responsibility of the art design teacher is to organize and guide, i.e., lead students to explore knowledge, cultivate students' critical thinking, and develop their awareness of knowledge inheritance and ability of innovation. They need to think more about what students need, which is just an important content of modern higher education reform of classroom teaching. Online teaching platforms such as MOOC, flipped classroom, cloud classroom, etc., as the catalysts for classroom teaching reform, have been combined with offline teaching in the blended teaching. Using the advantages of the two teaching modes, the blended teaching can truly give play to the dominant role of students in the classroom, and then effectively improve the classroom teaching effect of art design major.

2.3 Facilitating the deep learning of art students

The blended teaching of art design major courses is a mixture of online learning and offline teaching methods. It's also a mixture of different teaching theories-based models (such as constructivism, behaviorism, and cognitivism) at a deeper level to achieve the most ideal teaching effect, involving both student participation and teach-

er-led activities. Mainly guided by constructivism and mastery learning theory, the blended teaching in art design major makes comprehensive use of modern educational technology and a variety of teaching methods, and adopts the mode of first self-study and then discussion which is more in line with the laws of human cognition. It plays a very important role in inspiring the emotional experience of students, promoting effective questioning and active learning, and improving the knowledge construction. Also, this mode can integrate the learning and application according to the characteristics of different professional courses, and combine abstract art design professional theoretical knowledge with related activities to achieve better learning and application, which is conducive to expand the relatively narrow coverage of traditional teaching knowledge of art design major to a certain extent, and help the art design majors to effectively use various knowledge sources for the integration of art professional knowledge. Under the blended teaching, most of the relatively elementary learning goals such as memory and comprehension are completed in online learning, and students with strong abilities can even complete the analysis and application of some knowledge learned offline. Art teachers can cultivate students' application and analysis ability and comprehensive ability by organizing small projects in groups etc., and finally train their evaluation ability through mutual evaluation between groups. From this perspective, the blended teaching mode implemented in art design major course teaching can effectively promote students' deep learning of the knowledge they have learned and achieve higher learning goals.

2.4 Motivating the development of high-quality teaching resources for art design major

With the emergence of Internet technology-based online courses, especially MOOC, flipped classrooms, and cloud classrooms, etc., modern education has paid more attention to star-teacher classrooms and elite-school classrooms. Although the online course development mechanism is not yet complete, and some college teachers do not agree with or adapt to the new teaching model, it's still a general trend to integrate online courses into the modern education course teaching system. No matter whether it's from the perspective of teachers improving their own reputation, or of schools improving social reputation and attracting better quality students, high-quality teaching resources are the most useful means. Therefore, actively developing high-quality teaching resources will be more conducive to improving the teaching quality of art design major courses. At present, some colleges or alliances focus on the research and development of high-quality educational resources. Through the integration and allocation of teachers and resources in several universities, the maximum distribution of educational resources has been achieved. In addition, various forms of effective operating modes have also been developed during the educational resource sharing. For the current operating mechanisms of MOOC, flipped classroom, cloud classroom, etc., cooperation and alliances are often used to jointly develop courses and share high-quality resources, thus forming a world-wide learning community. This has a great enlightening effect on the blended teaching of art design major courses, and is also more conducive to the development of high-quality teaching resources

for art design majors, providing more sources of professional knowledge for the teaching of art design majors, and enriching the teaching content.

2.5 Implementing the teaching evaluation and information feedback of art design art courses

Considering the diversity of the teaching forms in art design major, the evaluation of blended teaching has always been a hot topic of research. For example, in the course teaching of some majors, the professional teacher requires students to compile the logical relationship diagram of the course content according to their own understanding at the end of the class; students can fully express their understanding and opinions, and complete it through the discussion with their classmates, which is then scored by the teachers accordingly. This indicates that in art design course teaching, the blended teaching is conducive to the summarization and sorting of professional knowledge points, which not only consolidate professional knowledge of art students, but also cultivate their own logical thinking and autonomous learning awareness; their teamwork skills are also cultivated through communication with classmates, and the evaluation of professional teachers is relatively fair. Thus, it is a multi-purpose teaching evaluation method of art design course. Furthermore, the application of blended teaching in the art design courses can help to establish a team of teaching assistants for supervision and Q&A on the online platform, and assist teachers in encouraging students to participate in offline classroom discussions for enhancing the learning experience and learning effects. And with the continuous development of modern intelligent technology, some intelligent evaluation systems have begun to appear. The mid-term and final exams and assessments are carried out through a combination of online and offline, which can not only accurately test the students' mastery of the professional content, but also analyze some errors and give reasonable evaluation and analysis. This has a very important role in guiding students to improve their professional learning ability.

3 Blended Teaching Strategies for Art Design Major Courses

From the above, the blended teaching has an important role in promoting the teaching quality of art design major courses. Therefore, it's very important to design the proper blended teaching strategies in the art design major. The authors proposed the following strategies.

3.1 Expanding the function application of the teaching platforms in art design major

The teaching platform functions of art design course are mixed. On this basis, first the course platform column or function item of art design major should be designed in a concise and clear manner, making it convenient for art design students to operate and learn. If the teaching platform is too complicated and cumbersome, it will affect

the emotion and enthusiasm of the students, and even cause their rebellious psychology. Secondly, the design of resources and functions such as the learning content, learning methods, testing of learning results, and the generation and feedback of test results etc. of art design courses should be coherent and continuous. In this way, the art design students can conduct continuous learning to improve learning efficiency, and understand the results, find problems, and correct errors in time. At the same time, it's necessary to make full use of the student learning management system, teacher teaching management system, and educational administration supervision system of art design major course, and timely feedback the data information to achieve the purpose of supervising and motivating students.

3.2 Enriching the construction of online resources for art design major course

The construction of online resources is the basis for the development of the blended teaching model in art design major, and it is also an important link and part in the implementation of the blended teaching. Teaching resources are related materials that support students to complete various learning activities and tasks. The design of high-quality teaching resources can reduce the cognitive burden of students in learning and improve their learning efficiency. Therefore, it is necessary to make full use of the country's excellent digital education resources, which can not only guarantee the quality and scientific nature of art design course resources, but also promote the development of online teaching content. The pros and cons of online teaching resources for art design major courses directly affect the quality of blended teaching. According to the overall requirements for the construction of art design major courses, the online resources of blended teaching should help increase students' interest and promote their understanding, mastering and application of relevant professional knowledge and principles. For this reason, the online resources for art design major courses should be diversified. First, the types of resources should be diversified, i.e., the types of resources can include text, pictures, audio, video, and animation, etc., completing each other's advantages of various resources; multi-dimensional resources are used to stimulate students' multiple senses and thinking. Secondly, the form of resources should be visualized. The knowledge such as abstract principles, structure, and procedures etc. should be visualized in the forms of video or animation as much as possible. Then, the introduction of projects or tasks should be interesting, so that art and design students can have curiosity and desire to explore, and then stimulate their learning enthusiasm and initiative. Finally, the content of resources should be refined; the teaching content presented on the platform should be the most important of unit teaching, rather than copying the content of art design professional textbooks, let students spend the least time to acquire more valuable professional knowledge and ability.

3.3 Enhancing online teaching ability of art design major courses

Online teaching is the basic link of the blended teaching in art design major. The art design teachers should make full use of the diverse resources of the art design course teaching platform, and design different personalized projects or learning tasks for students with different abilities and intelligence types, to ensure that every student

has gains and progress. For the students who have made progress and gains, professional teachers should promptly affirm and praise through the platform system. First, professional teachers can assign tasks to students, let them carry out independent learning and discussion about tasks, and closely integrate the tasks to be completed with the problems to be solved, to enhance the learning purposiveness and pertinence of students, and conduct the online learning in a faster, more efficient, and more accurate way. This shall help to realize the internal transfer of professional knowledge of art design and the cultivation of students' advanced thinking ability, enable them to understand and learn about the use of professional knowledge, and improve their enthusiasm, initiative and learning efficiency. Secondly, professional teachers should supervise and guide students' learning using the blended teaching model on the basis of students' autonomous learning, and pay attention to their learning dynamics and progress in time. Thus, the teachers find problems, and then enlighten and guide students to solve in a timely and appropriate way through interaction, while students can continuously develop a sense of gain during the problem-solving process, thereby enhancing students' motivation and confidence in learning.

3.4 Improving the offline classroom teaching effect of art design major courses

The offline classroom teaching effect of art design major courses should be improved in the following aspects. Firstly, the selection and design of the offline teaching content should be made according to the online teaching content and students' learning situation, that is, offline teaching is the extension of online teaching, while online teaching is the foundation of offline teaching. The key point of offline teaching is to test the students' mastery of relevant knowledge and theory in online learning by allowing them to complete related tasks or solve related practical problems. The difficult point is the way of guiding students to solve problems in the process of completing tasks. The online and offline teaching content should be closely linked. In offline learning, art design teachers teach professional knowledge, guide students to use the learned knowledge and implement tasks, and conduct a summary evaluation of learning. Secondly, the offline classroom teaching methods for art design courses should be determined according to the characteristics of the teaching content and the cognitive ability of students. Generally, the practice, discussion, and case methods etc. are used in the study of principle and method-related knowledge; project-based teaching, and field teaching methods etc. are applied to learn about structural, procedural, and operational knowledge. In addition, offline classroom teaching of art design major courses should be targeted. Various situations and problems that occur in related learning should be pointed out as much as possible, so that students can not only understand the types of problems, but also analyze the root cause, and find the best solution.

3.5 Deepening the evaluation and feedback mechanism for the course teaching of art design major

The teaching evaluation and feedback mechanism of art design major courses should be deepened as follows. At first, it's necessary to intelligentize the evaluation

tools of art design course. Art design teachers should fully utilize the data-driven evaluation methods to collect and analyse the data information of students in online learning and interaction, and then adopt special tools to evaluate the factors that affect students' learning results. They can also evaluate student performance and provide timely feedback to students by audio or video tools. Timely evaluation and feedback can help teachers to effectively understand students' current learning status and knowledge mastery, strengthen students' active learning behaviours, and correct negative learning attitudes. Teachers can also use the supervision and management functions of the teaching platform to keep abreast of students' learning in class. Second, the evaluation content of art design major courses should be diversified. Art design teachers can use sensor technology and learning analysis technology to intelligently locate, identify, track, and record learners' learning data in flexible learning space and time, fully record and quantify the learning process information, scientifically measure and interpret the hidden learning intensity that students are difficult to capture in the learning process, predict potential problems and hidden dangers, and provide a basis for teaching decision-making. Furthermore, the evaluation subjects need to be multiple; it includes online course learning content, homework, and test completion of art design courses, participation in forum discussions, and attendance of live courses and discussion courses, classroom performance, completion of practical project, and final test scores, etc.; on the other hand, as well as the teachers and teaching administrators' evaluation of students, and the mutual evaluation between students. Finally, the teaching evaluation process of art design major courses needs to be dynamic. The evaluation purpose is to promote students to learn knowledge, practice skills, constantly surpass themselves, and constantly climb new heights. Therefore, the evaluation of students should be made in a process-oriented and dynamic way, and the learning process of students should also be evaluated; also, students are allowed to perform multiple dynamic tests until they are satisfied.

4 Performance Analysis for The Blended Teaching of Art Design Major Courses

4.1 Principles in selecting performance indicators

In order to effectively measure the promotion effect of the blended teaching on the art design course, it is necessary to reasonably select the performance indicators and achieve an accurate and appropriate performance analysis result. In this paper, the performance indicators were selected based on the following principles:

1. Scientificity and rationality: The selected performance indicators must have clear scientific meanings and can reasonably represent the essential problems for performance analysis.
2. Objectivity and authenticity: The selected performance indicators should be selected based on objective facts, avoiding subjective guesswork, and the true situation of performance analyses should be expressed.
3. Comprehensiveness and systematicness: The selected performance indicators must reflect the attributes at different levels, and have good logic and system.

4. Easy analysis and easy operation: The selected performance indicators should make it easier to obtain relevant performance analysis values, and carry out effective qualitative and quantitative analysis, to obtain highly reliable analysis results.

4.2 Establishment of the performance evaluation index system

Table 1. Performance evaluation index system

System layer	Primary indicators	Secondary indicators
The evaluation index system for the blended teaching performance of the art design major course	Teaching ability	Basic professional ability
		Professional curriculum planning ability
		Teaching innovation ability
		Teaching team building ability
	Teaching methods	Instructiveness
		Continuity
		Scientificity
		Enlightenment
	Teaching means	Intelligence
		Diversity
		Pertinence
	Teaching forms	Rationality
		Innovativeness
	Teaching content	Richness
		Advancement
		Integrativeness
	Teaching effect	Classroom teaching atmosphere
		Interaction after class
		Cultivation of students' autonomous learning ability
		Cultivation of students' innovation ability
		Clarity of teaching objectives
		Completeness of teaching task
	Teaching assessment	Perfectness of the assessment mechanism
		Student satisfaction
		Teacher mutual evaluation satisfaction
		Expert supervision satisfaction
	Teaching results	The level and quantity of teaching awards
		The level and quantity of education reform projects undertaken
		The level and quantity of student competition awards
		Pass rate
		Student excellence rate
		Grade and quantity of high-quality textbooks
		Grade and quantity of published educational reform papers

Based on the above principles, this paper establishes an evaluation index system for the blended teaching performance of the art design major course. This system mainly consists of different performance indicators such as teaching ability, teaching

methods, teaching means, teaching forms, teaching content, teaching effects, teaching assessment and teaching results, as shown in Table 1.

4.3 Fuzzy information calculation model for performance analysis

Information axiom is an important part of axiomatic design theory [24-25]. On this basis, the less information contained in the design factors of a complex system, the better the design system. And, the amount of information I contained in the design factors can be expressed as

$$I = -\log_2 P \quad (1)$$

And, P is the probability that the current design factors meet the given design requirements.

Under special circumstances, if the discrete parameters are required to achieve the given design of the design system, the probability can often be determined through the relevant degree of membership, namely,

$$P = \int_{\mu_1}^{\mu_2} \rho(P) dP \quad (2)$$

where, μ_1 and μ_2 respectively represent the limit values of the probability that the design factor meets the given design requirements, and $\rho(P)$ is the probability density function, which generally shows random distribution.

Based on the performance evaluation index system established above, it can be seen that the performance indicators for the blended teaching effect of art design major courses were divided into qualitative indicators and quantitative indicators, or into positive indicators and negative indicators. Then, the corresponding index information calculation models were established respectively. Supposing that there are m analysis objects and n performance indicators; if the j -th performance indicator is a quantitative indicator, its value for the i -th analysis object is $v(ij)$; if it's a positive indicator, its standardized measurement value is $u(ij)$, that is

$$u(ij) = \frac{v(ij) - \min_{1 \leq i \leq m} v(ij)}{\max_{1 \leq i \leq m} v(ij) - \min_{1 \leq i \leq m} v(ij)} \quad (3)$$

If it's a negative indicator, its normalized value is $u(ij)$, that is

$$u(ij) = \frac{\max_{1 \leq i \leq m} v(ij) - v(ij)}{\max_{1 \leq i \leq m} v(ij) - \min_{1 \leq i \leq m} v(ij)} \quad (4)$$

Then, the amount of information $I(ij)$ about the j -th performance indicator of the i -th analysis object is given as:

$$I(ij) = -\log_2 P = \log_2 e^{1 - \left| u(ij) - \max_{1 \leq l \leq m} u(ij) \right|} \quad (5)$$

If the j -th performance indicator is a qualitative index, its value for the i -th analysis object is generally expressed by fuzzy membership $\varphi(ij)$; if it is a positive indicator, the amount of information $I(ij)$ is given as:

$$I(ij) = -\log_2 P = \log_2 e^{1 - \varphi(ij)} \quad (6)$$

If it is a negative indicator, the amount of information $I(ij)$ is expressed as:

$$I(ij) = -\log_2 P = \log_2 e^{\varphi(ij)} \quad (7)$$

4.4 Generation of performance indicator weights based on entropy weight method

Regardless of different types of performance indicators, it's assumed that the value of the corresponding indicator is expressed as $u(ij)$ for the convenience of analysis. According to the theory of system decision analysis, different performance indicators have different degrees of importance. For this reason, these indicators need to be weighted. Entropy weight method has the characteristics of simple calculation, strong objectivity, and high accuracy in the process of index weight analysis. Thus, it was adopted to assign the weights for performance indicators.

On the basis of obtaining the value $u(ij)$ of performance indicators, it can be calculated as:

$$G(ij) = u(ij) / \sum_{i=1}^m u(ij) \quad (8)$$

Then the information entropy H_j of the j -th performance indicator is given as:

$$H_j = -\frac{1}{\ln m} \sum_{i=1}^m (G(ij) * \ln G(ij)) \quad (9)$$

The absolute weight \tilde{w}_j of this indicator is calculated as:

$$w_j = 1 - H_j \quad (10)$$

From this, its relative weight w_j can be derived as:

$$w_j = w_j / \sum_{j=1}^n w_j \quad (11)$$

4.5 Algorithm implementation of performance analysis

After obtaining the information amount $I(ij)$ and relative weight w_j , the comprehensive information amounts $I(i)$ of the i -th analysis object in the performance evaluation system of the blended teaching for art design major course can be given as:

$$I(i) = \sum_{j=1}^n (w_j * I(ij)) \quad (12)$$

According to the physical meaning of information axioms, the smaller the amount of comprehensive information $I(i)$, the better the teaching effect of the art design major course under the blended teaching mode for the i -th analysis object; conversely, the greater the amount of information $I(i)$, the worse the teaching effect of the said course. Therefore, the principle of preference is shown as:

$$I(o) = I_c(k) = \min_{1 \leq i \leq m} I(i), \quad 1 \leq k \leq m \quad (13)$$

This indicates that the blended teaching for the k -th analysis object in art design major course performs the best.

5 Conclusion

The authors first analysed the implementation of the blended teaching in modern education, and confirmed its role in promoting modern art design education and course teaching. Then, specific strategies were presented to implement the blended teaching in modern art design education and course teaching, which provides directive guidance for the implementation of the said model in art design major courses. Finally, the evaluation index system and information axiom-based calculation models were established, to effectively evaluate the teaching performance of art design major course under the blended teaching model. This provides an important means of support for the performance evaluation of blended teaching in modern art design major courses.

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Article submitted 2020-10-03. Resubmitted 2020-10-27. Final acceptance 2020-10-28. Final version published as submitted by the authors.

The Use of Digital Portfolios to Enhance English as a Foreign Language Speaking Skills in Higher Education

<https://doi.org/10.3991/ijet.v15i24.15103>

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Abstract—The purpose of this study is to analyze the use of digital portfolios to enhance EFL (English as a Foreign Language) speaking skills in English-major undergraduate students at Universidad Técnica Particular de Loja, in southern Ecuador. The participants were 42 students at the A2 level, according to the CEFR (Common European Framework of Reference for Languages). All of them were enrolled in an English Language Integrated Skills course. A mixed-method approach was used to collect and analyze data in this study. Pre and post-questionnaires, observation sheets, and speaking rubrics were applied as instruments. Students used their smartphones to create digital portfolios in a free storage service (*Google Drive*), which included videos and audios about certain topics considered in the course syllabus. The speaking activities consisted of recording information in different locations of the university campus (cafeteria, laboratories, library, chapel, sports ground), and other places of the city. The students worked individually, in pairs or groups to carry out different speaking activities during an academic term of 5 months. Personalized feedback was provided by analyzing the students' oral performance through the speech artifacts uploaded in each portfolio. The findings show that digital portfolios were effective to enhance students' pronunciation and fluency. It was also confirmed that the implementation of digital portfolios through free storage services can increase students' motivation to practice oral skills in the target language.

Keywords—Digital portfolios, EFL speaking, free storage services, higher education, smartphones

1 Introduction

In the field of EFL teaching and learning, speaking has been considered as the most essential among the four language skills since it determines learners' ability to use the target language efficiently [1] and [2]; certainly, as [3] states, speaking involves the active use of language to express meaning. Nevertheless, this skill has been regarded as the most challenging to master for the majority of learners [4]. In this context, the use of technology, which is nowadays an inevitable part of our life, provides the as-

sisting tools that EFL teachers and students need for enhancing speaking [5]. One of these tools is the digital portfolio, which offers several benefits including effectiveness for the improvement of learners' speaking, autonomy, and media literacy skills [6].

Among the different technological tools that can be used to design digital portfolios in EFL education (Google Drive, Voice Thread, Evernote, Weebly, etc.), Google Drive is one of the most powerful ones. This web-based application allows learners to share files and handle them in their courses. Besides, it supports different types of file formats including documents, photos, spreadsheets, presentations, forms, among others, which can be easily used for educational purposes [7]. In fact, according to [8], the main advantage of this tool is that it offers a free online place to develop and maintain electronic portfolios through computers or smartphones. In the case of, smartphones, they can expand language learning opportunities beyond the EFL classroom [9]. Indeed, implementing mobile-based learning in EFL teaching and learning can enhance instructors' creativity in materials design, and it can increase students' motivation to learn language skills [10].

With the recent advances of technology, several studies about the use of portfolios have been conducted especially in North America and Europe [11], [12], [13], [14]; however, existing research has been mainly focused on promoting different English skills without making enough emphasis in analysing students' perceptions about their oral production. Based on the aforementioned aspects, this study attempts to address the effectiveness of digital portfolios to enhance EFL speaking so that educators motivate themselves to help students improve this skill, which is one of the most difficult language abilities for Ecuadorian students to master. It is important to remark that the use of free cloud storage tools and smartphones offers pedagogic possibilities that favor the implementation of digital speaking portfolios in higher education. In fact, despite the previously mentioned benefits, research conducted on the use of this tool to enhance EFL speaking in the Ecuadorian context has been scarce. Therefore, the present study is a pioneer attempt in this field. Thus, the following research questions have been posed:

How do students perceive the use of digital portfolios to enhance speaking skills?

What is the impact of the use of digital portfolios on EFL students' speaking?

1.1 English as a foreign language

English is considered a lingua franca that connects people in a global world. As [15] acknowledges, the importance of English worldwide has many economic, cultural, and social reasons. In fact, [16] asserts that "There has never been in the past a language spoken more widely in the world than English is today". [17] affirms that English is a contact language for people who do not share either a common mother tongue or a common national culture. Furthermore, English constitutes a communicative tool between its users from English native-speaker backgrounds and EFL speakers of this language in international business, politics, technology, and media discourse [18]. English is also considered as the most important vehicle in the world for

storing and transmitting information because it is the language of international communication [19].

1.2 Communicative competence through speaking

Speaking in a foreign language has been regarded as the most challenging among the four skills [20]. Indeed, according to [21] it is well-known that the speaking process involves a dynamic interaction between speakers and hearers, which results in spoken discourse. Due to this complexity, speaking has been recognized as an interactive, social, and contextualized communicative event. Consequently, the central role of speaking in developing learners' communicative competence has also become evident, since this skill requires learners to be able to produce not only linguistically correct but also pragmatically appropriate utterances. In this context, [22] refer to communicative competence as "a synthesis of knowledge of how language is used in social settings to perform communicative functions, and knowledge of how utterances and communicative functions can be combined according to the principles of discourse". Certainly, as [23] acknowledges, communicative competence is the speakers' ability to decide how to use different linguistic resources considering context and form.

1.3 EFL speaking

Speaking is widely considered one of the most important language skills to be developed in EFL education [24]. In fact, in the global era, the speaking ability is essential to achieve effective communication in the target language, especially because it allows people to communicate in a lingua franca in diverse social and cultural contexts [25][26]. In this respect, through verbal language, speaking helps people to express ideas and thoughts [27]. However, despite its importance, [28] mentions that EFL speaking is commonly perceived as a challenge for learners since they usually need a huge effort to effectively use the language in real-time. Additionally, other factors such as negotiating meaning, managing effective conversations, and speaking spontaneously are very common issues that EFL learners should face in the language acquisition process [28]. For these reasons, speaking constitutes a significant goal when communicating in the target language [29].

1.4 ICT tools to enhance speaking through digital portfolios

Information and Communication Technologies (ICT) have been widely used in language classes around the world [30]. EFL teachers use ICT tools for different academic purposes, especially for learning, improving, practicing, and assessing the speaking skill [31]. Among the multiple tools that EFL teachers can use to enhance students' speaking skills, digital portfolios give different benefits in terms of enhancing learners' oral production, autonomy, among others [6]. As a matter of fact, e-portfolios allow students to design and save their artifacts and also to reflect on their achievements and goals [32]. In this respect, Google Drive has been chosen for

conducting this study because it favours synchronous communication through a web-based application that allows users to store files and edit documents collaboratively from different types of devices [33]. It is necessary to remark that other tools such as Voice Thread and Evernote were also analysed as possible alternatives to be used in this study; however, Voice Thread did not allow multiple users to have access to the same account, while Evernote did not support real-time collaboration on notes with other users. In this regard, one way to incorporate storage tools in speaking courses is the use of e-portfolios, which usually have a positive influence on undergraduates [12]. Furthermore, mobile devices such as smartphones allow teachers and students to take advantage of interactive multimedia content for academic purposes [34].

1.5 Previous studies

EFL students' perceptions of the use of e-portfolios to document and assess their speaking performance were explored in a study conducted by [11]. This research work intended to bridge the gap in the emerging literature on e-portfolio instruction and assessment and bring to light an alternative tool for EFL teachers to assess students' oral skills. The participants included fifty-one sophomores from two English conversation classes at a Taiwanese university. The instruments included e-portfolios, an attitude questionnaire, and interviews. The results evidenced that EFL students generally positively perceived the implementation of e-portfolios because they are useful to identify their weaker areas in speaking, offer additional oral practice opportunities, and relieve speaking anxiety. Also, learners encouraged the use of e-portfolios as a supplementary oral assessment tool that considers not only the evaluation final product but also the efforts invested during the learning process.

In a study carried out by [12], the effectiveness of using e-portfolios to develop EFL learners' speaking skills was investigated. The participants were 17 Turkish learners who were asked to record their assignments using videos and audios through an e-portfolio platform called www.lore.com. The research method used involved data collection, interviews, self-assessment papers, and cover letters. The data were analysed using content analysis. The findings revealed that e-portfolio is equally effective to develop students' speaking skills as it is with their writing skills.

In [13]'s study, the teachers' perceptions of the use of e-portfolios in speaking classes were identified. The study followed a qualitative method in which semi-structured interviews were implemented and analysed through the content analysis method in terms of benefits of e-portfolios, drawbacks for learners, students' requirements, teachers' requirements, and the impact of e-portfolios on teachers. The method used was based on familiarization, coding/labelling, clustering, defining codes operationally, retrieving and organizing data, and looking for interrelationships between categories. The findings reveal that e-portfolios are helpful to measure students' progress, strengths and weaknesses, so that feedback is given positively. Also, the effective use of e-portfolios helps students to make connections about the learning process in the classroom and the use of the target language in real-life situations and contexts.

Finally, [14] explored the network and collaborative traits that videoblogs portfolios could bring in learning English as a second language in higher education. The study was based on Vygotsky's socio-constructivist theory and Siemens' theory of connectivism. These theories were implemented in a project-based on instruction, which emphasized student-centred learning. The participants were 19 students (5 males and 14 females) aged 18-20 years old. The researches integrated technology to help students enhance their English-speaking fluency for 10 weeks. Data was collected through a qualitative design using field observations, a qualitative document, and a focus group interview. After analysing the data, the main scaffolding techniques used by the participants were identified. The results revealed that learners made use of scaffolding techniques to enhance learning amongst peers throughout the vlog portfolio project.

2 Materials and Methods

2.1 Setting and participants

This study was conducted at Universidad Tecnica Particular de Loja, a private university located in southern Ecuador. The participants were 42 students (male and female, aged 19 - 25 years old) from the A2 level, according to the CEFR, who were registered in an English Language Integrated Skills course. The main purpose of this course was to develop students' listening, speaking, reading, and writing skills through a communicative integrated approach in which the exposure to authentic use of the language was permanently promoted. However, this study was particularly focused on enhancing students' speaking performance.

2.2 Instruments and materials

- A pre-questionnaire was used to diagnose the students' background knowledge regarding the use of digital portfolios for EFL learning as well as to identify if they perceived themselves as skilful in using storage tools through smartphones. This instrument was based on a 5-point Likert scale that included 10 questions and was administered through the Survey Monkey tool (see Appendix 1)
- Observation checklists were also used to obtain further information about aspects related to EFL speaking, motivation, use of the storage tool, use of smartphones, and feedback (see Appendix 2)
- Speaking rubrics adapted from Cambridge English Qualifications [35] were applied to assess the quality of the speaking artifacts saved by students in their portfolios through the storage tool (in terms of pronunciation, grammar, vocabulary, fluency, and originality) (see Appendix 3)
- A post-questionnaire was also administered to identify the participants' perceptions after using digital portfolios as a resource for enhancing EFL speaking skills. It consisted of 10 questions with similar characteristics to the ones included in the

pre-questionnaire, and it was useful to obtain quantitative and qualitative data about instruction intervention (see Appendix 4)

2.3 Procedure

The data for this study were gathered for five months in the academic period of October 2019-February 2020. A mixed-method approach, which included both quantitative and qualitative data analyses was used in this research. According to [36], the core assumption of this approach is that the use of both qualitative and quantitative methods allows a more complete comprehension of a research problem than either method alone.

Concerning the step-by-step procedure (see Fig.1), after the pre-questionnaires were applied, and those results were analysed, students were part of an intervention that consisted of using their smartphones to create digital speaking portfolios and organize them in the storage tool chosen for this study (Google Drive). The participants were asked to work either individually, in pairs, or groups to carry out different speaking activities dealing with describing interesting places and people, giving opinions about different situations, talking about their family and friends, and pronouncing lists of words. Besides, the portfolios included artifacts such as videos and audios recorded in different locations of the university campus (cafeteria, laboratories, library, chapel, sports ground), and other places of the city (see Fig 2). During this process, personalized written and oral feedback was provided based on the students' speaking performance which was evidenced through the artifacts included in each portfolio. To do this, the rubrics adapted from [35] were used to assess the quality of each speaking artifact considering linguistic aspects such as pronunciation, grammar, vocabulary, and fluency at an A2 level. It is necessary to mention that originality was another element considered for assessing students' academic performance because the process of recording videos and audios was also intended to promote the participants' creativity.

Additionally, during the aforementioned intervention, 8 lessons were systematically observed to register learners' attitudes regarding portfolio construction. At the end of this process, the post-questionnaire was administered to determine the participants' perceptions regarding the impact of digital portfolios to practice EFL speaking. It is necessary to remark that the pre and post questionnaires were piloted and validated with similar groups of students before being administered. As for the analysis, descriptive statistics and frequency distributions were calculated using Excel spreadsheets; this process was useful to obtain graphical representations of data. The main findings were then triangulated with the results of the speakers' academic performance and systematic observations.

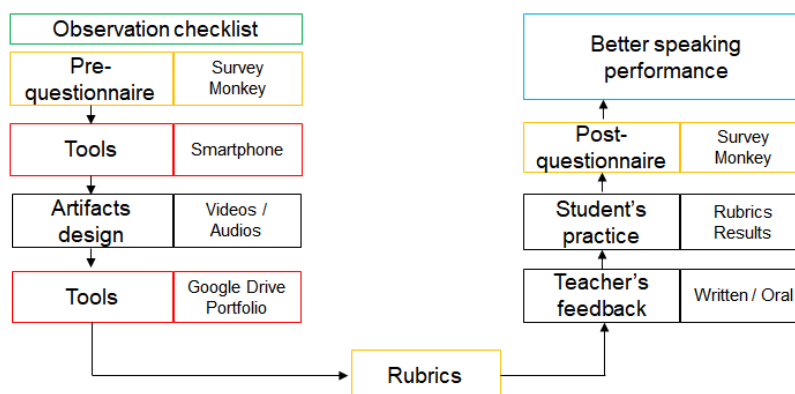


Fig. 1. Methodological procedure

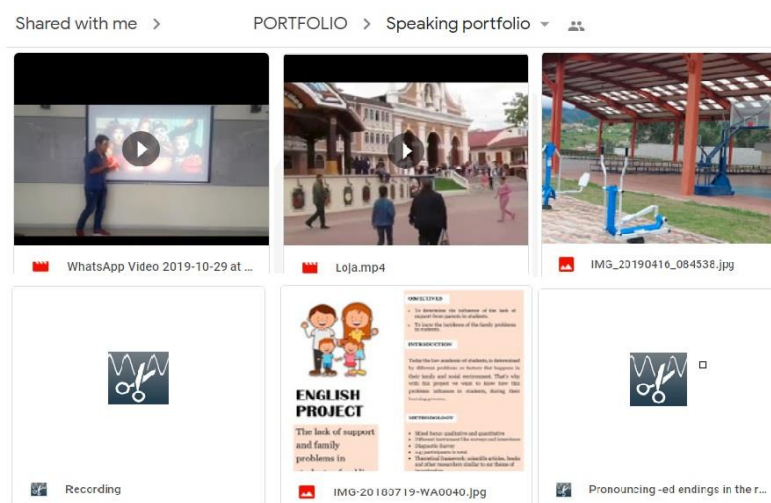


Fig. 2. Sample of students' digital portfolios

3 Results and Discussion

Before the intervention, some background information about students' previous knowledge of the use of digital portfolios for enhancing EFL speaking was obtained. In addition, the participants' technological skills in using storage tools through smartphones were identified. Generally speaking, most of the students had a neutral position about the use of digital portfolios as a tool that could help them to improve their oral skills (see Figure 3). Regarding learners' perceptions about their technological skills for using storage tools in their smartphones, 67.33% of them affirmed that

they knew how to use them for academic purposes. Concerning the students' experience of using digital portfolios, 48.47% of them asserted that they had used them before, especially in writing courses of their major. Based on the opinions above, it was found out that the students practically did not have previous experience in using EFL speaking portfolios.

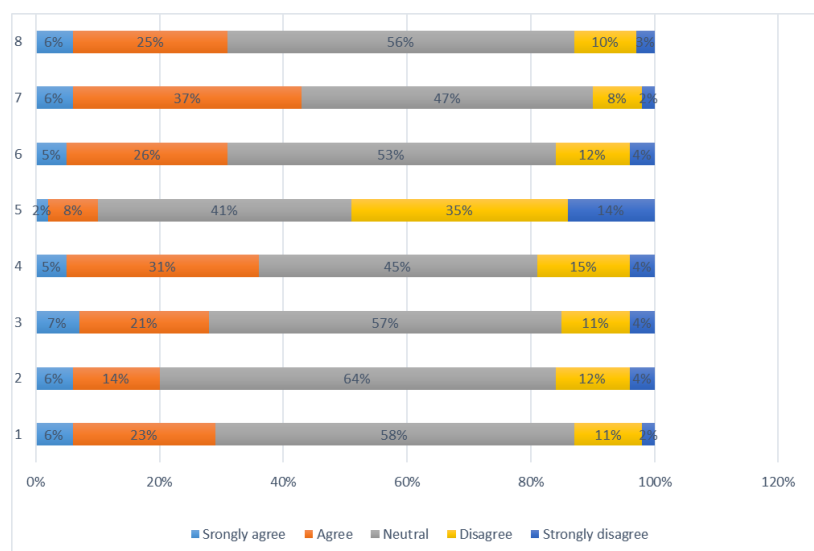


Fig. 3. Students' previous perceptions about digital speaking portfolios

After conducting the intervention, students' perceptions of the use of digital portfolios were statistically analysed in aspects concerning their impression about motivation, organization facilities, feedback, effectiveness of audio and video recordings, and improvement of linguistic skills. The results are shown in Table 1.

Table 1. Students' perceptions regarding the use of digital portfolios

No.	Statements	Strongly agree (%)	Agree (%)	Neutral (%)	Disagree (%)	Strongly disagree (%)
1	The use of digital portfolios was motivating.	63.45	31.11	3.44	2.00	0
2	The storage tool allowed me to organize my digital speaking portfolio.	68.78	25.16	4.62	1.44	0
3	The organization of the digital portfolio facilitated the practice of speaking.	81.45	13.74	2.95	1.86	0
4	The digital portfolio facilitated the feedback process.	92.66	4.45	1.46	1.43	0
5	The use of smartphones was effective to record videos and audios.	68.30	26.30	4.20	1.20	0
6	The use of digital portfolios allowed me to improve grammar and vocabulary in oral	68.70	28.20	2.10	1.10	0

	production.					
7	The use of digital portfolios allowed me to improve pronunciation and fluency in oral production.	77.10	19.80	2.30	0.8	0
8	My digital portfolio allowed me to improve my speaking.	87.90	8.30	3.50	0.30	0

Regarding the use of the storage tool to organize students' digital speaking portfolios (table 2), 68.78% of the participants indicated that they strongly agree with this factor, and 25.16% agree. During the observations, it was evident that the use of this storage service was easy for students to manage because they could use it without any difficulty. It is necessary to mention that a very low percentage of 1.44% considered that this tool was not useful for this purpose. These findings are fairly consistent with the existing research conducted by [37] who mentioned that using a file storage service is a valuable tool that can be used to guide EFL students understanding along the learning process.

Concerning whether the organization of the digital portfolio facilitated the practice of speaking, a significant percentage of students (81.45%) strongly agreed with this aspect, and 13.74% showed agreement. Only 2.95% of the participants had a neutral opinion about this factor. As for the observation, students seemed active and engaged during the process of audio and video recording. Certainly, the organization of their digital portfolio helped students practice by doing, and was useful to keep a record of their ability to speak in the target language. In fact, [38] affirms that the use of portfolios is beneficial not only to enhance EFL speaking but also to improve academic achievement.

As for feedback, 92.66% of the students perceived that the use of digital portfolios favoured the feedback process, while, a low percentage of learners (1.43%) disagreed with this aspect. In line with the observations, students showed a positive attitude towards individual and group feedback to develop their English-speaking skills. Indeed, they looked very grateful when the teacher made them repeat the pronunciation of certain words, or when linguistic aspects such as grammar and vocabulary were discussed. In this respect, [13] remark that e-portfolios help instructors keep track of students' progress by identifying their weaknesses when speaking in English.

Regarding the participants' perceptions of the use of smartphones as effective tools to record videos and audios, most of them (94.6 %) strongly agreed and agreed with the statement. Nevertheless, a few students (4.20 %) were neutral while 1.20 % of them disagreed. Certainly, researchers observed that students easily used their smartphones for recording their audios and videos. As [39] acknowledges, smartphones are frequently used for video production with different learning purposes in a wide range of educational contexts, this is possible because the technological development of smartphones and their video recording feature allows students to use them as portable and personal language learning tools.

Concerning the participants' perceived benefits of digital portfolios for enhancing oral production, the aspects considered were grammar, vocabulary, pronunciation, and fluency. Thus, 96.9 % of the students strongly agreed and agreed that digital portfoli-

os allowed them to improve pronunciation and fluency. However, 2.30% were neutral, and only 0.8% expressed disagreement. As for grammar and vocabulary, 68.70% of the participants strongly agreed and 28.20% agreed on the benefits of digital portfolios for enhancing their grammar and vocabulary knowledge when speaking, while a minimum percentage of 3.20% were either neutral or in disagreement with the aforementioned aspects. These results were corroborated by the observations in which it was evident that most of the students had the opportunity to improve their speaking skills through the activities that were implemented. Certainly, research reveals several benefits of the use of digital portfolios for improving speaking; thus, [12] assert that students' perceptions regarding the use of e-portfolios in speaking are positive in terms of grammar, pronunciation, vocabulary, self-confidence, and motivation.

The participants expressed their perceptions regarding the improvement of their speaking skills as a result of the use of digital portfolios. Most of them (87.90%) strongly agreed with this statement, 8.30 % agreed, and 3.80 % did not express agreement or disagreement. It is important to remark that nobody disagreed with the aforementioned statement. In this regard, [40] emphasize that speaking portfolios offer learners outstanding benefits including self-reflection, peer-feedback, and general improvement of their speaking skills.

To complement the previous analysis, Table 2 presents the main aspects that were observed by the researchers during the intervention process.

Table 2. Use of digital portfolios to enhance EFL speaking

Dimensions	Students' attitudes observed during the intervention
Speaking	Students improved their oral production
Motivation	Participants were engaged in the process of creating their artifacts and organizing their digital portfolios.
Use of file storage service	The use of file storage services was easy for students.
Use of Smartphones	Students used their smartphones to organize their portfolios easily.
Feedback	Students showed a positive attitude towards individual and group feedback.

Finally, after assessing the final speaking portfolios through the use of rubrics adapted from [35] (Figure 2), the results demonstrated outstanding media scores in terms of pronunciation (8.4 points), and fluency (8.2 points). The assessment was conducted through a careful analysis of students' performance in the different videos and audios that they recorded during the intervention. Indeed, at the end of the course students were able to exchange information, and describe matters of immediate need in simple terms, which is a learning outcome established at the A2 CEFR proficiency level. Furthermore, the scores in the originality aspect were also noticeable even though this factor was not directly related to the speaking skill; this might be the result of students' engagement and creativity with the portfolio organization.

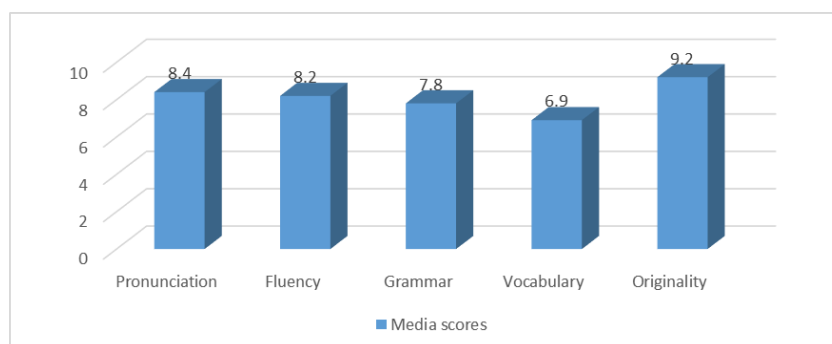


Fig. 4. Students' media scores in final digital portfolios

4 Conclusion

The use of digital portfolios is motivating for enhancing EFL speaking skills at the A2 CEFR level. Students were engaged in the process of recording audios and videos since they had the opportunity to visit different locations at the university campus (cafeteria, laboratories, library, chapel, sports ground), and other places of the city. Besides, they demonstrated to be proud of themselves when organizing creative and original artifacts.

Free cloud storage services and smartphones are easy-to-use ICT tools for creating and saving EFL speaking portfolios. University students and teachers can use these tools to record, store, and organize audio and video files effectively. This allows instructors to keep a record of students' artifacts, analyse them, and provide personalized feedback along the learning process.

The organization of digital portfolios helps students practice their speaking skills. This is evident since learners' practice by doing, which is a positive factor because they become more active and look for opportunities to improve their oral language skills. As students systematically record their artifacts, they feel more confident to speak the target language.

Digital portfolios allow teachers to provide timely feedback because of the facilities offered by smartphones and free storage services. Students were grateful when the teacher assessed their speaking performance because this process helped them to improve this language skill. Certainly, the most important benefits of digital portfolios in teaching EFL speaking are related to grammar, vocabulary, pronunciation, and fluency. Among all of these aspects, pronunciation and fluency are the most outstanding according to students' perceptions.

It is necessary to mention that an important limitation of this study was the reduced sample of participants. Since this research was conducted with only 42 students from one private university in Ecuador, the findings obtained may not be generalized in other contexts. Further research about the innovative use of digital speaking portfolios should be conducted to help students improve their EFL oral skills through the use of technology.

5 Acknowledgement

I would like to acknowledge the Research Department at Universidad Técnica Particular de Loja for promoting and supporting research projects through the EFL Learning, Teaching and Technology Research Group.

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Article submitted 2020-04-21. Resubmitted 2020-07-31. Final acceptance 2020-08-22. Final version published as submitted by the authors.

8 Appendices

8.1 Pre-questionnaire

Purpose: The aim of this questionnaire is to collect information to identify your prior knowledge about the use of digital portfolios as a technological tool for enhancing EFL speaking.

Instruction: Read the following statements which may or may not describe your beliefs about digital speaking portfolios. Rate each statement by circling a number between 1 and 5 where the numbers mean:

- 5. Strongly disagree
- 4. Disagree
- 3. Neutral
- 2. Agree
- 1. Strongly agree

N°	Statements	1	2	3	4	5
1	The use of digital portfolios is motivating.					
2	Storage tools allow students to organize a digital speaking portfolio.					
3	The organization of the digital portfolio facilitates the practice of speaking.					
4	Digital portfolios facilitate the feedback process.					
5	The use of smartphones is effective to record videos and audios for academic purposes.					
6	The use of digital portfolios allows learners to improve grammar and vocabulary in oral production.					
7	The use of digital portfolios helps students to improve pronunciation and fluency in oral production.					
8	Digital portfolios allow students to improve my speaking.					

9. Do you know how to use storage tools on your smartphone? If so, can you explain your technological skills for using them for academic purposes?

Yes ()

No ()

Explain: _____

10. Have you ever used digital portfolios in any of the language courses you have taken as part of your Major? If so, can you describe your previous experience?

Yes ()

No ()

Explain: _____

8.2 Observation checklist

Questions	Yes	No	Comments
The students had a positive attitude in communicative activities that involved oral production			
Students were motivated when organizing their artifacts through video and audio recordings			
The teaching strategies were effective for enhancing speaking at an A2 level			
The use of the file storage service was easy for students			
Students could use their smartphones to organize their portfolios without any difficulty			
The teacher provided individual feedback to reinforce students' speaking performance			
The teacher provided group feedback according to the students' learning needs.			

8.3 Speaking rubrics

CEFR A2	Exceeds expectations 6.68 – 10	Meets expectations 3.34 – 6.67	Needs improvement 0 – 3.33
Fluency	The student maintains simple exchanges and needs very little assistance or support.	The student maintains simple exchanges, despite some difficulty; however, he/she might need support from the teacher.	The student has considerable difficulty to maintain simple exchanges. Additional support is needed.
Pronunciation	Student's pronunciation is mostly intelligible and has good control of phonological aspects at both utterance and word levels.	Student's pronunciation is mostly intelligible, despite an evidently limited control of phonological features.	The student has very limited control of phonological features and is often unintelligible when pronouncing in the target language.
Grammar	The student has a good degree of control of simple grammatical forms at this level.	The student shows sufficient control of simple grammatical forms at this level.	The student shows only limited control of a few grammatical forms at this level.
Vocabulary	The student uses a variety of appropriate vocabulary when talking about everyday situations.	The student uses appropriate vocabulary to talk about everyday situations.	The student uses a vocabulary of isolated words and phrases.
Originality	Originality, insight, and creativity are evidenced in the speaking portfolio.	Originality, insight, and creativity are demonstrated sometimes; the student tries to contribute, but the final portfolio does not go beyond the expectations.	Originality, insight, and creativity are not clearly demonstrated; the final portfolio is not creative at all.

Rubric adapted from Cambridge English Qualifications [35]

8.4 Speaking rubrics

Purpose: The aim of this questionnaire is to collect information concerning your perceptions about the use of digital portfolios as a technological tool for enhancing EFL speaking.

Instruction: Read the following statements which may or may not describe your beliefs about digital speaking portfolios. Rate each statement by circling a number between 1 and 5 where the numbers mean:

- 5. Strongly disagree
- 4. Disagree
- 3. Neutral
- 2. Agree
- 1. Strongly agree

No.	Statements	1	2	3	4	5
1	The use of digital portfolios was motivating.					
2	The storage tool allowed me to organize my digital speaking portfolio.					
3	The organization of the digital portfolio facilitated the practice of speaking.					
4	The digital portfolio facilitated the feedback process.					
5	The use of smartphones was effective to record videos and audios.					
6	The use of digital portfolios allowed me to improve grammar and vocabulary in oral production.					
7	The use of digital portfolios allowed me to improve pronunciation and fluency in oral production.					
8	My digital portfolio allowed me to improve my speaking.					

9. How do you describe your experience of using storage tools on your smartphone?
10. Would you like to continue using digital portfolios for enhancing EFL speaking skills?

Yes ()

No ()

Training Model of Innovative Talents in Physical Education Major

<https://doi.org/10.3991/ijet.v15i24.19035>

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Abstract—In the major of physical education (PE), there are several problems with the training model of innovative talents: the model implementation is affected by numerous factors, the training strategies are unclear, and the measurement of the training effect is highly uncertain. To solve these problems, this paper explores deep into the training model of innovative talents in PE major, through both theoretical analysis and calculation modeling. Firstly, the essence of innovative talent training in PE major was summarized, and the training strategies were put forward. On this basis, a measurement model for the training effect was established, based on analytic hierarchy process (AHP) and extenics theory. The research results provide strong supports to the training of innovative talents in PE major.

Keywords—Physical education (PE), innovative talent, training model, modern education, extenics theory

1 Introduction

At present, with the rapid development of the society, innovative talents have been the driving forces and backbones of national development, and the cultivation of innovative talents has become an important part in the construction of modern human resources [1-4]. The training model of innovative talent is an inevitable trend of modern education development, and a key link in the implementation of quality education. It has an important role in promoting the cultivation of high-level talents [5-8]. As an important part of quality education, PE is an indispensable supplement to the development of modern education. The implementation of an innovative talent training model in PE major will provide great supports for the training of PE professionals, and is conducive to improving the competitiveness of PE talents and developing the physical education [9-11]. Lots of researches on the training model of innovative talent have been conducted. For example, Kwon and Block [12] analyzed the implementation of adaptive E-learning project in PE major. Forey and Cheung [13] studied the benefits of using explicit teaching of PE classroom language in the PE courses. Lin and Pan [14] analyzed the current research status of the training model of innovative talents in PE major and constructed a new training model. Tang [15] conducted research on the current research status of the training model of innovative talents in

PE majors, and explored the means for the implementation of this model. Liu [16] discussed the logical relationship and the corresponding realization path of the innovative talents training in PE major in the context of “Internet +”. The research above is of great significance to positively guiding the training of innovative talents and implementing the related training model in PE major. However, it is very challenging to implement the said model, and there is still a broad research space in terms of key research content. For this reason, this paper summarizes the existing research results, and deeply studies the training model of innovative talents in PE major through the theory analysis and calculation modelling based on AHP [17-18] and extenics theory [19-20].

This study consists of six parts. Part 1 summarizes the related research content of modern education and innovative talent training; Part 2 discusses the inner relationship between the training model of innovative talents in PE major and Physical education development; Part 3 analyzes the constraints on the development of innovative talents training model in PE major; Part 4 explores the implementation path and strategies; Part 5 constructs an index system for the training effect analysis of the training model, and establishes the corresponding measurement model; the last part gives the research conclusion.

2 The Inner Relationship between the Training Model of Innovative Talents in PE Majors and the Development of Physical Education

Talents are strategic resources for the development of modern society. The training of high-level talents is an important means to promote social development and national progress. Innovative talents are the cores of talent resources and important symbols of enhancing the social competitiveness. From the perspective of modern education, innovative talents in PE major, as the backbones of physical education, play a key role in improving the level of physical education development and the overall PE quality. Therefore, the development of physical education should focus on the training of innovative talents in PE major, while the training of innovative talents needs to be carried out according to the development needs of physical education. Both show an inner relationship of mutual coordination, promotion, and reinforcement.

2.1 The training model of PE innovative talents is the inevitable trend in the development of physical education

The traditional training model of PE major focuses on the training of applied professionals. Such model is exam-oriented in the training of PE professionals. Thus, the trained PE professionals obtain certain theoretical knowledge, but lack necessary practicality, and their comprehensive quality and innovation ability are poor. Following the continuous improvement of the modern society and modern education technology, the current talent training model in higher education has been gradually difficult to meet the needs of social development, and to achieve the goals and plans

of modern education development; also the social demand of high-level talent has been more pressing, and the cultivation of high-level innovative talents has gradually become the mainstream form of modern education development. The training of innovative talents in the PE major can ensure to provide professional talents with strong innovation ability and comprehensive quality, and further promotes the development of physical education, while the development of physical education also requires the talent resource guaranteed by the training model of innovative talents.

2.2 The training model of PE innovative talents meets the demand of PE teaching reform

Due to the continuous development of modern education technology, modern physical education is gradually changing from traditional test-oriented to quality-oriented education. But considering the influence of numerous factors in the traditional physical education process, modern model is difficult to form quickly and effectively. Also, in the changing process, many unknown problems will inevitably appear. If these problems cannot be analyzed and dealt with scientifically and reasonably, it must hinder the development of modern physical education. Innovation and reform are the driving forces for modern education. To develop the modern physical education, the most effective way is to carry out effective teaching reform, which can solve various problems in the existing physical education process, deal with the negative influencing factors, and break the existing educational shackles, thereby providing effective solutions to the development of physical education. Therefore, from the perspective of innovation and reform, the implementation of the innovative talent training model in PE major is an urgent need for modern physical education reform, which will enhance the reform ability of modern physical education.

2.3 The training model of PE innovative talents is the guarantee condition for improving the PE teaching quality

Apparently, the training model of innovative talents in PE majors differs from the tradition model only in terms of training form. It has no significant impact on the PE teaching quality, and causes no many changes in the development of physical education. However, this is not essentially true. From the form, this model is a change from the traditional PE professional talent training model, but the former pays more attention to the professional knowledge, innovation ability, learning ability, and thinking and resolving ability of PE professionals, and it is more conducive to the output of high-level and high-quality sports professionals. From the internal relations, it is a comprehensive improvement of modern physical education in terms of teaching philosophy, teaching methods, teaching means, teaching forms, teaching content, teaching management systems, and teaching assessments etc. The complete implantation of this model in different aspects will provide a solid guarantee for the improvement of PE teaching quality.

2.4 The development of physical education promotes and expands the training model of innovative talents in PE major

From the above, the implementation of the training model for PE innovative talents is an inevitable trend in the current development of physical education, and an important part of the physical education teaching reform. It can provide not only a strong support for the training of high-level PE professionals, but also a solid guarantee for the improvement of PE teaching quality. With the development of modern physical education and the continuous outputs of high-level PE professionals, higher requirements are put forward for the implementation of the said training model and cultivation of PE innovative talents. For this, it's necessary to solve the key issues more fully in the implementation of the training model under the new situation, continuously expand the scope of the training model for innovative talents, deepen the intrinsic nature of the training model, and further improve its implementation effect. This kind of virtuous circle will further strengthen the inner relationship of mutual coordination, promotion and support between the training model of PE innovative talents and the development of physical education.

3 Constraints on the Development of Innovative Talent Training Models for PE Majors

In view of the mutually reinforcing between the training model of PE innovative talents and the development of physical education, it's of great significance to develop the training model for cultivating high-level professional talents in PE major. However, due to many shortcomings in the current physical education environment, the implementation of this model is still constrained by many factors as follows.

3.1 The lack of innovative educational concepts

The training model for innovative talents in PE major requires corresponding teaching management systems and educators. The teaching management system must be able to effectively reflect the training goals, planning, tasks, management, and assessment, and manifest the inherent nature of the training model, so as to provide directional guidance for the establishment of correct innovative education concepts in PE major. At the same time, the educators, as the main carriers for implementing the innovative talent training model, have the most direct impact on the implementation process of the said model. The teaching concept of the educators should keep up with the current development requirements of the physical education, because it directly determines the implementation effect of the model. Nevertheless, in the transforming process from a traditional education model to an innovative education model in PE major, there still remains many factors of the traditional model, and the innovative education concept of the PE major needs to be further improved.

3.2 Weak faculty in the training of PE innovative talents

The continuous development of modern education technology and quality-oriented education has further highlighted the role of PE teaching in modern education, and encouraged the colleges to invest more in human resources of physical education. However, compared with other majors, the faculty in PE major is relatively weak, and especially in the process of promoting the training model of innovative talents, high-level professional teachers are relatively lacking. In addition, there is also a lack of abilities to build a professional team with a good talent echelon structure, which on the one hand cannot guarantee the effective introduction of high-level, highly-educated and high-title professionals, and on the other hand, fails to effectively develop and utilize internal talents, even leading to the loss of internal professional talents. This shall greatly affect the faculty of innovative education, failing to provide effective support for the implementation of the training model.

3.3 Insufficient input resources of basic education in PE major

The PE major is relatively weak compared to other disciplines or majors such as science, engineering, medicine, agronomy, and management engineering. It often receives a small proportion of basic education resources invested by schools, which makes it difficult to effectively guarantee the development of physical education, while the training of innovative talents in PE major requires much investment in basic education resources. Although with the development of modern society, the school's investment of basic education resources in the construction of physical education has been improved to a certain extent than before, it is often reflected in the hardware facilities such as construction of physical education site venues, stadium, and equipment. These hardware facilities are just face projects and cannot be effectively applied to the PE teaching process. Meanwhile, the supporting software facilities are lacking, so that the inputs of basic education resources in PE cannot give full play, and fail to promote the effective training of PE innovative talents.

3.4 Incomplete training system for PE innovative talents

The management of PE education means not only to coordinate the relationship between human resources, financial resources, and material resources, but also to reflect the goal, planning and social nature of the PE talent training. As the training model of innovative talent in PE is implemented constantly and deeply, the related talent training system has not been improved simultaneously. Especially some detail problems in the implementation process of the training model are difficult to be solved effectively, and there still exist some deficiencies in the links such as teaching task planning, teaching work management, teaching performance management, teaching incentive mechanism, and student management, etc. Therefore, it's urgent to keep the training system in line with the implementation of the training model, and effectively meet the needs of social development. Only a perfect training system for

innovative talents in PE major can better promote the implementation of this training model.

3.5 Low reform and innovation ability in PE major

The training model of innovative talents in PE major is an innovation of the existing training models. It's implemented through the PE teaching reform. This model needs to be completed through the joint efforts of educators in different links of the PE teaching. In this process, it is necessary for educators to brainstorm, take more responsibility for teaching reform topics, and study the essentials of the cultivation of innovative talent training. Especially the effective reforms and innovations should be conducted in terms of teaching concepts, teaching methods, teaching means, teaching forms, teaching content, and teaching management system, and teaching assessment mechanism, etc., and supporting measures, strategies and ways are proposed. This shall provide impetus for the implementation of the model. But there are still some shortcomings in the reform and innovation of the current PE teaching reform. On the one hand, there is a lack of an environment for the teaching reform and innovation; on the other hand, the teaching reform and innovation of the PE major are often mere formalities, which cannot effectively improve the teaching reform and innovation ability of PE major, nor can it provide sufficient support for the implementation of the training model.

3.6 The disconnection between the talent training program of PE major and social needs

The continuous social development has posed more urgent requirements for talents, i.e., talent training has certain professional and social attributes. The training of innovative talents characterizes the social demands for innovative talents and especially innovative abilities. From this perspective, the integration in two aspects should be highlighted in the training of PE innovative talents: One is the integration of theoretical knowledge and social practice, so that the theoretical knowledge and professional practice must be organically combined; the other is the integration of major settings and social needs; the purpose of talent training is to better serve the society, and then the training of innovative talents in PE majors must meet the development needs of the society. However, according to the actual implementation of the current innovative talent training model, there are still problems in the social practice and social needs. This is because more emphasis is placed on theoretical learning, lacking necessary practice, which may lead to certain restrictions on the scope of PE talents' innovative ability, and influence the training effect of innovative talents.

4 Strategies for Implementing the Training Model of Innovative Talents in PE Major

To effectively improve the implementation effect of the training model for innovative talents in PE majors, the authors proposed some strategies from the following aspects.

4.1 Increasing investment in the infrastructure construction of the PE major

The training model of innovative talent in PE major should be implemented under the support of software and hardware facilities. This is also the basic guarantee for the in-depth development of the training model. Therefore, it's critical to increase the investment in the PE infrastructure. In the process of implementing the said training model, the investment in the infrastructure construction of the PE major needs to focus on three aspects: one is whether the investment in the infrastructure construction is consistent with the training goal and professional construction planning of the PE major; the second is whether the investment meets the needs of the training of innovative talents; the third is whether the investment is sustainable and competitive for the implementation of the training model.

4.2 Enhancing the innovative teaching concept in PE major

The change in teaching concept is the key factor for the transformation of teaching model, and the advancement of the teaching concept seriously affects the training effect. Thus, in the process of implementing the training model of innovative talents in PE major, it's necessary for the educators to first change the PE teaching thinking and form an innovative teaching concept with modern education characteristics. The authors proposed to educate, study and train PE professional educators through various methods, constantly contact modern educational concepts and educational techniques, and verify and analyze them in the PE practice process, thereby enabling the educators to have a deeper understanding of the innovative talent training model.

4.3 Enhancing the ability of the faculty team for training PE innovative talents

The faculty team is the backbone for the implementation of the innovative talent training model in PE major, and it's also the key carrier to manage the training effect. So, it's the prerequisite for the effective implementation of the training model to enhance the ability of the faculty team. The authors proposed to enhance the ability of faculty team for training of PE innovative talents in three aspects. First, improve the comprehensive professional quality of PE teachers, and ensure them to have solid professional knowledge. Second, optimize the talent structure of the faculty team, and do a good job in the introduction and training of high-level professional teachers. Third, promote the communication and learning ability of the PE teachers, and ensure

the good sustainability and competitiveness of the faculty team in the training of innovative talents for PE majors.

4.4 Improving the reform and innovation ability of PE teachers according to the development needs of the times

As the development of modern society accelerates continuously, the society's demand for high-level innovative talents in PE becomes much more pressing. Also, social development, as a dynamic process, causes lots of uncertainty and makes the training of PE innovative talents a complex system process in the cultivation of PE innovative talents. Thus, it's urgently needed to conduct the educational reform and innovation. The authors proposed to improve the reform and innovation ability of the PE teachers in the training of PE innovative talents in three aspects. First, it is necessary to strengthen the teaching reform and innovation awareness of PE teachers according to the time characteristics and needs of the current social development, and formulate teaching reform and innovation guidelines with clear goals; second, encourage the PE teachers to actively undertake or participate in teaching reform and innovation projects during the implementation of the innovative talent training model, and perform in-depth study of the essential issue; third, summarize and analyze the results of the physical education reform, and effectively apply them to the follow-up teaching, thereby improving the reform and innovation ability of the teachers in practice.

4.5 Making a sound training program of innovative talents, and improving the management system

In order to make a sound training program of innovative talents in PE major, the PE educators need to formulate scientific and reasonable talent training goals according to the requirements of PE professional development, and corresponding implementation plans, which provides a direction for implementing the training model. For this, a sound management system is required. The authors proposed to improve the management system in the four aspects as follows. First, build a good management system of PE innovative talent training resource to optimize human resources, financial resources and material resources; second, form a sound teaching management system for the training of innovative talents to achieve effective management of physical education; third, establish a good student management system for the training of innovative talents to effectively supervise the learning process of students; fourth, form a proper teaching and learning incentive mechanism, and implement the integration of multiple incentive mechanisms, thereby enhancing the teaching and learning capabilities in the cultivation of innovative talents.

4.6 Reinforcing the industry-university-research cooperation in the innovative talent training of PE majors

The industry-university-research cooperation in the training process of PE innovative talents is to combine the cultivation of innovative talents with the social sports industry and sports science research, improve the theoretical understanding and practical verification of PE teaching, and then promote the teaching quality for innovative talents in PE, thus cultivating more high-level PE professionals. The high-level professional talents trained can be quickly engaged in the development of the sports industry and scientific research, which can further deepen the development of the sports industry and scientific research results. Therefore, in order to improve the effect of training innovative talents in PE, it is necessary to enhance the integration of industry, university, and research in the training process. First, build a set of effective industry-university-research cooperation mechanism according to the actual situation of the training model for PE innovative talents; second, well plan the content of industry-university-research integration, reasonably set their respective proportion and task planning, and take effective measures; third, establish a good evaluation mechanism for the effect of industry-university-research integration in the training mode, achieve effective evaluation, and be able to improve the weak links according to teaching goals.

5 Analysis for the Implementation Effect of the Training Model of Innovative Talents in PE Major

To measure the effectiveness of the training model for PE innovative talents, it is necessary to conduct an effective analysis for the implementation effects of this model.

5.1 Constructing an index system for the implementation effect measurement

Based on survey analysis, summarization of relevant research results, and consulting research scholars in related fields, the authors constructed the evaluation index system for the implementation effects of the said training model from different aspects such as teaching skills, student professional technical ability training, student innovation ability training, student independent learning ability training, student social practice ability training, and the reflection of teaching and learning effects etc. Table 1 lists the specific content and hierarchical structure.

Table 1. The index system for implementation effect measurement

Index system	Primary indicators	Secondary indicators
The evaluation index system for the implementation effects of the training model of innovative talents in PE major	Teaching skill	Teachers' professional quality and level
		Perfection of teaching system
		Basic guarantee conditions for teaching
		Advancement of teaching concept
		Scientific nature of teaching methods
		Intelligence of teaching means
		Epochal Character of teaching content
		Variety of teaching forms
	Student professional technical ability training	Professional knowledge reserve
		Technical mastery
		Coordination
		Observation
		Responsiveness
	Student innovation ability training	Teamwork
		Ability to find problems
		Ability to extract problems
		Ability to solve problems independently
		Ability of expansive analysis
	Student independent learning ability training	Pre-class preparation ability
		Classroom interaction and communication skills
		After-class summary and feedback ability
		Learning development ability
	Student social practice ability training	Ability to integrate theory and practice
		Industry-university-research integration capability
		Learning transformation ability
	The reflection of teaching and learning effects	Number of teaching reform projects
		Number of teaching awards
		Number of high-level teaching papers
		Number of transformed teaching results
		Student pass rate
		Student excellence rate
		Student turnover rate
		Employment rate of students
		Entrepreneurship ratio of students
		Student's entrepreneurial success rate
		Number of students participating in social practice
		Number of student awards
		Social satisfaction
		Student satisfaction
		Completeness of training goals

5.2 Processing and analyzing evaluation indicators of implementation effect

In the index system above, different evaluation indicators for the implementation effect analysis of the innovative talent training models may vary in terms of physical dimensions. They need to be normalized in order to reduce their impact on the measurement results. It's assumed that the value of the j -th indicator for the i -th analysis object is $V_{ij} = [v_{ij}(lef), v_{ij}(rig)]$, $v_{ij}(lef) \leq v_{ij}(rig)$, $1 \leq i \leq m$, $1 \leq j \leq n$, and the value range of the j -th indicator is $V_j^{thr} = [v_j^{thr}(lef), v_j^{thr}(rig)]$.

If the j -th indicator is a benefit index, its normalized value R_{ij} is given as:

$$R_{ij} = [r_{ij}(lef), r_{ij}(rig)] = \left[\frac{v_{ij}(lef) - v_j^{thr}(lef)}{v_j^{thr}(rig) - v_j^{thr}(lef)}, \frac{v_{ij}(rig) - v_j^{thr}(lef)}{v_j^{thr}(rig) - v_j^{thr}(lef)} \right] \quad (1)$$

If it's a cost index, its normalized value R_{ij} is given as:

$$R_{ij} = [r_{ij}(lef), r_{ij}(rig)] = \left[\frac{v_j^{thr}(rig) - v_{ij}(rig)}{v_j^{thr}(rig) - v_j^{thr}(lef)}, \frac{v_j^{thr}(rig) - v_j^{thr}(lef)}{v_j^{thr}(rig) - v_j^{thr}(lef)} \right] \quad (2)$$

Similarly, different evaluation indicators may vary in terms of the importance. For this, the AHP method [21-22] was used to obtain the weights of the corresponding indicators.

First, consult experts in the field, evaluate the indicators using the 1-9 score scale, and then obtain the judgment matrix A of the indicator weights for measuring the implementation effect of PE innovative talent training model.

$$A = [a_{ij}]_{n \times n} \quad (3)$$

And a_{ij} represents the importance of the i -th indicator compared to the j -th indicator, $a_{ij} = 1/a_{ji}$.

Then, normalize the judgment matrix A to obtain the weight w_j of the j -th indicator,

$$w_i = \sqrt[n]{\prod_{j=1}^n b_{ij}} / \sum_{i=1}^n \sqrt[n]{\prod_{j=1}^n b_{ij}} \quad (4)$$

Next, perform the consistency test of the judgment matrix, namely

$$\begin{cases} CI = \frac{\lambda_{\max}(A) - n}{n - 1} \\ CR = CI / RI \end{cases} \quad (5)$$

where, $\lambda_{\max}(A)$ is the largest eigenvalue of the judgment matrix, RI is the random consistency index, and its value is selected based on the number n of evaluation indicators.

If $CR < 0.1$, it indicates that the weights of the indicators is reasonably allocated, otherwise it needs to be reprocessed.

5.3 Classical domain division

The classical domain for the implementation effect analysis of the training model of innovative talents in PE major is related to the levels of its implementation effect. For different levels of the implementation effect, the value ranges of the analysis indicators also vary. Assuming that the implementation effect of the PE innovative talent training model is classified into K levels, then the classical domain of the j -th indicator at the level k of implementation effect is $U_j^k = [u_j^k(lef), u_j^k(rig)]$, $u_j^k(lef) \leq u_j^k(rig)$, and $1 \leq k \leq K$.

Similar to the normalization processing above, the value of the classical domain U_j^k was obtained on the basis of the normalized value, so the value range was in the closed interval of 0-1, i.e., $0 \leq u_j^k(lef) \leq u_j^k(rig) \leq 1$. The implementation effect level of the training model can be classified in terms of different accuracy of implementation effect, that is, give the relevant setting based on the form of 0-1 for poor-excellent. Under normal circumstances, it is not advisable to divide the implementation effect too much or too little, both of which will affect the final analysis accuracy and discrimination ability.

5.4 Extenics -based measurement model for implementation effect

After obtaining the classical domain U_j^k , the joint domain U_j^* of the j -th indicator can be constructed,

$$U_j^* = [u_j^*(lef), u_j^*(rig)] = \left[\min_{1 \leq k \leq K} u_j^k(lef), \max_{1 \leq k \leq K} u_j^k(rig) \right] \quad (6)$$

Based on the extenics theory [23-25], the extension distance $\rho_{ij}^k(R_{ij})$ between the j -th indicator and the classical domain U_j^k of the i -th analysis object is given as:

$$\rho_{ij}^k(R_{ij}) = \left| R_{ij} - \frac{u_j^k(rig) + u_j^k(lef)}{2} \right| - \frac{u_j^k(rig) - u_j^k(lef)}{2} \quad (7)$$

Similarly, the extension distance $\rho_{ij}^*(R_{ij})$ between the j -th indicator and the joint domain U_j^* of the i -th analysis object is given as:

$$\rho_{ij}^*(R_{ij}) = \left| R_{ij} - \frac{u_j^*(rig) + u_j^*(lef)}{2} \right| - \frac{u_j^*(rig) - u_j^*(lef)}{2} \quad (8)$$

In particular, at $R_{ij} = [r_{ij}(lef), r_{ij}(rig)]$, the extension distance $\rho_{ij}^k(R_{ij})$ can be expressed as:

$$\rho_{ij}^k(R_{ij}) = \frac{1}{2}(\rho_{ij}^k(r_{ij}(lef)) + \rho_{ij}^k(r_{ij}(rig)))$$

$$= \frac{\left| r_{ij}(lef) - \frac{u_j^k(rig) + u_j^k(lef)}{2} \right| + \left| r_{ij}(rig) - \frac{u_j^k(rig) + u_j^k(lef)}{2} \right| - (u_j^k(rig) - u_j^k(lef))}{2} \quad (9)$$

Similarly, the extension distance $\rho_{ij}^*(R_{ij})$ can also be expressed as:

$$\rho_{ij}^*(R_{ij}) = \frac{1}{2}(\rho_{ij}^*(r_{ij}(lef)) + \rho_{ij}^*(r_{ij}(rig)))$$

$$= \frac{\left| r_{ij}(lef) - \frac{u_j^*(rig) + u_j^*(lef)}{2} \right| + \left| r_{ij}(rig) - \frac{u_j^*(rig) + u_j^*(lef)}{2} \right| - (u_j^*(rig) - u_j^*(lef))}{2} \quad (10)$$

Then, the extension correlation coefficient $\phi_{ij}^k(R_{ij})$ between the j-th indicator and the classical domain U_j^k of the i-th analysis object can be obtained as:

$$\phi_{ij}^k(R_{ij}) = \begin{cases} -\rho_{ij}^k(R_{ij}) / |U_{jij}^k| & R_{ij} \in U_j^k \\ \rho_{ij}^k(R_{ij}) / (\rho_{ij}^*(R_{ij}) - \rho_{ij}^k(R_{ij})) & R_{ij} \notin U_j^k \end{cases} \quad (11)$$

Combining the obtained weight w_j of the j-th indicator, the extension superiority ψ_i^k between the i-th analysis object and the implementation effect level k can be derived as:

$$\psi_i^k = \sum_{j=1}^n (w_j * \phi_{ij}^k(R_{ij})) \quad (12)$$

Obviously, the larger extension superiority indicates a higher probability that the i-th analysis object belongs to the implementation effect level k.

6 Conclusion

This paper attempts to explore the training model of innovative talents in PE major. To this end, it performs an in-depth study of the inner relationship between the said training model and the physical education development, the constraints on the development of the model, and its implementation etc. Then, an improved index system and extenics-based measurement model were established to effectively measure the implementation effect of the innovative talent training model. This study provides a guiding role for the effective implementation of the training model of innovative talents in PE majors.

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Article submitted 2020-10-17. Resubmitted 2020-11-13. Final acceptance 2020-11-14. Final version published as submitted by the authors.

Adoption of Web-Enabled Student Evaluation of Teaching (WESET)

<https://doi.org/10.3991/ijet.v15i24.17159>

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Abstract—The “student voice” movement, which advocates for the critical importance of seeking and applying student input into educational decisions such as curriculum development and teaching methods, has been gaining momentum. We examine “student voice” through the vehicle of “Student Evaluation of Teaching (SET)” in the context of higher education. We treat Web-Enabled Student Evaluation of Teaching (WESET) in higher educational institutions as an innovation and apply Diffusion of Innovation theory to study its adoption. We study WESET rates of adoption by analyzing data from 45,934 anonymous student feedbacks of 427 teachers by 1102 students over a period of five years covering both undergraduate and graduate programs at an Indian university. Data from 589 courses in three distinct academic disciplines were collected and analyzed. The adoption rate of the students is primarily attributed to three factors: (a) the guarantee that the system will maintain anonymity, (b) expectation that student feedback will result in positive changes, and (c) ease of use as WESET was integrated into an existing system already used by students. Student evaluations for the same courses significantly improved over each subsequent semester, suggesting that faculty had incorporate student feedback into their curriculum and teaching methods.

Keywords—Teacher evaluation, Student feedbacks, Innovation Diffusion, Educational Innovation

1 Introduction

The student voice movement began several decades ago when the value of analyzing students’ perspectives on their learning experiences was recognized [1]–[3]. A number of benefits stemming from student voice have been identified including an increase in student appreciation of their experiences in a particular course and corresponding expression of that appreciation; increased opportunities for students to participate in civic and democratic practices; and expanded social interaction. This, in turn facilitates the use of multiple forms of media, and technology by them [4].

[5], [6] sees students as data sources, as active participants, as co-researchers and researchers. He considers these types of student engagement to be associated with the notion of the “student voice” and identifies associated advantages. When students are

seen as co-researchers, for example, they tend to display more initiative and assume more leadership roles.

Another facet of student voice, teacher evaluations, may offer benefits to faculty and course structure, as well. Supporters of student voice argue that allowing students to freely express their opinions regarding teaching processes results in improvements in teaching and course effectiveness [7], [8]. The structure of student voice effort and the nature of teacher-student relations often become a greater force in determining how and in what manner it will lead to better learning outcomes. [9]

The innovative aspect of WESET as a channel for student voice offers great promise, particularly if students understand its attributes. [10], in his theory of perceived attributes, notes that “the perceived attributes of an innovation are one important explanation of the rate of adoption of an innovation.” [10] states that the manner in which an innovation is perceived is based five factors: relative advantage, compatibility, complexity, trialability, and observability. This research study considers WESET adoption rates in light of these factors.

2 Literature Review

SET is steadily taking precedence in faculty evaluation systems all over the world. This tool influences decisions regarding faculty tenure, promotion and salary. However, the effectiveness of systems for evaluating teaching effectiveness is debatable. For instance, factors such as student perceptions of the teacher, individual student characteristics and the physical environment of the learning institution can influence the manner in which evaluations are made. In addition, students’ ratings are often influenced by the charisma of the teacher. A study on student evaluations of teaching, conducted by the American Association of University Professors (AAUP) Committee on Teaching, Research and Publication, revealed that such factors as students’ gender bias and emotions (such as fear of a particular teacher) also influence SET results. Hence, SET cannot be considered as a tool that flawlessly reflects actual teacher effectiveness.

[11] touched on a related concern, noting that the concept of teachers and students working together has the potential to be detrimental for teachers. When this arrangement empowers students to voice in support or opposition to the teaching style, course, etc., this can hamper teacher morale if students, who often do not know what constitutes effective teaching practice, may evaluate them incorrectly. However, [12] findings counter this, suggesting that cooperative teacher-student relationships help in the establishment of a supportive teaching-learning environment between the learners and the instructors.

According to [13], student voice serves as an important tool for assessing learning outcomes. They suggest that students do have the capability to make reflections upon the quality of learning, and thus considering what they say is imperative in designing a course. [5] research supports this, indicating that student feedback provides insight and understanding that are not considered by teachers.

More recently, [14] indicated that student voice, as expressed in teacher evaluations, helps in the development of successful course curriculum, regardless of whether the traditional paper and pen method or a technology-based approach is used. However, [15] suggested the potential usefulness of implementing technology into student voice efforts, including Student Ratings of Teaching Effectiveness. Along these lines, [16] found that often students feel more confident and at ease when they provide their evaluations through anonymous digital methods.

Even though SET has been implemented in many institutions, a separate but related issue is whether the student feedback is taken into account while designing the course curriculum [17]–[20].

Regardless of how SET is administered, validity and usefulness of SET depends upon a number of external and internal factors such as content and coverage of items in the system, scientifically sound and practically feasible measurement instruments and processes.

Although the value of technology-based approaches to SET has not yet been thoroughly investigated, technology's value has been well established in other aspects of education. Through the use of technology-based tools in classroom, students feel encouraged to take active part in accessing information circulated by their instructors or study materials. Thus, it is undeniable that rapid development of technology has encouraged the adoption of innovative tools like social media and internet for promoting collaboration and facilitating better sharing of information in the academic setting. This has resulted in enhancing student engagement in learning processes and encouraging better learning [21]–[23].

A specialized study on developed countries suggests that Anglo-American universities rely entirely upon SET to assess teaching quality. This is because students are believed to be the best judge to assess the quality of education in their institution throughout a course. Particularly in the United States, SET is considered as a determining factor in decisions regarding conditions of employment, salary and promotion of faculty members in academic institutions [24]. In comparison to these, the scenario is different in India. Although there is significant growth in higher secondary education and number of student enrollment in India, student evaluation of teaching effectiveness and course curriculum have not been fully recognized [25]. Availability of an innovative web-enabled student evaluations (WESET) system could contribute significantly to implementation of student evaluations in India.

According to [10], “rate of adoption is the relative speed with which an innovation is adopted by members of a social system. It is generally measured as the number of individuals who adopt a new idea in a specified period.” As noted, [10] identified five primary characteristics as having a primary influence on the adoption of an innovation like WESET: Relative advantage, compatibility, complexity, trialability and observability.

[10] defines relative advantage as the “degree to which an innovation is perceived as being better than the idea it supersedes.” Thus, in the case of WESET, the degree to which students perceive web-enabled technology to be a better approach than using paper-pencil method would be a significant factor in its acceptance and adoption. Perceived compatibility of an innovation has a positive influence on the adoption of

that innovation. Thus, the degree to which potential-adopter students consider WESET to be consistent with their usual beliefs and values about student feedback process would influence adoption. The idea of complexity was formulated from an “ease of use” perspective in this study. If potential-adopters find WESET difficult to use, there would be resistance to its adoption and usage. Regarding trialability, if potential-adopter students could try the WESET before fully committing to it, their apprehension of that innovation would significantly decrease. Finally, if potential-adopter students can observe the benefits of the WESET innovation, they will easily adopt it.

The relative value of SET may continue to be debated for some time. Increasing student participation and improving the quality of student input could provide valuable data to this ongoing debate. WESET, as a technological innovation, offers the potential to provide this increase in participation and quality.

3 Method

This research study was conducted in an Indian university that has implemented a Web-Enabled Student Evaluation of Teaching (WESET) process (Table 1).

Table 1. Summary Statistics

	Engineering (ENG)	Sciences (SCI)	Business (BUS)	Totals
Faculty	250	80	97	427
Students	742	98	262	1102
Courses	319	119	151	589
Feedbacks	33,134	3,163	9,637	45,934

The goal of the research study was to answer these questions:

1. Is WESET, a technology-based SET, a viable platform for student adoption?
2. Are there differences in its adoption rates as measured by Percentage Student Feedback (PSR)
 - (i) By discipline (ENG, SCI, BUS)
 - (ii) By academic level (UG, PG) (within UG – first semester vs. last semester)
 - (iii) By type of course (Core, Elective, Lab, Soft skills)?
3. Is there improvement in the Teaching Effectiveness Index (TEI) in courses that are taught by the same faculty in the following year that indicates that student feedback is considered and leads to improvement?

Towards this goal, we analyzed the WESET adoption patterns. Our study covered both under-graduate (UG) and post-graduate (PG) programs across 3 disciplines – Engineering (ENG), Sciences (SCI) and Business (BUS). For every discipline, entire WESET history data from two logical units of students (UG and PG) were considered and followed from the first semester to the last semester of their academic program (Table 2).

Table 2. Semesters per discipline

	ENG	SCI	BUS
UG	8	6	6
PG	6	4	4

In each academic discipline, we considered only a single cohort of students in its entirety as they progressed through the semesters into graduation. For example, UG ENG is an eight-semester program, and only the data of students who joined in 2011 and graduated in 2015 were included for the study. New students who later transferred into the program were not part of this study. We used semester as the basis for comparisons since feedback was given at the end of every semester. The feedback questionnaire included 19 Likert scale questions along with 3 open-ended questions that include both course and teacher elements. The university uses varying weights for the answer choices in calculating the Teacher Effectiveness Index (TEI).

Although this paper focuses on adoption of WESET as one particular vehicle for student voice, it was administered within a broader context that offered several options for student feedback. Students actively participated in the teaching-learning process through multiple channels (Figure 1) including individual anonymous feedback (WESET), active participation in decision-making by class coordinators, and group input for specific topics from student committees. Every class had two elected student councilors, who held leadership roles in the class. They collected feedback from the class, and actively participated in all class committee meetings along with faculty and administrators. Independent student committees responsible for both administrative and academic aspects provided input to administrative heads. The university policy encouraged student voice as they considered it valuable to sustain the high quality of education.

4 Discussion

Prior to WESET students were using a paper-based system and the analysis of the written responses tended to be a tedious task with no timely feedback to teachers. Many students hesitated to offer feedback due to apprehension about the confidentiality of their identity, even though the administrators gave them full assurance. Also, students were often rushed to give feedback in a classroom session and not given enough time to reflect before giving their responses.

4.1 Innovation diffusion process for WESET

The steps and timeline for introducing and integrating WESET is shown in Table 3. WESET was implemented as an end-of-semester feedback process where students were given a fixed time period of several days at the end of the course to give their anonymous feedback. Detailed and summary versions of anonymous student feedback were provided only to the concerned faculty and to the appropriate department head. WESET has a simple and intuitive web-based interface and no training is needed for

students. Once a student logs in, they see their enrolled list of courses and can provide feedback for each course. Faculty members were persuaded to participate by informing them about the potential benefits for improving teaching style and for help in reflection on their teaching practices

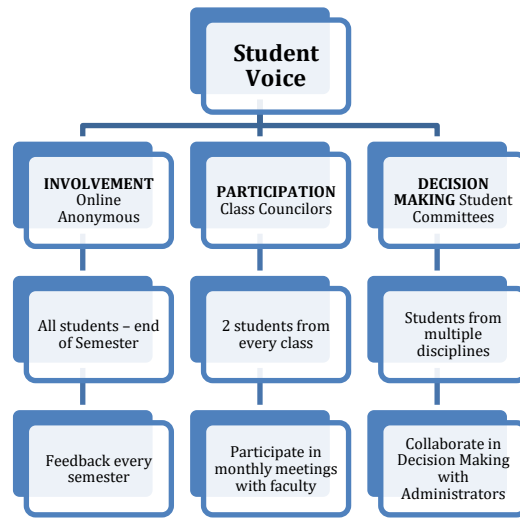


Fig. 1. Multiple Channels for Student Voice

Table 3. WESET: Innovation – Decision process adoption timeline

Knowledge 2010	Introduction of WESET Informational circulars, town hall meetings to create awareness about WESET Hands on demo on how it works - Easy to use web-based interface Online help developed Students who were class councilors and committee heads participated in the test drive WESET system with guest logins and see how the entire process works.
Persuasion Early 2011	WESET has many advantages than using paper-pencil method in that it allows students more convenience of using it anytime and anywhere without any time pressures. It is very much compatible with the traditional method like similar set of questions as before and complete anonymity of the feedback It has very easy to use web interface with features like saving the responses, manage multiple courses and Many students were convinced of WESET's usefulness when they saw their peers using it.
Decision Early 2011	Academic council mandate to shift from paper-pencil method to WESET Engineering chosen to be early adopter
Implementation Late 2011	Circular sent to all students every semester towards end of course to use WESET Faculty given training in using WESET feedback

	Recognize best teachers based on feedback, most improves, and some individual areas (group of q)
Confirmation Early 2012	Regular monitoring of student feedback by course, by department, by discipline Feedback sought from both faculty and students for improvements in the process and on how to improve the % of student responses Academic council mandate to start using WESET for other disciplines like Business and Sciences.

The Engineering Department (ENG) was the early adopter, having started using WESET in 2011. Historically, ENG has been an early adopter of other home-grown technology initiatives such as using learning management systems (LMS) for course content and grading; hence, ENG faculty were very comfortable with technology. The WESET pilot with ENG helped fine-tune and stabilize the system to the university processes. After a successful year-long pilot by ENG, the university's academic council mandated WESET as a university wide initiative for all disciplines. Informational circulars as well as training were provided for faculty in each discipline to demonstrate WESET as well as to seek suggestions for further customization.

Although individual faculty members cannot see other teacher's individual ratings, they can compare their own rating with the average rating for other faculty in their disciplines. Students are asked to provide feedback for every course via "Alert" reminders sent by WESET. In addition, each class coordinator provided information to the students, and educated them on the benefits of WESET for course improvements while emphasizing that the feedback is anonymous. During implementation, a centralized support team was available to provide assistance to students and ensure that WESET was always available.

4.2 Diffusion of WESET by discipline

Figure 2 shows the PSR provided by the students based on engineering (ENG), Business (BUS) and Science (SCI) disciplines across their entire college years. PSR in all disciplines was over 92% showing a high adoption rate.

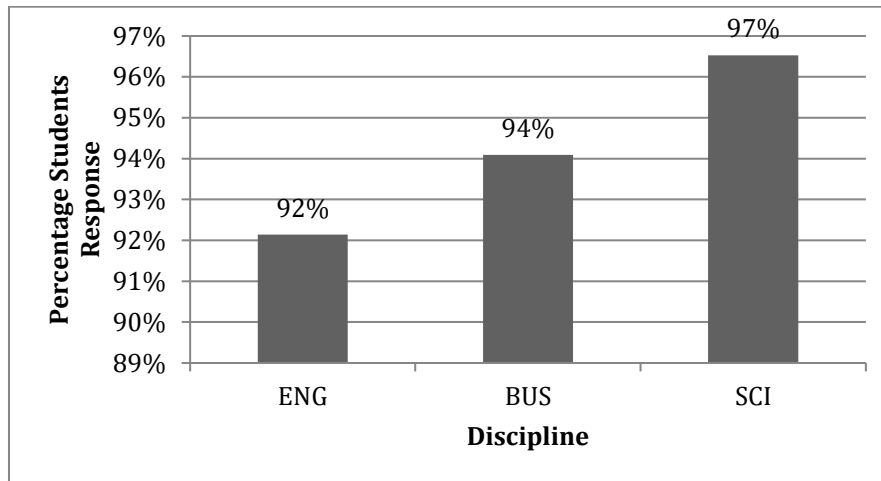


Fig. 2. PSR by discipline

4.3 Diffusion of WESET by academic level

Figure 3 shows the PSR for the UG students compared to the PG students in the same discipline. In all cases, the PSR in the last semester is higher than in the first semester.

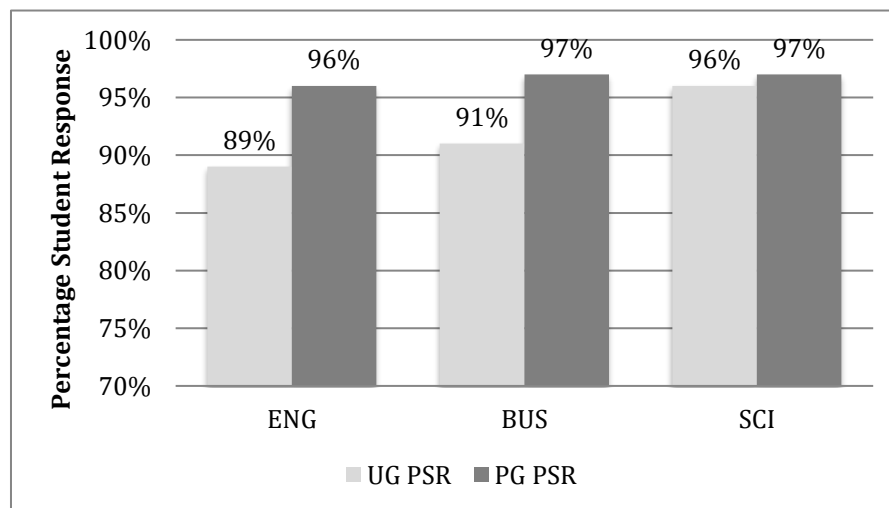


Fig. 3. PSR by UG & PG programs

An independent-samples t-test was conducted to compare the PSR between UG and PG (Table 4). The classification by UG and PG was done across the disciplines. For ENG, there is a statistically significantly higher PSR in PG ($M=95.57$) when compared

to the PSR in UG ($M=88.71$), $p=0.00$. There is no significant difference in PSR between UG and PG in BUS and SCI disciplines.

Table 4. Mean PSR across UG and PG programs

		Mean	p value	Inference
ENG	UG	88.71	0.00	PG > UG
	PG	95.57		
BUS	UG	96.70	0.08	UG = PG
	PG	94.67		
SCI	UG	96.38	0.40	PG = UG
	PG	96.69		

4.4 Diffusion of PSR between first semester and last semester

Figure 4 shows the PSR for the same set of students in their first semester as freshmen compared to the last semester for the six groups. In all cases, the PSR in the last semester is higher than in the first semester.

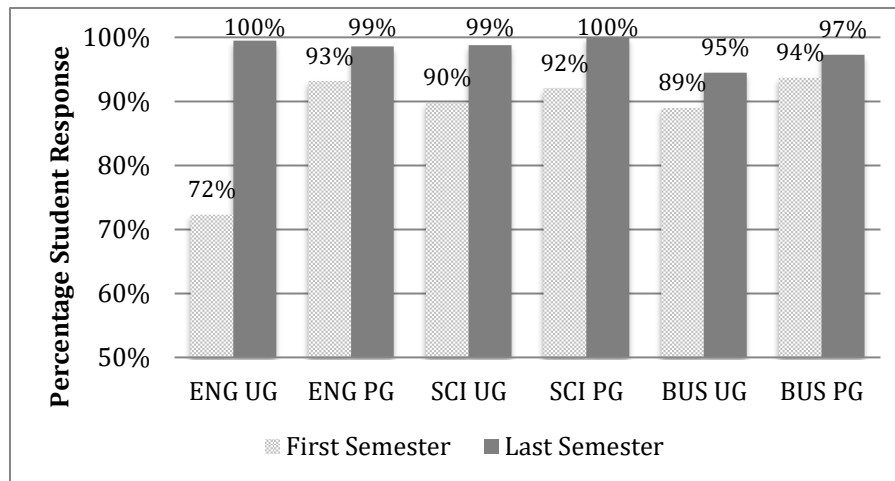


Fig. 4. PSR First semester & last semester across the six groups

A one-way ANOVA was conducted to compare the PSR for each semester within the academic level, UG and PG. We conducted the ANOVA across three disciplines, ENG, SCI and BUS. There was statistically significant difference between groups as determined by one-way ANOVA ($p<0.05$) across the discipline (Table 5). A Tukey post-hoc test reveals statistically significant difference in PSR between semesters in each academic level. Similarly, we observed a statistically significant difference between PSR in first semester and last semester in all the three disciplines. In all cases, the increase in PSR between the first and the last semester was significant.

The table shows that in all three disciplines and in both the UG and PG programs, there was significant improvement in PSR from the first semester to the last semester.

The last column shows that in all disciplines, the first significant increase in PSR was recorded either in the second or third semester.

Table 5. Anova: Improvement in PSR from first Semester to last semester

Discipline	F	Sig	Tukey posthoc (first significant increase from S1)
ENG UG	57.173	0.00	S1<S3(0.04)
ENG PG	10.495	0.00	S1<S3 (0.00)
SCI UG	37.667	0.00	S1<S2 (0.00)
SCI PG	18.774	0.00	S1<S2 (0.00)
BUS UG	11.475	0.00	S1<S2 (0.00)
BUS PG	25.378	0.00	S1<S3 (0.00)

4.5 Deeper analysis of UG ENG

We further analyzed the UG ENG course data as it has the largest set of PSR and includes two cohorts each of Computer Science, Electronics, Mechanical and Electrical Engineering with the largest number of students, faculty and courses. 30146 student feedback from 541 UG ENG students were tracked over a period of eight semesters. Though the students provided feedback on many questions, only the overall TEI rating for a given course along with PSR were used for analysis. We found that student adoption of WESET increased over the first several semesters and then flattened out with a small drop in the final semester. Though the PSR decreased slightly in the final semester, the TEI was maintained or increased. The courses that did not include project work in the final year continued to maintain the PSR.

In UG ENG group, the post hoc test showed a significant improvement ($p=0.00$) (Table 4) in PSR between the first ($M=72.3$) and last semester ($M=99.5$). The change in PSR for the UG ENG was significant between S1 and S3 and then between S3 and S4. Changes from S4 onwards were not significant, indicating that the maximum adoption possible had been achieved. Some final semester courses - notably those involving semester-long projects or industry internships -- showed a dip in the PSR., while maintaining the TEI. Since courses without significant projects in the last semester did not show a drop in PSR, we attribute the decrease to the project-oriented nature of these courses rather than because students no longer saw value in providing feedback at the end of their last semester.

Table 6. Anova Post hoc Tukey test: Detailed Analysis for UG ENG

ANOVA (ENG UG)							
Sem	S1	S2	S3	S4	S5	S6	S7
S1		0.64	0.04	0.00	0.00	0.00	0.00
S2	0.636		0.796	0.00	0.00	0.00	0.00
S3	0.043	0.796		0.00	0.00	0.00	0.00
S4	0.00	0.00	0.00		0.981	1	0.977
S5	0.00	0.00	0.00	0.981		0.998	1
S6	0.00	0.00	0.00	1	0.998		0.997
S7	0.00	0.00	0.00	0.977	1	0.997	

4.6 Diffusion of WESET by course type

The PSR across different types of courses such as Core, Lab and Soft skills showed similar diffusion of PSR suggesting that the PSR was unaffected by the type of course (Figure 5, 6, 7).

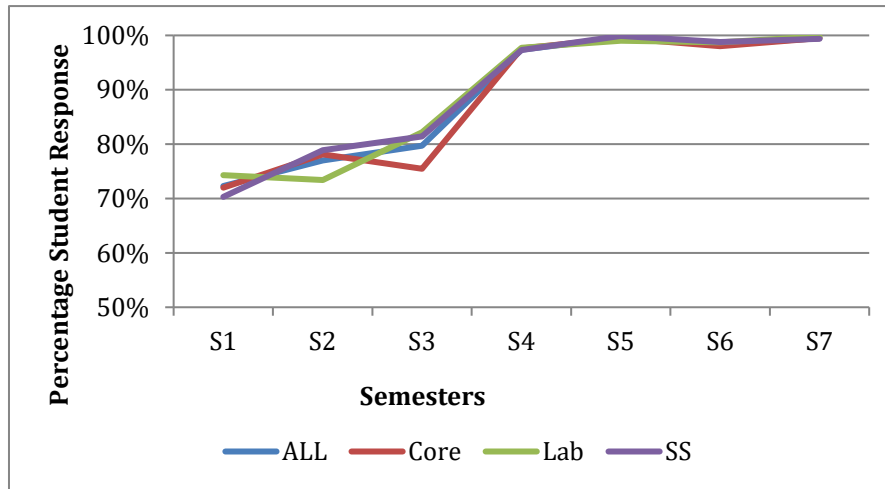


Fig. 5. PSR by Course type (UG ENG)

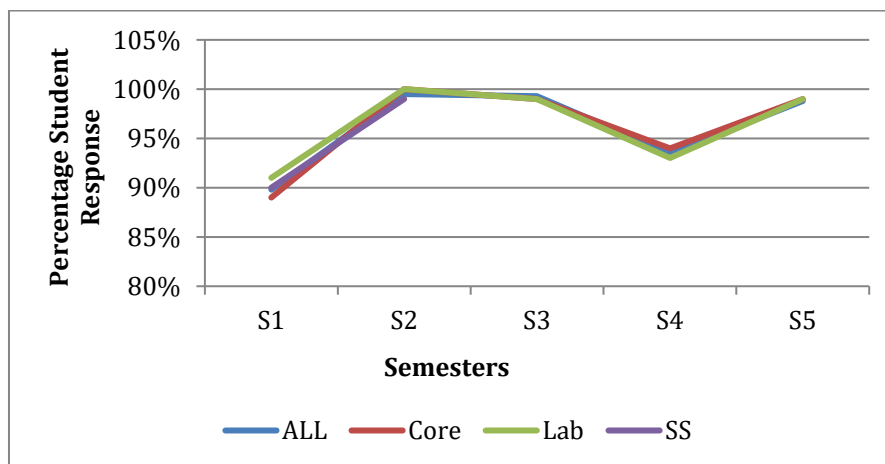


Fig. 6. PSR by Course Type (UG SCI)

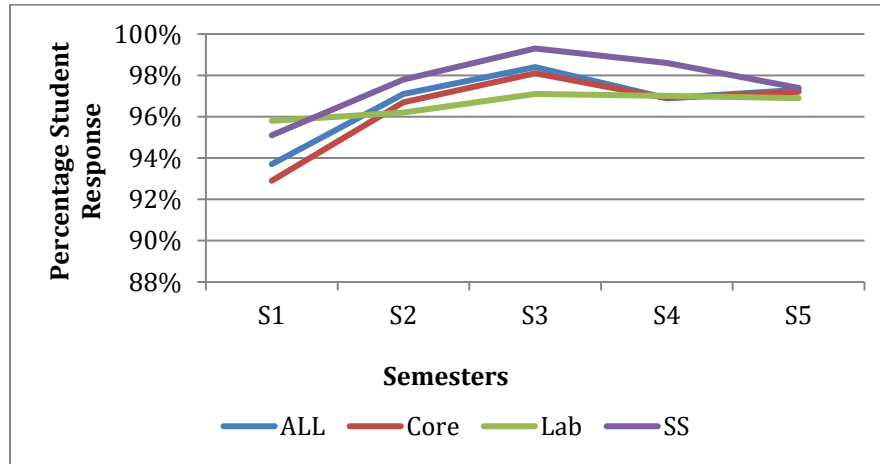


Fig. 7. PSR by Course Type (UG BUS)

4.7 TEI by academic level - UG & PG

An independent-samples t-test was conducted to compare the TEI score between the academic level, UG and PG (Table 7). For ENG, there was a statistically significantly higher TEI score in PG ($M=95.57$) when compared to the TEI score in UG ($M=88.71$), $p=0.00$. Similarly, BUS and SCI discipline have a higher TEI score in PG when compared to the TEI score in UG. One possible explanation may be that generally senior teachers with more experience teach the higher academic requirements of the PG programs.

Table 7. Mean TEI across UG and PG programs]

		Mean	p value	Inference
ENG	UG	87.61	0.00	PG > UG
	PG	89.51		
BUS	UG	90.05	0.00	PG > UG
	PG	92.10		
SCI	UG	88.89	0.00	PG > UG
	PG	94.24		

4.8 TEI improvement in courses

A course-wise analysis was conducted as a separate study to understand if the university administration and the faculty were incorporating TEI. 68 courses taught between 2013 and 2015 that had been repeated at least a second time during that period and taught by the same teacher were analyzed. The TEI for these courses was broadly divided into two groups: those with TEI in the 50-75% range those with TEI in the 75.1-100% range. Our analysis shows that a number of courses with TEI in the 75.1-100%

range had increased each year suggesting that faculty members and administrators were incorporating student feedback to improve teaching outcomes (Figure 8).

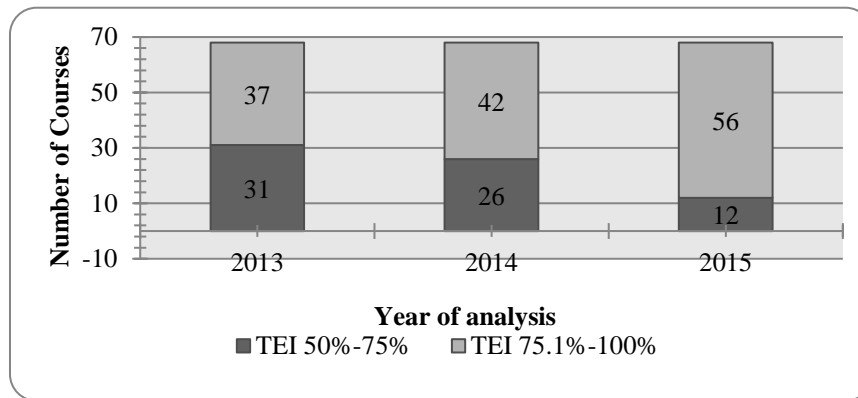


Fig. 8. TEI Improvement (2013, 2014, 2015)]

4.9 Cultural and educational shifts

WESET was implemented after consultations, modifications and enforced as a university driven policy. There was a remarkable change culture shift in some of the teachers as they were no longer the sole decision makers. As specific feedback from a larger percentage of students was discussed at the committee level, and teachers had to acknowledge issues raised by students, understand that students are an active part of learning and work with the democratic process, thus changing the teaching practice

As the students saw their concerns being addressed, they used multiple channels, class committees, direct and anonymous feedback to provide inputs into curriculum, teaching and learning processes.

5 Conclusion

In this paper we argue that digitally-enabled student voice is an innovative concept and its diffusion in higher educational institutions warrants detailed study. The data and inferences derived from analyzing WESET rates of adoption are consistent with prior innovation diffusion research work.

For a technology-based educational innovation such as WESET to be fully adopted, one has to focus both on students as well as faculty. Addressing the complexity associated with implementing WESET, boosting motivation of the students and faculty with incentives to adopt this innovation are the key factors that will make WESET a credible and authentic representation of student voice.

Our large-scale study that included students' entire program of study from first semester through graduation, in three different disciplines, shows that WESET achieved good adoption across all disciplines. ENG was the first to adopt and thus

helped to improve the system, and other disciplines followed within a couple of years. PSR increased across disciplines from the first semester to that last, with the first significant improvements achieved in the second or third semester. PSR improvement was similar across the various types of courses.

The positive effect of university policy regarding the WESET process improved the quality of learning and teaching style. Important factors include the system's ease of use, the anonymity of feedback which put to rest the student fears, and the fact that university administrators did not penalize faculty members for negative feedback. Increases in positive student feedback from one year to the next were in itself motivational for the faculty.

Our data agrees with other researchers that teaching practices can be improved with student voice [26]–[29]. Student evaluations from 68 courses that were taught each year by the same faculty showed that the overall TEI increased each time the course was offered, suggesting that teachers were incorporating feedback to improve the teaching process. Teachers in interviews said that WESET was useful and helped improve teaching practices. Our TEI did not find rating bias based on the type of course, unlike [30] finding that elective courses receive higher ratings than general courses.

Though across disciplines the first semester TEI scores were slightly lower than later semesters, these were not significant; this is in contrast to earlier paper-based findings that students who had experience gave higher feedback than freshmen [31, 32, 33]. However, in all cases the TEI for PG scores were significantly higher than UG scores. A possible explanation may be that generally the more experienced and qualified faculty members teach the PG programs. Traditionally, the Indian education culture has teachers as power centers. There is an inherent understanding of the power differences between faculty and students that can inhibit student voice. Before WESET, the teaching style and student engagement varied greatly depending on the teacher personality and preferences. WESET changed the equation and over the years resulted in a listening culture in the teachers. Providing multiple avenues to solicit both individual and collective expressions from students, such as anonymous feedback for sensitive issues, leadership and partnership opportunities, resulted in more students including the reticent ones expressing some form of student voice.

6 Acknowledgements

6.1 Statements

1. Not open data
2. Yes, anonymized data with permission and approval by ethics committee
3. No Conflict of Interest.

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Article submitted 2020-07-19. Resubmitted 2020-08-20. Final acceptance 2020-08-22. Final version published as submitted by the authors.

A Framework for the Use of Immersive Virtual Reality in Learning Environments

<https://doi.org/10.3991/ijet.v15i24.16615>

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Abstract—Immersive Virtual Reality (iVR) technologies can enrich teaching and learning environments, but their use is often technology-driven and instructional concepts are missing. The design of iVR-technology-supported learning environments should base on both, an evidence-based educational model as well as on features specific to iVR. Therefore, the article provides a framework for the use of iVR in learning environments based on the Cognitive Theory of Multimedia Learning (CTML). It outlines how iVR learning environments could and should be designed based on current knowledge from research on Multimedia Learning.

Keywords—Virtual reality, instructional design, immersive virtual reality, pedagogical framework

1 Introduction

Virtual reality (VR) technology is increasingly promoted as a promising educational tool in various training settings [1, 2], like health care [3 - 6] or engineering [7 - 9]. While the educational use of VR is growing, little is known about the learning processes occurring in VR environments [10]. When asking “Where is the pedagogy?”, Fowler [11] is urging for models explaining learning in VR environments. Using VR technology in training should be a balanced decision that considers the positive and restrictive attributes of VR. Several educational benefits of implementing VR have been reported in the literature. It is highly motivating, increases student engagement, provides high-quality visualizations, and creates the feeling of being present [1–3, 12–14]. However, the additional educational value of VR differs in terms of intensity in (1) immersive VR (iVR) environments and (2) 3D environments that are presented via a 2D display. A distinction between low immersive VR, that is based on traditional devices like mouse and keyboard, and high immersive VR, that generally involves a head-mounted display (HMD), is typically made in the literature [15, 16]. This paper focusses on how to design iVR learning environments to support meaningful learning. However, iVR technology is subject to certain restrictions. Disadvantages of using iVR are related to time and costs necessary for developing hard- and software, possible health and safety effects, the uncomfortable nature of wearing HMDs, possible reluctance to use and integration into learning scenarios [17]. Additionally, especially

immersive VR environments are more likely to distract and overload users and result in lower levels of learning. Depending on the instructional goals, integrating iVR may reduce working-memory capacity and thereby interfere with learning processes. Thus, the use of iVR technology should provide an added value for learning results [18]. Following instructional guidelines, the opportunities of iVR should be exploited as well as challenges by using iVR should be addressed. Developing a powerful learning environment requires consideration of features specific to iVR technology. So far, research on iVR applications is often technology-driven and focuses on anecdotes, case studies and demonstrations of technical prototypes. Neither learning processes are mentioned in iVR nor do instructional methods form the basis of training applications [1, 2, 11, 19]. This leads to the situation that in some cases iVR seems to be uneconomical, ineffective as well as exaggerated, i.e., too complex, or inappropriate to fulfil a training goal and other learning media (e.g., simulations, pictures) might have been a better choice regarding costs and benefits [20]. Consequently, instructional designers and computer scientists should work closely together to develop iVR learning environments that are based on educational decisions. This paper suggests that iVR technology used in educational settings should be designed according principles to design multimedia to benefit from its promising characteristics. Hence, an approach is needed that offers instructional hands-on guidelines how to design iVR learning environments to take full advantages of the technology and overcome obstacles.

2 Theoretical Background

The development of our framework is based on two assumptions. First, we understand learning in iVR as multimedia learning, because in virtual worlds images and texts are presented in combination. Secondly, learning is an active process that goes beyond the mere repetition and reproduction of information or central concepts. Therefore, we are following the distinction between rote and meaningful learning postulated by Mayer [21]. Whilst rote learning leads to superior performance in retention processes, meaningful learning supports transfer processes as well. Meaningful learning refers to the application, i.e. the transfer of knowledge to solve problem-based tasks. This is illustrated by the revised taxonomy for educational objectives [22], according to which meaningful learning addresses the goals of understanding, applying, analyzing, evaluating and creating [21]. To enable meaningful learning, Mayer suggests to design instructional media according to the principles stated in the cognitive theory of multimedia learning (CTML) [21, 23].

These two assumptions guide the development of our framework. Therefore, we first introduce the CTML, how multimedia learning works and the consequences for the instructional design to help learners to learn with multimedia instruction. Subsequently, we will describe the key features of iVR technology. In a final step, we synthesize both, CTML and features specific to iVR. As a result, we present the meaningful iVR learning (M-iVR-L) framework. Based on this framework, we identify design guidelines to enable meaningful iVR learning.

2.1 Multimedia learning

The combined presentation of words (spoken or written) and pictures (static or animated) for the purpose of learning is known as multimedia learning [24]. This term, originates from the empirical work of Mayer and colleagues, is widespread and influences research on various instructional media like computer games, simulations, video and also iVR [25–27]. The CTML is a theoretical framework of how people learn with instructional media [24, 28]. Therein, three principles are assumed [29]. First principle, has its roots in dual coding theory [30], that is that people process information within two different channels. One channel is responsible for the processing of verbal information, the other one of visual information. Second principle, the limited capacity of each channel, builds upon the findings of cognitive load theory (CLT) [31, 32]. This instructional theory has proven that human working memory capacity is limited and therefore instruction has to abandon the application of inappropriate instructional approaches. This is achieved by reducing unnecessary strain for learning, i.e. extraneous cognitive load, as much as possible [33]. These two rather cognitivist principles are supplemented by a third constructivist one, namely learning as a generative activity [29]. According to generative learning theory of Wittrock [34, 35], learning is an interplay between already stored information with new stimuli and is effective when learners active cognitive processing is stimulated. In CTML, active cognitive processing is stimulated through the engagement of learners in selecting the relevant material, organizing it into a coherent structure, and integrating it with prior knowledge [29, 36]. Learning with instructional media according to the principles stated in CTML is then what Mayer calls meaningful learning where learners acquire knowledge and skills for the purpose of effective problem-solving [21, 23].

Over the last 30 years, empirical research has repeatedly confirmed the assumptions made in CTML. From these results three major instructional design goals emerged that should be considered when designing multimedia learning environments [29].

2.2 Instructional design goals

Instructional design goals are based on the scientific study of how to help people learn, i.e. the science of instruction. The current assumption here is that hands-on activities by themselves cannot foster meaningful learning, but cognitively guided active processing can do so [29]. With the principles of CTML in mind, three instructional design goals are essential to help learners learn with instructional media:

First design goal is the reduction of extraneous processing. This is dispensing distracting aspects within the multimedia learning environment, like background music (coherence principle) or presenting onscreen text during narration (redundancy principle) [37]. Another way is the physically and temporally synchronous display of information. The positive effect on learning outcomes of temporal and spatial contiguity principle is also confirmed in metanalyses [38]. The same applies to the signaling principle where symbols and colors are used to guide learner's attention on relevant

material. The positive effect of signaling on learning outcomes is well documented and robust [39].

The second design goal refers to scaffolding which helps learners to manage the essential processing to avoid cognitive overloading. Principles that help are the modality principle, segmenting principle and pretraining principle. The modality principle states that it is better to present images with spoken instead of written text. This presentation format leads to better learning, at least for less complex content [40, 41]. The distribution of complex material into smaller learning units is recommended by research on the segmenting principle. If considered learning time increases, cognitive load is reduced and a positive effect on both memory and transfer tasks occurs [42]. For learners with little prior knowledge of the to be learnt content pretraining is an effective principle. Here, learners study the basic concepts of a lesson before interacting with the multimedia instruction which in turn frees up working memory capacities for the essential processing [43].

Making sense of the material through generative processing is the third instructional design goal. Here, the use of social cues and generative learning strategies are recommended. Social cues are the usage of conversational language during narration (personalization principle), speaking of information or instructions with a friendly and human voice (voice principle) as well as the application of human-like gestures for animated content (embodiment principle) [44]. Generative learning strategies in multimedia learning are self-explanation [45] and drawing principle [46]. Other strategies like self-testing, summarizing, mapping and teaching are already well investigated for traditional media like textbooks and are now gradually finding their way into the design and research of more emergent instructional media (for an overview see [47]). The use of learning strategies is based on aforementioned generative learning theory [48] and the idea that learning is an active construction of knowledge. The positive effect of such strategies has already been proven for instructional videos. Learning with video becomes with the help of strategies an active engagement with the content instead of a purely passive consumption [26].

Aim of the outlined instructional goals is to help learners gain skills and knowledge that are applicable to new problems and tasks. This claim regarding the transfer of learning outcomes is the difference between retention-based or rote learning and meaningful learning as it is understood by Mayer and colleagues [21].

2.3 Key features of VR technology

The application of multimedia principles and instructional goals within iVR learning environments requires a profound understanding of the medium itself and factors that affect individual perceptions of iVR technology. VR can be described as “the sum of the hardware and software systems that seek to perfect an all-inclusive, sensory illusion of being present in another environment” [49]. This distinguishes VR from other reality enhancing technologies such as augmented reality (AR) and augmented virtuality (AV). These are placed on the reality-virtuality-continuum of Milgram and Kishino [50] between the real environment and the entirely computer-simulated environment (Fig. 1).

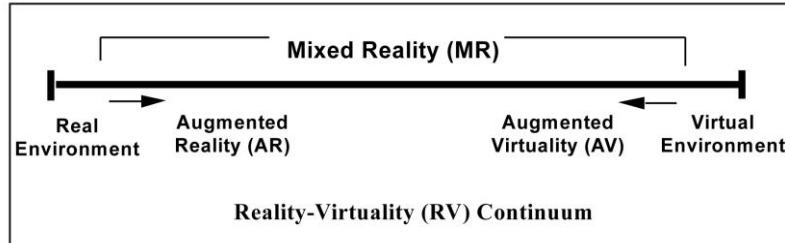


Fig. 1. reality-virtuality-continuum [50]

VR learning environments, especially the more immersive ones, allow the realistic visualization of three-dimensional (3D) data and support an exciting real-time learning experience. They can improve performance outcomes, enable high interactivity with objects and persons, allow to present a virtual environment that resembles the real world, offer feedback from the simulation to the learner and foster conceptual understanding by providing an effective and unique way to learn and motivate learners [51]. Learning environments building up on this technology offer authentic learning activities that other media (e.g. video) cannot provide appropriately (e.g. turn and rotate elements of mechanical installations that are not available in real world). There are different ideas about the key characteristics of VR that distinguish VR from other educational media [52 - 56]. Burdea and Coiffet [52] define VR as "I3" (Immersion-Interaction-Imagination).

Immersion: Immersion is one factor that contribute to the capabilities and impact of VR as it can bridge the technical features of a 3D environment, the experience of presence and the educational affordances of a task. Immersion can be classified into:

- 1) Mental immersion
- 2) Physical immersion

It plays an important part in creating a successful personal experience within a VR environment. When the user is moving, the visual, auditory, or haptic devices that establish physical immersion in the scene are changing in response. A user can interpret cues to gather information while navigating and controlling objects. Naturally, the more sensory inputs are present in a virtual environment, the easier it is for the user to visualize and feel incorporated into the world [57]. Mental immersion refers to the tension to be deeply engaged within a VR environment [58]. Hence, immersive environments can offer learners rich and complex content-based learning while also helping learners to improve their technical, creative, and problem-solving skills [51]. Slater and Wilbur [59] identify five characteristics to describe immersion: inclusiveness (diversion of focus from the real world), extensiveness (extent of sensory input), surroundingness (extent of panoramic display), vividness (richness of features) and proprioceptive matching (alignment of perceptual means with the virtual interface).

Interaction: Another feature that contributes to the success of learning in 3D environments is interaction or interactivity [56, 60, 61]. That is, a VR system can detect an input (e.g., a user's gesture) via multiple sensory channels (e.g., haptic, visual) and

provide real-time response to the new activity instantaneously. At the same time, users can see activity change on the screen based on their commands and captured in the simulation [51]. Interactivity includes the ability to freely move around in a virtual environment, to experience it “first-hand” and from multiple points of view, to modify its elements, to control parameters, or to respond to perceived affordances, environment cues, and system feedback. Interaction has also often been linked to immersion, indicating that user control over the environment was important for the experience of being present in VR [62]. VR learning environments enable several interactions (e.g., navigation, selection, manipulation). When using an HMD, the user can navigate freely if he does not leave the range of the tracker, is hindered by cables or hits a wall of the real room. By a simple touch with the input device, selection can be made. The position of the input device in the virtual world is represented by a 3D cursor, for example in the shape of a human hand. If the objects are too far away, techniques such as laser pointers or crosshairs can be used by pointing too distant objects. The manipulation of objects in the real world is manifold (touching, lifting, rotating, turning on etc.). In VR, it is usually precisely defined which objects allow which interactions and special 3D widgets are required (e.g., spotlight manipulator, Through-the-Lens-Camera Control etc.) [63 – 65].

Imagination: A further construct that is specific to VR is imagination [52]. It refers to the human mind’s capacity to perceive non-existent things. VR supports the user to elaborate on thoughts and engage in meaningful learning. This requires you to wilfully put yourself into a suitable frame of mind. It takes active attention as well as active mental modelling of what one is perceiving [66]. For Jonassen [67], VR technologies can activate cognitive tools that help learners to elaborate on their thoughts and to engage in meaningful learning. Therefore, a VR environment triggers the human mind’s capacity to imagine in a creative sense non-existent thing. Hence, VR technologies are well suited to convey abstract concepts (e.g., the inside of a machine) due to visualization abilities [51]. To stimulate imaginations of direct experiences, sensory information should be balanced with prior knowledge to avoid under- or overstimulation, which would impede imagination [68].

Depending on their particular instructional goals, many educators regard it as unnecessary to deploy all three features. Hence, numerous virtual learning applications integrate interaction and immersion, whereas imagination seems to be underrepresented [69]. However, focus of current research in the field still often seems technology-driven, whereas it is crucial to explore how to design an iVR learning environment to accomplish learning objectives and to enable meaningful learning. In the following section, we therefore aim at developing a framework that provides guidelines for the instructional design of iVR learning environments and to encourage stakeholders to implement iVR for their own learning scenarios based on this framework.

3 Meaningful iVR Learning (M-iVR-L) Framework

In this section, we bring the principles of CTML, the instructional design goals to support learning and the key features of iVR technology, described in section 2,

together. As a result, we postulate the meaningful iVR learning framework (see Fig. 2) which considers the design of iVR learning environments as a process. The principles found in CTML influence the instructional design goals [29] and these must be taken into account with respect to the technical features of iVR technology to enable meaningful learning.

Consequently, we propose six evidence-based recommendations within our M-iVR-L framework that should be considered when designing iVR learning environments.

3.1 Learning first, immersion second

With the raise of iVR technology, the key feature of immersion was claimed as supportive for learning, e.g. because of its possibility to provide situated learning through authentic contexts and tasks [70]. Recently, studies comparing learning scenarios in low immersive VR media (like desktop computer games) with iVR media draw a contradictory picture. On the one hand, the study in [12] found that an iVR simulation leads to a higher feeling of being present in a virtual lab but less learning compared to the low immersive desktop condition. This was also found in [71]. On the other hand, the studies in [72–74] found evidence for a positive influence of feeling of immersion on learning outcomes. We recommend, on behalf of the instructional goal to reduce extraneous processing, to carefully think about the grade of immersion necessary. If a higher degree of immersion is not relevant to achieve the learning objective, here, less is more.

3.2 Provide learning relevant interactions

Learn-relevant physical activities can positively impact declarative knowledge acquisition and are unavoidable if procedural knowledge, i.e. skills, are to be obtained. This learning strategy is known as enactment and can foster generative processing [47]. However, it should be noted that enacting is only beneficial if the movements performed are relevant for a certain learning task [75]. This is also true for iVR learning, where for example the use of controllers let learners perform object manipulation with virtual representations of one's hands. In [76] high levels of interactivity are found to be helpful for learning, while in [77] compared to a video condition without generative processing, no advantage for iVR was found for procedural knowledge gain or transfer performance. To optimize iVR learning in terms of interaction, we postulate two recommendations: First, avoid unneeded and learn-irrelevant interactions. Second, enable the learners pre-training, not only in terms of basic concepts, but also on how to use the iVR interaction tools.

3.3 Segment complex tasks in smaller units

Content in iVR learning environments is an extremely complex form of multimedia instruction with the high risk of overwhelming learners. The influence of this possible distraction was tested in two studies, also through EEG measurement regarding cogni-

tive load. In both studies it was found that the iVR groups cognitive load was higher and at the same time the scores in a retention and transfer test were lower compared to a slide show presentation group [25, 78]. Similar results for cognitive load levels were found in [12] and [79]. The authors of the mentioned studies point out that iVR can increase extraneous load, which is the type of load that hinders learning [70]. Providing scaffold to manage essential processing is one way to overcome this issue. For example, in [25] an iVR simulation on the human body was divided into six smaller segments with a summarizing phase after each segment. Therefore, the iVR group with segmented lessons outperformed an iVR condition without segmenting and compared to the slide show group similar performance levels were reached. We conclude that breaking down complex tasks into small segments is also effective for managing essential processing in iVR.

3.4 Guide immersive learning

The role of guidance is still a debated topic in educational psychology and beyond. Even if there seems to be at least some agreement that completely unguided discovery learning is not useful due cognitive overload issue, the debate is now about timing and form of guidance for effective learning [for an overview see 80]). As mentioned in section 3.1, iVR itself increases cognitive load, whereas it is the responsibility of instructional designers to provide appropriate guidance. If not, especially novices will feel overloaded and thus not learn [32]. Evidence for that claim was found in [81], where elementary students reported high levels of presence but not for perceived learning during an iVR field trip. Here, highlighting essential material (signalling principle) as well as the use of pedagogical agents, designed based on personalization and voice principle can guide learners through the iVR learning environment. Guidance can also foster generative processing through just-in-time information that fades away if the learner has built higher levels of knowledge and skills to solve the next learning task [82]. For example, in vocational education novices practice car-painting through an iVR simulation with hints and information during the process. After reaching a certain skill level the hints fade away, still giving the learner the chance to call for help if needed [83].

3.5 Build on existing knowledge

To foster learning activities, new information should be balanced with prior knowledge to avoid under- or overstimulation [51, 68]. Worked examples and tutorials may help learners with a low level of prior knowledge, but hinder learners with a high level of prior knowledge. This phenomenon is called expertise reversal effect [84] and is also valid in iVR learning scenarios [85]. We recommend, to determine learners' current level of knowledge to adjust severity as well as amount of support. This needs to be an ongoing process during learning progress. Depending on their current level of knowledge, learners need preparation, inside and/or outside iVR (pertaining principle), which frees up working memory capacities for the essential processing within the iVR learning task. Supportive information helps to keep the cogni-

tive load low, especially for learners with little prior knowledge [43]. This principle has already been tested within iVR. Compared to a group with video instruction and with and without pretraining, the iVR group with pretraining achieved the greatest learning success in both memory and transfer [79].

3.6 Provide constructive learning activities

Today it is common consent that learning is an active process which engages learners in knowledge construction. Some construction processes are visible, like hands-on activities which often result in a self-designed artifact or product [86]. Others are not visible, like linking prior knowledge with newly acquired information which is based on human cognitive architecture [32, 87]. What they have in common is the assumption that learning takes place through learning activities. Several learning activities were found to be effective in iVR learning. In [72] learners used the strategy of memory palaces in an HMD and outperformed a desktop based control group condition. In [25] the generative learning strategy of summarizing was used to foster processing. Here, the summary was written by the learners after each segment of an iVR simulation on the human body outside of the HMD. The same applies to the study in [77] for the learning strategy enactment. Here, the learners used a virtual lab in iVR and afterwards enacted physical objects on a table that represent the same laboratory tools manipulated before in iVR. Of interest in these last two studies is that the learner's enjoyment during the iVR lesson was not diminished through adding generative learning strategies. This means that iVR has the potential to be effective for learning and at the same time makes learning more enjoyable than traditional media like slide show presentation. We conclude with the words of David Merrill who stated that "information alone is not instruction" [88, 89]. Learning is an active process of knowledge construction and even the most impressive, immersive, and realistic iVR environment will not promote learning if learners do not engage in learning activities. Therefore, we recommend providing constructive learning activities that enable learner's knowledge construction and the application of it to newly problem-based tasks inside or outside of iVR.

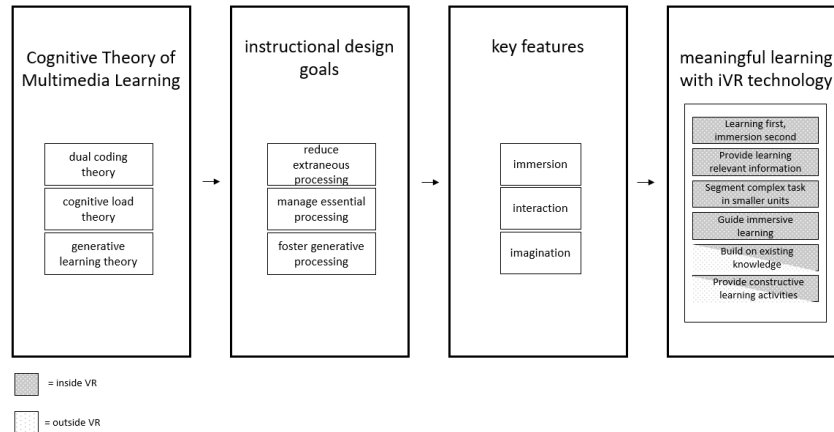


Fig. 2. Meaningful IVR learning (M-iVR-L) framework.

4 Conclusion and Future Research

IVR offers new learning experiences based on a vivid and lifelike learning environment [90 - 92]. So far, there are only few examples that demonstrate the usefulness of iVR in learning applications. Therefore, we have worked out an evidence-based framework grounded on the widespread and proven theory of multimedia learning (CTML), its consequences with regard to instructional design goals and additionally have taken into account key features of iVR that make this technology unique.

Our framework consisting of six recommendations is not to be understood as final, it has been developed based on current empirical findings in learning with iVR. The key findings are that effective and enjoyable learning does not need high degrees of immersion in most cases, but it profits from guidance and the breakdown of iVR lessons into smaller units. Interactions must meet the learning objectives, if not, they can distract and therefore hinder learning. Taking prior knowledge into account to enable learner's efficient knowledge construction as for every learning environment also applies for iVR learning. Learner preparation inside as well as outside iVR is recommended. Due the fact that learning is more than just consuming information, constructive learning activities must be integrated, inside or outside the virtually designed world, if meaningful learning with iVR should happen. Teachers and instructional designers need not fear that iVR learning will no longer be perceived as joyful if they use our recommendations. The current findings show that learning strategies do not diminish learner's positive affective states towards learning with iVR.

However, even if our framework is based on an analysis of current literature findings, we need to point out that the proposal is still mostly centered on assumptions. For example, we have not incorporated the social dimension of learning in iVR [93] or other aspects like gamification and game-based learning mechanisms [94].

To learn more about these aspects, more carefully planned and rigorous designed research is necessary, both in real-classroom as well as in laboratory settings [95–97].

For example, not all principles of CTML are tested in iVR learning, nor were the learning strategies proposed in generative learning theory [47]. It is also noticeable that the added learning strategies used in the outlined studies were always established outside the iVR environment. Research studying their usage inside an immersive virtual world are completely lacking. For instance, it would be interesting if self-explaining or teaching others (humans or avatars) is affected by the features of iVR and hence impacts learning outcomes.

The creation of an empirical basis on how learning happens in iVR should also consider replication studies like in [78]. Here, the authors found no beneficial effect of adding the learning strategy of practice testing to an iVR simulation compared to traditional slide show presentation neither for retention nor transfer.

Further open questions concern the already mentioned social interaction possibilities in iVR. It may be possible to reduce extraneous cognitive load in a collaborative iVR learning environment based on the claims made in collaborative cognitive load theory [98, 99]. Thus, design elements found to be distracting in other studies would lose this negative significance and design collaborative iVR learning environments would have to be thought differently.

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Article submitted 2020-06-26. Resubmitted 2020-09-30. Final acceptance 2020-09-30. Final version published as submitted by the authors.

Lessons from Lockdown: Are Students Willing to Repeat the Experience of Using Interactive Smartboards?

<https://doi.org/10.3991/ijet.v15i24.19327>

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Abstract—COVID-19 outbreak has stimulated all kind of e-learning proposals to continue with students' educational progression. Despite the fact it is significant to understand students' perceptions regarding their performance with collaborative tools, specifically interactive smartboards, no research was found during the exhaustive literature review conducted. A research model has been pre-tested using a sample of students of the Faculty of Commerce and Tourism of the Complutense University of Madrid. The results of this exploratory research expose that (1) playfulness has a significant and positive impact on intention to use; (2) interestingness of content has a meaningful effect on perceived playfulness; and (3) perceived ease of use has considerable and positive influence on playfulness. Besides, perceived ease of use and usefulness were not found to have a direct impact on intention to use. The results are revised to propose useful academic and educational contributions.

Keywords—Interactive smartboards, e-learning, playfulness, intention to use

1 Introduction

This pandemic has forced educators to adopt all kind of technological approaches so as to encourage students learning process. Google Jamboard is an interactive smartboard where teachers and students are able to collaborate on a virtual whiteboard, which enables them the opportunity of fostering brainstorming ideas and creating sketches.

This research aims to establish the causal relationships that describe if the use of this collaborative e-learning tool enhances students' behavioural intentions. The model will be pre-testing using Partial Least Squares Structural Equation Modelling (PLS-SEM).

2 Literature Review and Hypotheses

2.1 Technological acceptance theory

Several theories have been widely employed to describe subjects' predisposition to accept and use technological advances. The most widespread are the Technological Acceptance Model (TAM)^{1,2,3}, Theory of Planned Behaviour³ and Unified Theory of Acceptance and Use of Technology (UTAUT)^{4,5}. This research has employed TAM as the foundation of the proposed model as it is considered to offer the best explanations regarding subjects' attitudes and behaviour⁶.

Although prior research has examined different educational issues of Google^{7,8,9,10}, no studies were found in the literature review conducted that deal with Google Jamboard performance. Hence, the following hypotheses were proposed:

H1: Perceived ease of use of Google Jamboard positively and significantly influences

- 1) Students' intention to use
- 2) Perceived usefulness
- 3) Attitude.

H2: Perceived usefulness of Google Jamboard positively and significantly influences students' intention to use.

2.2 Entertainment drivers

Users seem to be predisposed to repeat a technological experience when they feel stimulated with the interestingness of the content and if they have a playfulness feeling^{11,12,13,14}. Thus, as prior studies had already confirmed these relationships in order contexts, it was hypothesized:

H3: Perceived playfulness of Google Jamboard positively and significantly influences

- 1) Students' perceived ease of use
- 2) Perceived usefulness
- 3) Intention to use
- 4) Attitude

H4: Interestingness of content of Google Jamboard positively and significantly influences students' perceived playfulness.

3 Methodology

3.1 Data collection

From June 29 to July 9, 2020 an online questionnaire was sent to a class of 40 students of an online Personal Branding course of the Faculty of Commerce and Tourism of the Complutense University of Madrid. A total of 19 usable questionnaires were collected.

Table 1. Profile of respondents

Characteristics	Frequency	Percentage (%)
<i>Gender</i>		
Female	11	7,9
Male	8	42,1
<i>Age</i>		
20-25	15	78,9
26-30	3	15,8
30-35	1	5,3
<i>Education</i>		
University degree	13	68,4
Master's	6	31,6

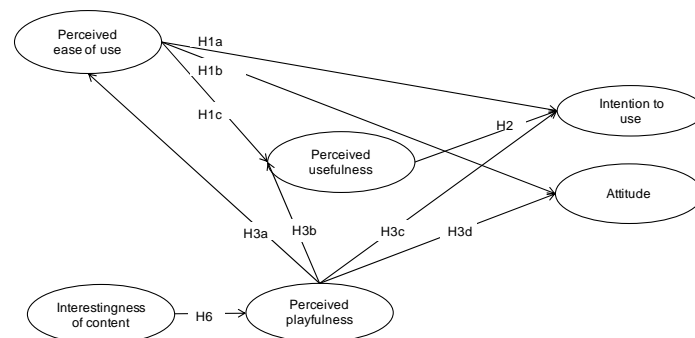


Fig. 1. Proposed model

3.2 Measures

The model proposed in Figure 1 was used in the pre-test analysis. All the scales items were adopted from prior studies and rated on a seven-point Likert Scale (Table II).

Table 2. Descriptive analysis.

Construct/Associated Items		Mean	Standard Deviation
<i>Perceived usefulness (PU)</i>			
1	Using this tool improves my performance in this course	5.200	1.720
2	Using this tool is useful to me in this course	5.550	1.687
3	Using this tool helps me accomplish my learning effectively	5.450	1.687
4	Using this tool makes my work easier in this course	5.250	1.728
<i>Perceived ease of use (PE)</i>			
1	It is easy to get this tool to do what I need to do	5.500	1.775
2	this tool is easy to use		
3	My interaction with this tool is clear and understandable	6.000	0.949
4	It is easy to become skilful at using this tool.	5.850	1.526
<i>Attitude (AT)</i>			
1	I believe that using this tool is a good idea.	5.850	1.424
2	I believe that using this tool is advisable.	5.850	1.388
3	I am satisfied in using this tool.	5.700	1.487
<i>Interestingness of content (IC)</i>			
1	I think the content taught throughout this tool is interesting.	5.850	1.424
<i>Playfulness (PL)</i>			
1	I enjoy using this tool to receive my classes.	5.850	1.424
2	I feel this tool use is fun as way to received my classes.	5.600	1.497
<i>Intention to use (IN)</i>			
1	I plan to use this tool very often during next course.	5.250	1.479

3.3 Reliability and validity evaluation

The model was calculated using PLS-SEM as it is an adequate technique for small sample sizes. Table III details the reliability and convergent validity test. Cronbach's alpha values accomplish the recommended value of 0.60. Average variance extracted (AVE) for each construct was superior to 0.50. All items were meaningfully ($p < .01$) related to their hypothesized factors, and standardized loadings were superior to 0.60. Regarding discriminant validity, the shared variance between pairs of constructs was inferior to the corresponding AVE (Table IV).

Table 3. Reliability and convergent validity of the final measurement model

Factor	Indicator	Standardized	t-Value	CA	rho_A	CR	AVE
		Loading	(bootstrap)				
Attitude	AT1	0.988	13.397	0.976	0.979	0.985	0.955
	AT2	0.979	11.396				
	AT3	0.965	32.888				
Interestingness of content	IC1	1		1	1	1	1
Intention to use	IN1	1		1	1	1	1
Perceived ease of use	PE1	0.894	17.231	0.89	0.902	0.926	0.758
	PE2	0.88	16.609				
	PE3	0.955	32.115				
	PE4	0.739	2.531				

Playfulness	PL1	0.962	32.17	0.957	0.959	0.969	0.888
	PL2	0.956	13.51				
Perceived usefulness	PU1	0.943	28.571	0.913	0.916	0.958	0.92
	PU2	0.957	38.489				
	PU3	0.992	95.491				
	PU4	0.875	12.861				

Note: All loadings are significant at $p < .01$ level. CA = Cronbach's alpha; CR = composite reliability; AVE = average variance extracted.

Table 4. Measurement model discriminant validity for the higher-order construct.

	Factor	1	2	3	4	5	6
1	Attitude	0.977					
2	Intention to use	0.757	1				
3	Interestingness of content	0.897	0.73	1			
4	Perceived ease of use	0.879	0.684	0.839	0.871		
5	Perceived usefulness	0.841	0.703	0.712	0.847	0.943	
6	Playfulness	0.842	0.841	0.823	0.837	0.867	0.959

Note: Diagonal values are AVE square root.

4 Research Findings

Results reveal that perceived ease of use and perceived usefulness do not have a significant effect on intention to use. However, the rest of linkages examined in the proposed model are significant and positive. Hence, playfulness had a significant and positive effect on intention to use.

Table 5. Reliability and convergent validity of the measurement model.

Hypothesis	Path	Standardized Path Coefficients	t-value (bootstrap)	
H1a	Perceived ease of use -> Intention to use	-0.004	0.122	
H1b	Perceived ease of use -> Perceived usefulness	0.386	1.763	*
H1c	Perceived ease of use -> Attitude	0.568	3.769	***
H2	Perceived usefulness -> Intention to use	-0.083	0.263	
H3a	Playfulness -> Perceived ease of use	0.795	6.109	***
H3b	Playfulness -> Perceived usefulness	0.555	2.313	**
H3c	Playfulness -> Intention to use	0.878	2.812	***
H3d	Playfulness -> Attitude	0.350	2.042	**
H4	Interestingness of content -> Playfulness	0.759	4.646	***

Note: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$

5 Discussion

This study adds value to prior studies related to e-learning tools by analysing the effect of the use interactive smartboard for fostering students' performance and ex-

tends findings concerning the adoption of TAM model in different innovative technological applications. Therefore, this research contributes to the understanding of the drivers of students' willingness to repeat the use e-learning tools as well as their perception regarding playfulness and interestingness of content. Thus, educators should emphasize students' perceptions of playfulness during their online classes so as to enhance their intention to repeat the educational experience.

As future research lines, scholars are prompted to consider the limitations of this study. Precisely, the small sample of students could have led to bias. Researchers are encouraged to replicate this study in other universities or even other employee contexts.

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Article submitted 2020-10-19. Resubmitted 2020-11-28. Final acceptance 2020-11-29. Final version published as submitted by the authors.

The Influence of Policy on Emotional Labour and Burnout among Further and Adult Education Teachers in the U.K.

<https://doi.org/10.3991/ijet.v15i24.19307>

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Abstract—The Society for Education and Training (SET) regards maintaining wellbeing for teachers as important as it ensures the retention of staff and the progress of learners. A survey conducted with teachers reported various factors contributing to lack of wellbeing of teachers in further education (FE) and adult education [19]. Focus group interviews asked teachers in an FE college about equal opportunity, management, working conditions, staffing levels and career prospects and how they use emotions. For some, there is insufficient working space and time for breaks between lessons. They will take work home to complete, learners can be affected when staff are ill and supply staff are not employed due to funding so covering for existing staff imposes demands on them. Management policies lack practical application and promotion opportunities are restricted for some. This paper examines the extent to which existing policies shape the practice of teachers and whether this impacts on their wellbeing in terms of emotional labour and symptoms of burnout. Interviews reveal that teaching staff may suffer from panic attacks and anxiety and feel unsupported by heads of departments. However, they will maintain a professional exterior when interacting with learners. The impact of policy on work life-balance (WL-B) is discussed. Some teachers do not have sufficient time to spend with families and presumably interests and hobbies while more experienced teachers can separate family life from working life and so maintain a balance. The paper examines the adequacy of existing standards for staff seeking to maintain wellbeing.

Keywords—FE/adult Ed. teachers; policy; wellbeing

1 Introduction

The Society for Education and Training (SET) in the U.K [19] conducted a survey with 1,000 SET members and reported that a number of factors contribute to the feeling of wellbeing among further education (FE) and adult education teachers. These are: good working relationships with colleagues, opportunities for professional development, professional autonomy in a supportive organisation and having good managers. Participants of the survey also completed the Warwick-Edinburgh Mental

Wellbeing Scale, and this assessed the mental wellbeing of FE teachers and trainers. The scale revealed that they scored lower than the general population. Contributing factors affecting wellbeing of teachers were graded lesson observations, lack of autonomy/trust, lack of flexible working opportunities, poor decision making or practice by management. All had a negative impact on SET teacher members' wellbeing.

A link between stress, emotional labour and burnout in the FE/adult education sector was examined by Rasheed-Karim [18]. That is, older teachers, fifty plus, may feel exhausted due to, for example work demands, but interacting with students is not overly stressful. That is, they feel that they accomplish positive outcomes with students. It is evident that older teachers will use surface and deep acting appropriately in particular situations. This paper extends research and reports evidence from focus group interviews which show that there is sufficient reason to believe that existing policies with respect to current physical working conditions of part time and full-time teachers also contribute to emotional labour and symptoms of burnout.

Stated in the SET Issue [19], policies are generally created by government to meet current political aims. These are met with respect to such features as the distribution of learners and the size and nature of the workforce.

Given constraints, the government's intention would be to improve learner outcomes for the public. However, examination of policy does not always have a positive impact on the teaching workforce of FE and adult education. The extent and reasons for making this claim is examined in this paper. A summary of FE in terms of policy and practice was made [17].

'Adult providers as well as further and adult education colleges are a major part of an economically driven society improving skills for developing careers as well as for new interests and jobs. Further education (FE) colleges deliver courses that not only meet the demands of school leavers but also serve the wider community in terms of delivering higher education courses allied to universities. FE advocates the concept of 'inclusiveness', in terms of, for example, disabilities, ethnicity and race. This complies with the Equality Act [5], which points out that facilitating learning conditions for the vulnerable is essential. Additionally, staff should be appropriately trained to deal with issues such as the wellbeing of learners and day-to-day teaching (e.g. The Wolf Report, 2011 [21]; Ofsted, 2014; and the Society of Education and Training, 2017). However, this may be hampered by lack of resources to deal with such issues [6]. It is suggested there may be repercussions on the wellbeing of teaching staff, and this may have negative effects on work-family balance. The Education Support Partnership (2017) advise that the effects of exhaustion/burnout should not be underestimated. There is sufficient evidence to show that what policy intends to achieve is unachievable given the current climate of FE. One effect is that teachers may feel pressurised. How exhaustion and burnout is dealt with must be a joint effort between policy makers, researchers, teachers and managers.'

Some key words and terms are associated with the concept of 'wellbeing'. These are summarised: -

Emotion: Emotions are complex cognitive structures linking feelings, thinking and action according to Averill [1] and lie at the core of teaching [10]. Others, such as Damasio [3] argued that the emotion-induction process releases a range of body and brain responses that lead to emotions. It could be argued that suppression of lesser felt emotions generates stress. However, when there is suppression of more deeply felt emotions such as anger, then it is envisaged that this will lead to emotional labour with students, colleagues and family [2].

Emotional Labour: Emotional labour was defined by Hochschild [11] with respect to the way people carry out their job roles in the workplace. In terms of the teaching profession, teachers will manage feelings to create emotional displays (either surface or deep acting) in exchange for a wage. Emotional labour also entails managing emotions when interacting with others at work. However, emotional labour is recognised as an occupational requirement which constitutes rules of how employees should feel/display with others. Emotional labour, while useful to the organisation, may have negative impacts for the employee. As emotions vary in intensity, more intense emotions will be more difficult to regulate, but how this is carried out is not yet clear [7].

Emotional Regulation: This includes the efforts to increase, maintain or decrease emotions ([8]; [13]). Displays of emotion affect the quality of service that organisations provide and so the capacity to make profit [11]. Emotion regulation occurs when emotions are not adequate for a given situation; people will influence the emotion's course. When emotional regulation takes place in the workplace, emotional labour is apparent as regulating emotions becomes a laborious activity [9].

Burnout: The conceptual framework assumes that in the event of a lack of adequate emotional regulation, burnout may ensue. The Maslach Burnout Inventory for Educators (MBI-E) measures three aspects of burnout: emotional exhaustion, depersonalisation and lack of personal accomplishment [15]. From the measurement of several items, three scores are achieved. The emotional exhaustion scale measures the extent to which individuals feel chronically tired. The depersonalisation scale assesses impersonal responses toward students. Finally, personal accomplishment measures the extent to which teachers feel they have achieved positive outcomes with their work with students.

Work-Life Balance (WL-B): As teachers manage the demands in the workplace and then face personal needs from family and in their lives, the home-work interface becomes problematic [20]. Emotional labour within the family involves managing the interpersonal domestic relationships, and spill over from work emotions will inevitably lead to stress [16]. For some, research instruments measuring WL-B are constructed by the researchers to answer their questions [12]. In a similar vein, the research instrument used in this research is created based on a literature survey.

2 Methodology

Focus group research from an FE college in England gathered information on policies with respect to equal opportunity, management, career plans, working

conditions, staffing levels and WL-B. The focus groups (FG) were four: FG 1- two teachers; FG 2- two teachers; FG 3- five teachers; FG 4-five teachers. Quotes and discussions from the interviews are reported which exemplify the thoughts and experiences of staff members in the college. To further assess WL-B, a Qualtrics survey asked teachers to choose statements which they agree with. The paper examines the extent to which policies and practice impact on use of emotions and symptoms of burnout. The implication on work life-balance (WL-B) is discussed. All participants used pseudonyms and were asked to complete an ethics consent form.

3 Results

3.1 Equal opportunity

Figures reported from the Education and Training Foundation (ETF) surveys point out that approximately 11% of FE staff is from black and minority ethnic backgrounds (BAME) [14]. The figure points to less than 9% for senior managers. Mann is of the opinion that students do not see BAME role models among college staff, and this is especially pertinent in leadership roles. Significantly, there are no minority body representatives who can offer moral, social and economic support. It is recognised that BAME staff should be encouraged by organisations not to leave [14]. Furthermore, learning from successful practice on gender equality might safeguard the development of BAME leaders in the future [14].

Researcher: Do you think that equal opportunity policies are adequately implemented?

Sarah: Not really, I don't. I think they're OK for me on my behalf. I wouldn't really complain about any equal opportunities that are implemented within the department.

Stephanie: Yes, I think the department reflects our student cohort. We've got lots of, the staff, so we've got Asians, British so we've got all of the ethnicities. We've got Muslims. But our main aim is to enforce that even though we are, what's the word, we are different, we are at the same time equal and this is what we're trying to promote to our students. The only thing that has been brought up recently is that even though it reflects the staffroom, our staffroom reflects the student cohort, higher up in management, this is not the same. Apparently above us we've only got very few ethnic minorities. The other thing that I would like to, I don't know how important this is but we are currently, we've got 30 members of staff and only three of those are male and the rest are female. So, we find that bit unequal.

Jennifer: No. Equal opportunities aren't followed in our department, I don't think, as much as they should be. There's not enough inclusion for people with learning differences and yeah that's enough actually. Because staff aren't treated equally in any department probably and in this one especially. They're not given support when things are changing. We're not getting training for specific things we need to do. We're just expected to do it and we are sometimes discriminated against.

It is evident that policies of equal opportunity applied to staff are dysfunctional. Teachers tend to form their own conclusions of how their department functions and conclusions about equal opportunities are generally negative.

3.2 Management

Researcher: How do management policies influence your job role?

Steve: Very supportive in some areas. Usually, management are involved in key areas, either budget holders who are involved in spending the money or staffing. If they decide that say more contracts can become available, then we can take in more contracted staff. But they also, they decide whether money can be allocated to certain areas so we can get new equipment or spend more money on transport or trips. So they're the people at our level, the teaching staff, we're not involved in the financial side of education but that's their job so they can really take a turn in whether we get more staff or not, whether we get new equipment or not or whether we get what we asked for.

Paula: Well, the policies are brought about aren't they as a form of protection and obviously a formula in which we are to actually comply. However, what's always written is always practical as to what can be enforced.

Nicola: And I think what's written, it's written by senior members of staff or HR members of staff that have nothing to do with teaching, have no comprehension of our job roles so policies that are enforced, I don't think a lot of these policies are appropriate for us.

Maise: I think sometimes yeah, I think probably, I don't know if it's on the right lines, but policies are introduced to kind of tick boxes, especially when like you've got inspections and so on. So, you're kind of, extra things get added on to make us kind of, it's like a paper trail isn't it sometimes, and extra things that you have to do.

Paula: I think there's far too much ticking boxes actually, we check, that hinders the form of our job really in a lot of ways because we have to tick a box but it's not always true to what we actually do.

To conclude, while management policies are supportive for some, they can hinder others as they do not apply to the reality of practice.

3.3 Working conditions

Researcher: Do your physical working conditions help you to maximise your potential in the workplace?

Sarah: Well, I don't know, like my physical ability in terms of lots of marking, we do as you can see, where we're situated ergonomically. We could be situated in a bigger space, I think. That can affect our physical ability.

Stephanie: Yeah, well we've got far too, our job space, as you can see, we're sharing desks. We haven't got enough space to place, do our marking or do our other tasks. A lot of our, we take a lot of our work home with us. For example, sessions last, one session can last three and a half hours and the students are given a fifteen-minute break but us staff are told that we can't leave the room, well we feel that we also need,

could do with a ten-minute break to make use of the toilets, sometimes we would like to leave the room to eat something. We have very little lunch breaks. Our classes finish at 12:15 and the next class starts again at 1. By the time the students have all left and you've logged off, taken your stuff, done your register, fifteen minutes will have elapsed. Then you've been told by your head of area that you've got to be in class ten minutes prior to start time so there's only ten minutes to fifteen minutes for you to actually physically make it to the next room where you have to go, and have your lunch. Personally, myself as well as other members of staff, I find it extremely difficult to be able to eat, have a toilet break, have something to drink and physically move to another area where we have to teach.

Teachers generally feel that there is a lack of time for their main daily meals. Furthermore, there is insufficient desk space for completing tasks and so taking work home to compensate may cause lack of wellbeing among staff due to poor work life-balance (WL-B).

3.4 Staffing levels

Researcher: To what extent do staffing levels affect your ability to work?

Carol: This is Foundation Learning. So, we're very low staffed, we're having to employ agency staff to do some of the teaching and we have got a member of staff who's off ill with anxiety and stress so we're having to cover classes and we've had to cancel some classes because we've just had nobody to cover them. So, it's pretty bad.

Paula: They don't really affect my role in the college or the department, to be honest, because we have staff really. It's just staff sickness. Because there's no funding, there's no money for part time staff like there used to be, then it impacts everybody because then we have to cover extra hours so you could have no desk duties for the week because you're just constantly teaching and that's the only time the level of staffing would really affect us.

Samantha: I think generally with the sickness as such, I think it does have an effect on us all in the sense of workloads because we do have heavy workloads because there's no, not only do we pick up the teaching but we pick up the administration. So, I think it's quite to our detriment.

In terms of staffing, teachers tend to cover when others are sick, and this seems to be due to stress and emotional labour experienced by sick staff. Teachers who cover class topics as well as teach their working hours may also suffer from exhaustion and this may endanger their responses and interactions with peers and students. Consequently, burnout may ensue.

3.5 Career plans

Researcher: How does your current job role influence your choices for future career plans?

Stephanie: I'm currently lecturer B. I've been doing this job for five years. As a lecturer B I'm a team, the leader of the team. However, I feel that after five years, there have been no opportunities for me to either move up in my career because above

me is SEL and I've had to simply apply for other jobs, first of all because I'm not happy with the working conditions here and secondly because I felt that there was no other opportunities for me to climb up the career ladder so by the end of this month I will be officially leaving. And one of the reasons is because I'm not satisfied with the working conditions here.

Steve: Well, I've worked in various careers. I was a medic in the Air Force, I've worked in IT and then eventually worked in the fitness industry and then sort of did my degree, came into teaching and so this is my career now. I've been through enough other things and I've settled in and I've done this job for 18 years and I'll probably see it right through to retirement because I still enjoy the teaching side. I didn't really want to get promoted and end up sat in an office wearing a shirt and tie. I like teaching the learners so I'm quite happy to carry on doing what I'm doing.

Teachers who have had a varied career may be happier to remain in their current teaching post as it is a more satisfying choice in comparison to their other job roles. Younger staff whose main career is in teaching would want to progress speedily after a period of time in full time employment but may find this difficult for reasons such as lack of opportunities.

3.6 Staff use of emotions and symptoms of burnout

Researcher: Do you feel teachers genuinely experience the emotions they show?

Stephanie asserts that staff must suppress emotions and appear professional or according to Sarah deal with problems. She maintains that she does not show emotions. Stephanie explains that when students are threatening, the head of department thinks the student's behaviour is due to Stephanie's interaction with the student. She has panic attacks and suffers from anxiety.

Carol will display a professional exterior and is currently suffering from severe anxiety but does not let this impact on her learners. Nicole and Paula agree that they are all very professional and can scream/cry in the staff room, but this never impacts the classroom. They feel they have to build strong relationships with their learners and have a duty of care. They are empathetic with other teachers and feel they should be compassionate towards learners and staff.

Steve feels teachers genuinely experience the emotions they show. He said he is experienced and wants students to progress. Steve thinks that his job requires him to show emotions and he will speak about his experiences to students and this creates a bond between them. That is, Steve wants to explain student vulnerability through his experiences.

In summary, teachers can feel that they are blamed by heads of department because of negative attitudes from students and this affects them emotionally. However, they like to look professional and will hide negative emotions with learners, although they seek support in staff rooms where they show these emotions.

3.7 Work Life –Balance (WL-B)

Researcher: Do you feel family responsibilities help/hinder you in the workplace? Please explain.

Stephanie thinks that family responsibilities hinder her and had she not been helped by her husband she would have been unable to do her job. Her husband takes their children to and from after school club. At work, she feels unsupported as a parent and says her job role does not meet the needs of parents. Sarah explains that teachers do not want to take work home because their role changes when they get home, from a teacher to housewife.

For Carol, family life helps her at work, but less time is spent with them and the family suffers as a result. Jennifer takes home some work as she needs to complete marking and planning tasks. This impacts on family life such as at times when there is a family loss and home responsibility clashes with her job role.

However, Paula explains that her experience at work has taught her to separate home from working life. She does take work home but says that new staff cannot ‘switch-off’ and so this impact on their home life.

Steve admits that he feels guilty devoting more time to his job than his family. That is, he spends more time looking after the health and welfare of other people’s children and this makes him feel guilty at weekends, especially when he sorts out learners’ work. Balancing work and other life commitments is difficult for him.

Survey data using online ‘Qualtrics’ from thirty-seven teachers of various FE and adult colleges reveal the following about WL-B.

Table 1. Percentage agreement of WL-B statements

Percentage (%) Agreement with Statements	Statements
32.4%	Keeping family life and work loads manageable is difficult.
18.92%	My spouse sometimes feels left out when I have too much to do such as marking and this makes me unhappy in the workplace.
16.22%	Relaxing with family helps me to be more focussed in solving problems at work.
Other: 13.51%	Neither help/hinder I don’t suffer and have a good work/home balance. My family are grown up and do not hinder.
8.11%	I can help my children with homework and learn from the mistakes my students make and this makes me a better worker.
8.11%	I feel I get too emotionally involved with family and this makes me feel emotionally drained at work
2.70%	I learn from my children and can manage a classroom.

The data from the survey support the quotes from focus group interviews. That is, by not having an adequate rest period with family and doing things of interest outside work, for example hobbies, wellbeing of teachers may be affected in the workplace. This could have negative effects such as dealing with conditions of the workplace, interactions with students and addressing issues of lack of promotion opportunities.

The consequence is that teachers feel unable to deal with policy and effects on practice effectively. The significance of not finding a balance between work and other life activity may result in symptoms of emotional labour and burnout.

4 Conclusion

Staff may feel that interaction between students and themselves must be emotionless when required as well as empathetic. This is necessary so that teachers gain an objective view of the needs of students and at the same time convey concerns to students that they understand their vulnerabilities. According to teachers, this helps students to progress. However, when teachers feel they are stressed due to, for example work demands, they will vent their frustrations in the staff room, where there may be peers who can offer support. Teachers show symptoms of burnout and this exhaustion is symptomatic of panic attacks and anxiety in an effort to remain professional in the classroom. Workloads and feeling of guilt, due to not having sufficient time for family may have negative emotional consequences in the workplace. Such experiences of regulating emotions and using emotional labour could also be indicative of existing policies of the college which reflect government needs. To summarise, teachers may feel they lack control over the demands found at work; are short-tempered; have panic attacks; absence from work likely; feelings of anxiety and exhaustion; lack time with children and detached from others. Various organisations have investigated ways of helping teachers maintain wellbeing.

The Education Support Partnership in the U.K [4] has advice for teachers on online blogs. The organisation suggests that teachers should set themselves goals such as learn how to play an instrument, attend gym twice a week or set a time to finish school each day during term time. The quotes in this paper, however, found that older teachers may have developed strategies to separate working life from home life and may be less prone to emotional labour and symptoms of burnout. However, SET (2019) point out that according to the Education and Training Foundation (ETF), one-fifth of practitioners would like mental health training. The ETF has links with the Education and Support Partnership which offers a helpline for teachers and Mind's (U.K) Mental Health at Work portal offers support. Furthermore, a programme that aims to remove bias and obstacles to those seeking leadership roles in education and training, especially for BAME, is promoted by the Education and Training Foundation (ETF). However, it is suggested that many more colleges should have counselling services with links to the National Health Service. Additionally, those policies which cause teachers' lack of wellbeing should be addressed by representatives in the workplace.

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Article submitted 2020-10-19. Resubmitted 2020-11-25. Final acceptance 2020-11-26. Final version published as submitted by the authors.

Gamified Learning: Are Vietnamese EFL Learners Ready Yet?

<https://doi.org/10.3991/ijet.v15i24.16667>

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Abstract—Given the strong empirical evidence, which confirms the relationship between the use of game elements and increased learning motivation, gamification has recently become a concept that starts drawing attention in the field of English language teaching (ELT). However, gamified learning is still under-presented in ELT research. The current research explores the extent to which Vietnamese learners of English are ready for and their attitudes toward online-based gamified learning. The study draws on data collected from survey questionnaires with 147 students and focus groups with 12 students. The findings indicate that gamification has started taking a certain role in English learning both within and beyond classrooms in the context of the study. Students are technologically well-prepared for online-based gamification and hold positive attitudes towards gamified learning. However, online gamification is being mainly used to assist vocabulary learning.

Keywords—EFL pedagogy, gamification, gamified learning, learners’ perspectives

1 Introduction

In today’s world, the most challenging task that faces teachers in general and English teachers in particular is to motivate and engage learners in learning. Gamification has been found to be one of the ways to do so effectively in education [1][2][3]. The era of blooming technology has brought about an unprecedented opportunity for the application of this pedagogical approach with the availability of abundant online game platforms and smart devices. In English-as-a-foreign-language (EFL) contexts, however, the application of gamification is assumed to face several constraints including tight curriculum, teachers and learners’ limited access to hi-tech facilities, their unfamiliarity with gamification, also their attitudes towards the approach. However, the status of gamification in EFL classrooms was little known due to limited research in the field.

In Vietnam, English teaching methods have sometimes been reported as a major demotivating factor for learners [4]. The strong encouragement of the Vietnamese government for the use of information technology (ICT) in education [5] should be favorable for teachers to transform the perceived “tedious” traditional classroom

practices. Counterintuitively, no research attention directed at the topic of gamification in Vietnamese ELT to date. Furthermore, [6] claimed that learners' experience in gamified learning has been rarely investigated from a qualitative perspective. To bridge the gap in literature, the current research explores the extent to which learners in Vietnam are ready for and their attitudes towards online-based gamified learning. The research draws mainly on qualitative data from focus groups which is illuminated with some quantitative data from questionnaires. The research focuses on three research questions:

1. To what extent are Vietnamese EFL learners technologically prepared for and familiar to online-based gamification?
2. In which aspects of English language is online-based gamification used to assist learners' learning?
3. What are learners' perspectives of the effectiveness of online-based gamification in their English learning?

2 Gamification in Education

The concept of "gamification", adding game mechanics and game elements in non-game contexts [7], has recently been introduced and quickly gained its ground in several aspects of life. In education, gamification is an emerging approach and attracting much research attention [8][9]. Gamification means to extract, adapt and apply game elements such as points, badges, leaderboards in teaching process to make learners motivated in learning, feeling "as if they were playing a game" [10].

Gamification is strongly believed to be an effective learning environment thanks to its capacity to motivate and engage learners [1][2][11][12][13][3]. In addition, this pedagogical approach is also found to promote not only learners' transversal skills such as collaboration [14] and problem-solving skills [15] but also specific skills in particular domain of knowledge [16][12][13]. Though the effectiveness of gamification in general in learning enhancement remains to be proven due to mixed research findings, several specific aspects of gamification and certain game platforms have been found to promote learning (see, for example, [17]).

Despite the promising potential of gamification, the application of the approach in education is not without constraints. It is claimed that teachers in several contexts are not well equipped with appropriate methodology, technical skills [16] and may not have sufficient technical support [12] to apply this approach effectively. Teachers' and learners' attitudes towards gamification are another factor that may lead to either the success or failure of gamification in a particular context.

3 Gamification in Language Teaching

The use of gamification should be more relevant in language teaching than in any other aspects of education given that games have long been part of foreign language pedagogy. When surveying teachers in different countries for their experiences and

perspectives of the application of games, [18] finds that the learning potential brought about by gamification in language classes is perceived by teachers as higher than in other subjects. Nowadays, the burgeoning use of ICT in language education would be a firm premise for gamification to thrive.

Despite the lack of ELT research on gamification to date, advantages of gamification in EFL classrooms have recently confirmed. [19] finds that gamified activities help to reduce EFL learners' anxiety and improve their grammar performance. Besides, young EFL learners' language acquisition is boosted and learning distraction is reduced in gamified environment [20]. [21] explores EFL teachers and learners' views of the use of gamification at primary education in Hong Kong and gets positive findings of the perceived effectiveness of gamification in engaging, motivating learners and boosting learners' confidence and learning outcomes. However, most of the studies on gamification in EFL world, apart from Zou's [21], investigates the effectiveness of specific games or game platforms basing on quantitative data collected from tests. This suggests that qualitative research on teachers and learners' views of gamification would add valuable insights into the topic.

4 Methodology

The current research is a part of a bigger project which investigates the use of ICT in Vietnamese English classrooms and draws upon a subset of the data collected via survey questionnaires and focus groups. The survey questionnaires were adapted from that developed by [22] to investigate teachers and learners' perspectives of English pronunciation pedagogy in Europe. The survey consists of three main parts with the total of 25 5-point Likert-scale items and involve 147 students who were in the last semester of a 6-month English preparation course (EPC) at a private technology university in Hanoi. In the survey, the section on gamification, which the current research draws upon includes nine questions. The survey link was sent to students via their institutional email addresses. The data collected was automatically processed by Google Forms.

Twelve volunteers among surveyed students joined focus-group interviews, each of which consisted of four students. During focus groups, students were invited to discuss about their experience with online-based gamified activities and the perceived effectiveness of this approach. The length of focus groups ranged between 40 minutes and an hour. Given that the first language would significantly facilitate one's understanding of survey questions and in-depth discussions about a certain topic, Vietnamese is chosen as the language for both the survey and the focus groups. The prominent patterns emerging from survey data function to guide the in-depth exploration conducted via the focus groups afterwards. All focus groups were audio recorded and interview data were coded manually and analyzed thematically by the author.

5 Findings

5.1 Learners' technical readiness for online-based gamification

As can be seen in Table.1, students are quite technologically ready for online gamified activities with 95% of participants claiming to possess either a smartphone or an internet-connected computer. All respondents could frequently get access to internet at school and 93% could do so at home (see Table.1). At focus groups, students disclosed that owning a laptop is a must for them to join class activities, get access to learning materials and do tests, which were all highly web-based at this university. Regarding learners' internet using skills, all students at focus groups indicated high confidence in their web-browsing skills. Some students, including Minh, Thuong, Mai even claimed those skills as their prominent strengths.

Table 1. Learners' access to technological devices and internet

Statements	Agree/Strongly Agree
I own a smart phone or an internet-connected computer	100%
I can get access to internet at school on frequent basis	100%
I can get access to internet at home on frequent basis	93%

5.2 Learners' familiarity with online language games

Survey data indicate that online language games were quite familiar with the vast majority of the students. Table 2 shows that half of the surveyed often or very often played one or some online language games to learn English at home. Thirty nine percent sometimes played those games and those who rarely or never did so make up a small proportion of 10%. Students' exposure to language games in the classroom was even greater. Ninety four percent of students claimed to (very) often or sometimes play language games in classrooms while only 5.5% disclosed that they rarely or never did so.

Table 2. Frequency of learners' exposure to online-based gamified learning

Questions	Very often	often	Sometimes	Rarely	Never
How often do you play an online language game at home to learn English?	14.5%	35.8%	39.3%	8.2%	2.1%
How often do you play an online language game in the classroom to learn English?	22.1%	42.1%	29.5%	4%	1.3%

Focus group data reveal that games in use in the context of this study including Kahoot, Quizziz, Quizlet. Among the mentioned online games, most participants said they only played Quizlet at home because it is "suitable for self-study" (Phuong-F3). Other games such as Kahoot and Quizziz were said to "involve a lot of competition and excitement and we enjoy playing them in class better. It is more fun and stimulating to play and compete with people physically present around" (Minh- F1). The use

of online language games in class was reported to highly depend on each individual teacher. Van (F3) said “it is hard to say how often games are used in our classes because some teachers used them very frequently while some others rarely or never do”.

It seems that the decision on which game to apply in class also vary among teachers. A student, Mai (F2) said that each of her teachers preferred a certain game: “While Mrs. Anh often use Quizlet, Mr. Chen never uses that game. He often uses Quizziz instead”.

5.3 Aspects of English assisted with gamified activities

Data from both focus groups and survey indicate that online games are mostly used to teach vocabulary. According to survey results, 85.5% students said that games were used to assist the learning of English vocabulary while only 11.8% and 3.8% mentioned the use of games to teach content knowledge, and English grammar respectively. No participant reported the use of online games in teaching and learning other aspects of English. In focus group data, only one student (Thuong-F1) recalled an instance in which his teachers used Kahoot to teach how to write a topic sentence of a paragraph.

Table 3. Aspects of English assisted with online gamification

Statements	Vocab	Grammar	Writing	Content knowledge	Others
What aspect(s) of English are online games used to facilitate your learning?	85%	11.8%	0%	3.8%	0%

5.4 Learners’ perception of online language games

A major theme emerging from collected data is a strong favor towards online language games. In response to the question “What is your experience with the online language games you have played like?”, the majority of the students (57%) indicated a positive view, 28% expressed a neutral view and 14% provided a negative evaluation (see Table 4). Regarding the effectiveness of online language games, 66% of surveyed students indicated their agreement or strong agreement with the statement that “The use of online games effectively enhances my English learning” and only 11% disagreed or strongly disagreed with the statement (see Table 5). At the focus groups, online games were frequently associated with positive adjectives such as “fun” (Hieu-F3; Thuong, Minh -F1), “interesting” (Thuy, Phuong -F3; Thuong-F1), “relaxing”, “great” (Minh, Thuong-F1; Van-F3; Hang-F2). Students quoted several reasons for their favor of online language games. Some mentioned the appealing presentation of the games with “colorful surface” (Thuy-F3; Truc-F3; Minh -F1), motivating music (Thuy, Phuong-F3; Thuong, Minh -F1), competitive nature (10 students). Especially, nine students strongly confirmed that their English learning is “very much assisted with online language games” (Truc-F3). Notably, six students mentioned the bonus that teachers often gave students in the leaderboard as a signifi-

cant source of motivation for them to join the games. On this issue, a representative student, Phuong (F3), said “without those bonuses, many of us may feel less motivated to play the games. Games are fun but you know marks are important when we go to school (laugh)”. Another student, Thuy, added that “if I know there is a game in the next class, I will revise the lesson more carefully at home to get top scores and get bonus”.

However, it also emerges from the finding that games need to be carefully designed to be effective. Truc (F3) revealed that when “I recognize that I cannot get into the leaderboard because my score is too low, I want to quit the game in the middle”. Commenting on the effectiveness of the games, Hieu (F3) complained that one of his teacher sometimes organized games right after the new knowledge was introduced, and so “students have not enough time to digest the knowledge and so not ready for the game”. Thus, Hieu raised his concern over the effectiveness of gaming in such situations because it was not properly organized: “I don’t think the game is useful”. As indicated in this comment, the matter of how and when to organize the games may require thoughtful consideration from teachers as it may strongly affect the perceived effectiveness of the game and also learners’ satisfaction with the gamified learning.

Table 4. Learners’ general impression of online language games

Statements	Positive	Neutral	Negative
What is your experience with the online language game(s) you have played like?	57%	28%	14%

Table 5. Learners’ perception of the effectiveness of online language games

Statements	Strongly agree	Agree	Unsure	Disagree	Strongly disagree
The use of online language games improves the effectiveness of my English learning.	14.5%	51.1%	23.5%	7.5%	3.4%

6 Discussion

This study shows that students in the context of this study were technologically well-prepared for the application of gamification. This finding resonates Nguyen’s [5], which indicates high availability of internet and smart devices for Vietnamese university students, who also possess good competence in computer and web-browsing skills. Secondly, gamified learning via online games has been applied frequently both within and beyond classrooms with higher frequency for the former. However, gamification does yet seem an official component of English curriculum and, thus, presented often in some teachers’ classes but absent in those of others. Notably, the finding that games such as Quizlet being voluntarily included by students in their self-study at home suggests the appeal and potential of gamification in changing learning behaviors.

Despite the frequent use of online language games, this form of gamified activities is currently deployed mainly to teach vocabulary. This limited application suggests

that teachers may have more difficulties in applying this approach in teaching aspects of English rather than vocabulary, and may need guidance to fully cultivate the potential of gamification in their teaching practices. Illuminating this finding, [16] claims that adequate methodology is essential for teachers to successfully apply gamification.

Regarding the effectiveness of online language games in enhancing learning, learners generally showed positive evaluation, which resonates Hong Kong learners in Zou's study [21]. However, 14% of surveyed students indicated negative experience with online language games and 11% perceived gamification as of little effectiveness. At focus groups, some of students' comments showed that poor preparation in game planning and designing may lead to the limited effect of gamified activities. As discussed earlier in the literature review, though it is widely claimed that gamification is highly effective in engaging and motivating learners, the effectiveness can only be guaranteed if conducted "under appropriate conditions" [14]. Further research, thus, should be conducted to get more insight of learner's needs in gamified learning so that teachers can design gamified activities in a way that maximize learners' positive experience and so maximize the potential of gamified learning.

Another finding that is worth comments is that gaming elements such as badges, leaderboard can be a source of motivation but also of demotivation for learners at the same time. This drawback of gamification is already acknowledged by [10] and [2]. The question raised here is what teachers can do to motivate other forms of learners' intrinsic motivation when joining the games so that the meaning of playing is not just restricted by the matter of winning or losing, but by the senses of, for example, social interaction, being challenged and knowledge gaining. This task may require much work from not only researchers who need to explore how features of games can trigger different aspects of learners' motivation but also teachers who should foster different aspects of their learners' motivation in online language games so as to maintain their engagement and maximize their learning.

7 Conclusion

In such a digital era that we have deeply immersed into today, young generations have not only grown up with a huge capacity to play computer games but also enjoyed the experience immensely; not applying games in education is, thus, a waste of a favorable condition [1]. The current research shows that Vietnamese learners of English warmly welcomed gamified learning and highly appreciated the effectiveness of this pedagogical approach. Erenli [23] claimed that if the demand for gamification is raised among learners, teachers should properly respond to the demand even though they may not be keen advocates of gamification. As such, the current research confirms Vietnamese EFL learners' strong favor of gamification in the forms of online language games. It suggests that this demand should be properly responded by teachers and curriculum designers. The findings also suggest that gamification is an approach that bears a great potential which should be cultivated in such EFL contexts as Vietnam to make English education more motivating and fruitful. To best exploit this pedagogical approach, it is necessary that gamification be given with a place in

English curriculum and sufficient training be provided to teachers so they are well-prepared to use gamification effectively.

7.1 Limitations

The current research bears some limitations. Firstly, the research scope is limited to learners' views regarding the potential of gamification in Vietnamese EFL classrooms. Further research should be conducted to investigate EFL teachers' willingness and readiness in pursuing this newly emerging pedagogical approach as well. Findings of such studies would better inform curriculum makers and educational administrators about whether or not gamification should be incorporated into English curriculum in their contexts. This is also a good source of information about what teachers may be in needs of to apply this pedagogical approach fruitfully.

Secondly, the research explores the case of a university, which, as mentioned earlier in the Methodology, is a leading private technology university in Vietnam; the technological facilities that students can get access to at this university may not be a representative scenario for higher education institutes in Vietnam in particular and many other EFL contexts in general. However, this research is not aimed to seek a generalization but to gain an insight into learners' perception and attitudes regarding gamification-related issues. The findings achieved in the current research are of values in informing teachers and educational administrators in the context of this study and similar EFL contexts about the potential of gamification as an emerging teaching approach.

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Article submitted 2020-06-27. Resubmitted 2020-08-08. Final acceptance 2020-08-12. Final version published as submitted by the authors.

Imprint

iJET – International Journal of Emerging Technologies in Learning

<http://www.i-jet.org>

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Publication Frequency

Bi-Monthly

ISSN

1863-0383

Publisher

International Association of Online Engineering (IAOE)

Kirchengasse 10/200

A-1070 Vienna

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