Ireland International Conference on Education (IICE-2018)

April 23-26, 2018

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Message from the Steering Committee Chair

Welcome to the Ireland International Conference on Education (IICE-2018) biannual conference (April and October). The IICE-2018 provides an opportunity for academicians and professionals from various educational fields with cross-disciplinary interests to bridge the knowledge gap, promote research esteem and the evolution of pedagogy. The IICE-2018 theme is Global Issues in Education.

We received 331 papers (107 Abstracts, 85 Extended Abstracts, 139 Full Papers), 22 Speaker's Proposals, 30 Posters and 25 Workshops from 71 countries. After the double-blind review, we finally accepted 1 Speaker's Proposal, 3 Posters, 4 Abstracts, 5 Extended Abstracts, 21 Full Papers, 1 Workshop and 1 Invited Workshop.

The IICE double-blind paper evaluation method was adopted to evaluate each submission and selected papers will appear in high impact International Journals published by Infonomics Society.

Many people have worked very hard to make this conference possible. I would like to thank all who have helped in making IICE-2018 a success. The Steering Committee and reviewers each deserve credit for their excellent job. I thank the authors who have contributed to IICE-2018 and our Keynote Speakers: Dr Christina Harnett, Dr Cristina Hava Muntean and Dr Neil Kenny, for agreeing to participate in IICE-2018. I also like to acknowledge my appreciation to the following organisations: Infonomics Society and Canadian Teacher Magazine. It has been a great pleasure to serve as the Steering Committee Chair for IICE-2018. The long-term goal of IICE is to build a reputation and respectable conference for the international community.

On behalf of the IICE-2018 Executive members, I would like to encourage you to contribute to the future of IICE conference as authors, speakers, panellists, and volunteer conference organisers. I wish you a pleasant stay in Dublin, and please feel free to exchange ideas with other colleagues.

Professor Charles A. Shoniregun
IICE-2018 Steering Committee Chair
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Keynote Speakers
Keynote Speaker 1

Dr. Christina Harnett is a licensed psychologist and Associate Professor at the Johns Hopkins University School of Education. Her faculty appointment is in the Counseling and Human Development Program where she teaches graduate courses in clinical mental health counseling; she also teaches in the Master of Health Professions Education Program, an inter-school initiative at the university. She was awarded her doctorate in Psychology from The Catholic University of America and an M.A. in Clinical Psychology and MBA in Executive Studies from Loyola University of Maryland. Dr. Harnett’s professional background includes delivery of clinical and management services in non-profit health and community organizations as well as administrative and significant teaching experience in universities principally at the graduate level. She has given presentations and provided consultations and educational training activities for organizations around issues pertaining to work-force and executive/professional development to include delivery of specialized trainings promoting resilience and professional wellness for diverse populations of professionals. Additionally, Dr. Harnett has worked with local, regional and national law enforcement agencies, and state, national and international military organizations in delivering services related to principles and strategies for building dispositional resilience and behavioral health issues.

Title: Avoiding “Brand” Fractures: Orientation for Adjunct Faculty as a Leadership Imperative

Abstract: In higher education today in the US, adjunct faculty constitute a significant portion of the academic workforce engaging learners and supporting institutional missions and program outcomes. Within a climate of heightened accountability to both internal and external stakeholders, it is incumbent upon leadership to deliver a quality orientation to the educational organization to ensure that such faculty have full knowledge of their role as part of an integral learning network. A full understanding of an institution’s educational landscape to include the culture of the organization and the assigned program situated within it ensure that targeted learning outcomes have a strong likelihood of being achieved. Any derailment of the teaching/learning cycle threatens promised delivery of the educational product and this may be considered a potential “brand fracture”. While there are many other reasons for providing part-time associates with proper onboarding, none is more imperative than ensuring the educational “brand” represented by the many facets of a program our learners have been promised and have come to expect. The many talents and professional experiences that adjunct faculty bring to our programs must be leveraged to ensure delivery of a high quality educational experience linked directly to program outcomes for the learner. To do this, academic program leadership must provide timely and adequate
information. Therefore, a thorough and relevant orientation for adjunct faculty is a leadership imperative to avoid “fracturing” the university’s brand.
Dr Cristina Hava Muntean is a Senior Lecturer with School of Computing, National College of Ireland. She holds a B.Eng. degree in Computer Science and a Ph.D. degree awarded by Dublin City University, Ireland in 2005. Dr Cristina Muntean has been constantly involved in various research related activities over the past 16 years fostering and promoting research, leading research projects, supervising PhD and MSc students and publishing over 90 publications in international peer-reviewed books, journals and conferences. Adaptive and personalised e/m-learning, user modelling, technology enhanced learning, game-based learning, self-directed learning, consumer behaviour, end-user Quality of Experience, adaptive multimedia, energy saving solutions are the main research areas she is involved in. Dr Cristina Hava Muntean chaired or served as technical program committee member for top international conferences and acted as reviewer for several journals.

Title: Technology Enhanced Stem Education Fostering 21st Century Skills

Abstract: Teachers are facing many difficulties when trying to improve motivation, engagement, and learning outcomes of learners in Science, Technology, Engineering, and Mathematics (STEM) subjects. The disengagement is mainly due to the perception that scientific subjects are difficult. Both teachers and researchers believe that learners’ disengagement from STEM area can be overcome by using interactive, engaging, technology-based educational materials in order to support knowledge acquisition through direct experience. Thus, technology-based teaching and learning is the future of the education and has already started to be applied at all levels, from primary school to the third level education. Meanwhile, the new technology developments that are emerging on the market at a growing speed demand young people to quickly recognize the importance of lifelong learning. To become a lifelong learner a person must have developed 21st century skills such as digital literacy, communication, critical thinking, problem solving, collaboration, creativity and imagination, in order to be able to identify the learning activities he/she has to undertake in order to improve his/her knowledge and skills. Therefore, education should both motivate learners to study STEM subjects and eventually to follow a STEM career, and to support the development of 21st century skills by making use of various technology-based pedagogies. Technology based teaching approaches such as flipped classroom, problem-based learning, game-based learning, virtual lab and multimedia will be discussed and exemplified on a set of STEM subjects. An analysis on the 21st century skills developed through these teaching methods and learners’ engagement and satisfaction will be presented.
Keynote Speaker 3

Dr Neil Kenny is an assistant professor at the School of Inclusive and Special Education at the Institute of Education, Dublin City University. He holds an B.A. in Psychology from University College Dublin, was awarded his PhD from Maynooth University in 2011 and a Specialist Diploma in teaching, learning and Scholarship from the University of Limerick in 2014. He teaches on a range of post-graduate courses for practicing teachers in the domains of autism specific education and provision for students with complex needs. Dr Kenny has many years’ experience of working in educational settings with children, young people and adults on the autism spectrum. The focus of his research work has been on inclusive and person-centred education spanning the full continuum from early intervention services to learners in third level education. He has been the principal investigator on a range of funded collaborative research projects focusing on inclusive education, autism and participatory research. Dr Kenny has an active research agenda and has published in national and international peer reviewed education journals.

Title: Voicing Inclusion: Exploring the Experiences of Students with Autism in Mainstream Schools

Abstract: It has been policy within Ireland, in common with other European and international administrations, to address issues of equity and equal opportunity by embracing a more inclusive education philosophy. As a result, in recent decades, many children with a range of Special Educational Needs (SEN) have been educated, where educationally appropriate, in mainstream educational settings. In particular, the numbers of students diagnosed with high functioning autism (HFA) attending mainstream schools has dramatically increased in the last ten years. This inclusive approach has been argued to have potentially life-long impacts on such young people’s quality of life, educational performance and social development. However, there is an emerging evidence that educational inclusion in mainstream schools is a challenging and complex experience for many students with HFA. Research suggests that these students often face a range of negative academic and socio-behavioural challenges in mainstream settings, with social isolation being commonly experienced. There is also strong evidence that this cohort of students is particularly vulnerable to being victims of bullying across all age levels of the education systems. Given the emphasis in Irish educational policy and practice on the inclusion of children with HFA within mainstream settings, it is demonstrably important that the voice of such children or young people is considered in future inclusive planning. In this context, it is perhaps concerning that there is currently a lacuna of research exploring the experiences and perspectives of children or young people with HFA receiving education within mainstream school settings in Ireland. This keynote presentation will explore research on the experiences of students on the autism spectrum within
mainstream education settings in Ireland. The potential for student voice engagement to empower young people with HFA to participate meaningfully and collaboratively in transforming their experiences within the mainstream schools they attend will also be explored. While there is a paucity of research exploring this area, this presentation will discuss the importance of eliciting the perspectives and varied experiences of students with HFA to inform best practices in supporting their inclusion in mainstream education settings into the future.
Workshops
Invited Workshop: A Comparison of East (China) and West (USA)
Self-Reported Views of Middle School Teachers
Bullied by Their Students

This workshop is considered directly relevant to the main conference. Bullying is a topic of immense importance to teachers today. The fact that teachers are now a target for bullying is of great concern to all educators. Furthermore, this workshop is considered to be novel since it addresses a comparison of self-reported perceptions of middle school teachers in the USA and China. We often think of bullying as an event that occurs between two students but who thought that teachers could be bullied too. Most think that teachers are “unbullyable”. After all they are in charge, they give grades, they supervise the classroom management, they are the adult in the classroom. In addition, there is the issue of culture. China is quickly being transformed and taking on many of the characteristics of the West. When this research was undertaken this year, it was discovered that there really has been no term for “bullying” in the Chinese language. So, how do Chinese Middle School Teachers feel about bullying today? The results are surprising since it is often felt that in Chinese classrooms the teacher is the authority figure, even more so than in USA classrooms. That idea is tested in this study and workshop. Lots to talk about that is new and innovative with implications for how teachers should respond to bullying of themselves as teachers.

Organiser: Robert G. Harrington, The University of Kansas, USA
Workshop 1: Innovative Pedagogies for Effective Technology Enhanced Learning (IPETeL)

Catering for digital learners in today’s global diversity is challenging. Especially because learners have different beliefs, knowledge, attitudes, emotions, motivation, cognitive abilities, behaviours and needs. Effective Technology-Enhanced Learning requires a strong pedagogical foundation. The IPETeL workshop addresses the theory, research, innovation, principles, and best practices on how various innovative pedagogies could be used in Technology-enhanced Learning. IPETeL provides an opportunity for researchers, practitioners and industry to present their research and discuss best practices on the use and integration of innovative pedagogies for effective Technology-enhanced Learning. The scope of the workshop to provide an opportunity for in-depth discussions and exchange of ideas as well as best practices related to the inclusion of innovative pedagogies for effective Technology-Enhanced Learning. The goals of the workshop are:

- To build the existing body of research on innovative TEL pedagogies
- To promote the inclusion of innovative pedagogies in current and future Technology-enhanced Learning
- To provide an opportunity for researchers, practitioners and industry to present and discuss the latest research on the use of innovative pedagogies for effective Technology-enhanced Learning

Organiser: Ioana Ghergulescu, Adaptemy, Ireland
Sessions
Session 1: Inclusive Education and Practices

Title: The Cases of Educational Segregation of Roma Before the European Court of Human Rights: Recognition of Systemic Racial Segregation  
(Author: Norah Burns)

Title: Student Experiences and Two Canadian Universities  
(Authors: Sandra Styres, Dawn Zinga)

Title: Addressing the TRC in Higher Education: The Role of Faculty and Senior Administrators  
(Authors: Dawn Zinga, Sandra Styres)

Title: Muslim Young Women and Science Identity  
(Authors: Saima Salehjee, Mike Watts)
The Cases of Educational Segregation of Roma Before the European Court of Human Rights: Recognition of Systemic Racial Segregation

Norah Burns
School of Law University of Limerick, Ireland

Abstract

According to the Council of Europe, segregation of Roma children is the most widespread violation of Roma children’s right to education in Europe. This segregation takes many forms from placing Roma children into specific areas in classrooms, placing them in separate Roma only classes, placing them in annexes to the main school building or placing them in special schools. In a 2008 study it was found that 35 per cent of Romani children in the Czech Republic were not enrolled in school, this figure is in stark contrast to the national figure of just 2 per cent. An estimated 30 per cent of Roma children are placed in schools for children with mild intellectual disabilities; this is in comparison to 2 per cent of non-Roma children. Thus far two cases concerning the placement of Roma children into special schools and four cases of educational segregation of Roma have appeared before the European Court of Human Rights. Barany has suggested that many of the Roma community’s contemporary problems can be traced back to poor education and the resultant limitations in the job market. As such the cases that have appeared before the Court challenging State practices of educational segregation are particularly important as not only are they challenging discrimination but they are also dealing with the tool which can unlock a better future for Roma children.

This paper will first provide a brief overview of the historical context of the educational segregation of Roma in Europe. An introduction to the cases taken by Roma applicants will then be provided. These cases will be analysed for the way in which the Court dealt with the applicant’s claims that they were segregated due to their ethnicity. There will also be a brief discussion of the major issues identified in relation to education such as the nomadic nature of Romani families, parental consent to children being segregated, testing by governments before the placement of Roma children into special schools, the issue of white flight and the majority populations reaction to Roma children in mainstream schools. The conclusion of this paper will provide an overview of the judgements handed down in the cases, a discussion of the dissenting judge’s opinions in the cases and the pioneering developments in the Courts interpretation of discrimination.
Student Experiences and Two Canadian Universities

Sandra Styres¹, Dawn Zinga²
¹University of Toronto, ²Brock University
Canada

Abstract

This paper draws upon the findings of a funded research project that addresses the educational rights of Indigenous peoples by exploring the experiences of Indigenous students at two Canadian universities. We share their struggles and achievements and focus on the university climate as spaces of contestation and tokenism. We examine the ways these universities are/are not including more education about Indigeneity, reconciliation, anti-oppressive practices, and settler-colonial relations. We also explore the ways that the universities were engaging with the calls to action and the impacts of that engagement on university practices, policies and protocols. We make recommendations for how universities can become more welcoming spaces for Indigenous students and ways that the calls to action can be more effectively addressed by universities across Canada.

1. Introduction

The Truth and Reconciliation Commission challenges educational institutions to incorporate in meaningful and respectful ways the values and principles of Indigenous peoples and to address issues concerning inadequate funding for Indigenous students wishing to access higher learning. We explore the ways these issues are taken up by two Canadian universities and the impact of the climate of those universities on Indigenous students. The objective of the research focused on what it means to be Indigenous in the academy by exploring:

1) Indigenous students’ experiences;

2) The role of Indigeneity in higher education;

3) Barriers to incorporating Indigenous values, cultures, leadership and knowledge systems;

4) The ways universities are addressing the TRC’s calls to action.

3. Methodology

This research is grounded in ceremony which, by its very nature, resists mainstream understandings of how to conduct respectful and relevant research concerning the issues of pressing concern to Indigenous peoples and their communities. This paper reflects a method that is informed by Indigenous epistemologies and relational accountability. Relationships were an important aspect of the research itself and we engaged in circle work using open-ended semi-structured interviews and talking circles in order to prompt conversations in a process whereby participants and researchers share their experiences and engage in dialogue and co-creation of knowledge. Talking circles provide interconnectedness and foster understandings of self-in-relationship that removes barriers, issues of power and privilege and allow individuals to express themselves honestly, freely and without reservation [1], [2], [3].

4. Expected Outcomes

There are many systemic factors contributing to the current pressing needs related to Indigenous education across Canada and the importance of looking at why there should be a focus on Indigeneity. Indigenous people across Canada are culturally, linguistically and politically diverse, with knowledges and philosophies grounded in their traditional places. The TRC released its final report in 2015 that included 94 calls to action aimed at different levels of learning institutions, academic disciplines, and governments - yet most Canadian universities lag behind in addressing, let alone implementing the TRC report. This research offers insights into ways to reconceptualize preconceived notions around Indigeneity and strengthening the Indigenous presence within the academy as well as how students and faculty have responded to and perceive the efforts of two Canadian university’s endeavors to take up the TRC’s 94 Calls to Actions. We also discuss the various contestations concerning Indigeneity, academic spaces, representations, higher learning practices, systemic structures and administrative practices.

5. References


Addressing the TRC in Higher Education: The Role of Faculty and Senior Administrators

Dawn Zinga¹, Sandra Styres²
¹Brock University, ²University of Toronto
Canada

Abstract

The authors (one Euro-Canadian faculty and one Indigenous faculty) consider pressing issues concerning practices across two universities specifically around how those universities are responding to The Truth and Reconciliation Commission’s (TRC) calls to action. This research is grounded in ceremony which, by its very nature resists mainstream understandings of how to conduct respectful and relevant Indigenous research concerning the issues of pressing concern to Indigenous peoples and their communities.

1. Introduction

The research objective focused on what it means to be Indigenous in the academy by exploring 5 critical questions: 1) What are Indigenous students’ experiences within university structures; 2) In what ways is Indigeneity understood within the context of higher education; 3) What barriers continue to exist to increased consciousness concerning traditional and contemporary Indigenous values, cultures, leadership and knowledge systems within the academy 4) In what ways are universities taking up the principles and calls to action of the TRC; 5) What is the role of Indigeneity in transforming education spaces?

2. Methodology

Our method is informed by Indigenous epistemologies and relational accountability. Relationships were an important aspect of the research and we engaged in circle work using open-ended semi-structured interviews and talking circles in order to prompt conversations in a process whereby participants and researchers share their experiences and engage in dialogue and co-creation of knowledge. Talking circles provide interconnectedness and foster understandings of self-in-relationship that serves to remove barriers, issues of power and privilege and allow individuals to express themselves honestly, freely and without reservation [1], [2], [3]. Guided by the 5R’s and exploring what it means to be Indigenous in the academy and to look at the ways educators and universities are taking up the TRC to support the overall success and retention of Indigenous learners, we engage in this research with a goal of supporting decolonizing methodologies.

3. Outcomes

The data demonstrated that there are clear differences and communication challenges between Indigenous and non-Indigenous faculty and non-Indigenous senior administrators including varying levels of awareness around the TRC and motivation to address the calls relevant to education between and among Indigenous and non-Indigenous faculty and senior administrators. There are important nuances in the various participants’ understandings of the TRC and of their own roles in addressing calls to action. There are also interesting contradictions and factors that are cited as being reasons why universities have not adequately addressed the TRC within higher education contexts. More specifically, we consider some of the factors that need to be taken into account to move from talk to action. We share some identified barriers and supports for being able to move talk to action. This paper offers insights into the ways faculty and senior administrators have responded to and perceive the efforts of two universities endeavors to take up the TRC’s 94 Calls to Actions. It is important to note that reconciliation needs to be defined within an institutional context and part of an institute of higher education’s mandate should be providing educational opportunities that push students, staff, faculty and administrators at every level to define what reconciliation means for themselves at an individual level.

4. References

Muslim Young Women and Science Identity

Saima Salehjee¹, Mike Watts²
¹University of Strathclyde, ²Brunel University
United Kingdom

Abstract

This paper case studies the science identities of the three Muslim South Asian girls within an independent all-girls school in England. We took into consideration as how these girls narrated their stories and identified themselves as a sciencey or non-sciencey person. Their narratives interacted with personal preferences, personal experiences, South-Asian culture, religion and their ultimate decision of undertaking science education (or not) in the future. We employed semi-structured interviews with the girls and revisited four to five times over a period of one year. We found that the science identities formed by these girls depend largely on the wider everyday culture, their religion and community engagement. While there might be suggestions that thirteen year-olds would, by virtue of their youth, be more fluid, less fixed and certain in their science identities, however, this is not the case for the girls discussed here. Our significant contribution to the research in science identities is that our participants emphasized an internal personal drive to accept and/or reject everyday culture and religion, and unlike recent science identity research (for example ASPIRE’s project) less emphasis was given to parents, teachers and school science towards the development of identity.

1. Introduction

In any social analysis, one can attribute observed outcomes to actions and inactions of people or to the presence or absence of certain structures or systems. This links to the classical division between agency and structure, which has been widely indicated by the social researchers which involve around a young person’s early ‘dispositions’ - driven primarily by agency or structure. Similarly, Block [4] pointed out, the presence of theoretical rigidity between structure and agency in sociological research and indicated it as a ‘tension often mentioned but seldom explored in depth’ (p.126). In addition, Giddens [9] a British sociologist in early 1970’s established the theory of duality and structuration indicating that such polarities are iniquitous, both sets of factors are vitally important as he stated that ‘structure enters simultaneously into the constitution of the agent and social practices, and ‘exists’ in the generating moments of this constitution’ (p. 5). Giddens [12] believed that, while there exists ‘ontological security’ that gives a ‘sense of continuity and order in events’, ‘self’ is not a passive entity, determined solely by external forces. In this manner, Giddens moves away from ‘dualism’ to ‘duality’ where both agency and structure are viewed as a part of the same phenomenon. Dualism also indicates a person to be a ‘reflexive actors’ (p. 53) where people develop self-identities over time and there is a potential to change or transform their identities.

In this paper, in line with duality, we are interested in the intimate links between self, science and culture, in particular, the origin of young people’s orientations and identifications towards or away from the study of science after the compulsory age of science education. Our approach to self-understanding is grounded in narrative, as a primary means of learning about self. We argue that reflecting upon personal experiences through the stories we tell others about ourselves, and through the stories that we hear about ourselves from others, is an essential part of the formation of self and identity. As according to Plummer [25], self-narrative - autobiography - is defined by three components: autos (what is meant by the self), bios (what is meant by life) and graphe (what is presumed in the act of setting this out). Among other important questions explored in this form are: How do I see myself? Who do I relate to and who are ‘people like me’? What is my school life like? What do I want to do in life once I leave school? How do I feel about discussing these areas? By and large, very little is known about how young people give meaning to their relationship with science, and how their personal histories affect those meanings and identifications. Although Habermas and de Silveria [10] have argued that life stories do not consolidate before mid-adolescence, at around age fifteen, later elicited life stories from children as young as eight. This research, we report here, involves a study of cases drawn on the narratives of six Muslim girls aged thirteen, to enquire their present and past science lives and also to probe their future science and non-science choices.

Our choice of sample, mentioned above, is to engage with the studies on ethnicity and gender in relation to school science, which commonly calls for schools to forge a more ‘hospitable environment’ for
minority students. Common remedial actions to slow the decline have seen attempts to increase the attractiveness and relevance at the school level, for example, changing pedagogy to address women learning styles [15], changing the language and culture of science to prevent the marginalisation of stigmatised groups and adopting classroom interventions [19]. Science lessons are to be ‘girl’s friendly’, to engage and retain girls from ethnic minority groups into science education [11]. When science is in the frame, a recent survey by Business in the Community [5] ranked the three top choices based on ethnic differentiation among women across the UK. The most popular subjects for these women, were allied to Medicine including Indians (44%), Pakistanis (41%) and Bangladeshis (36%). The second choice was Biological sciences - most popular among Bangladeshi women (32%) as compared to Pakistani (28%) and Indian (19%) women. Third came dentistry, including 17% Indians, 12% Pakistanis and 9% Bangladeshis. A recent 2015/2016 report published by The Higher Education Statistics Agency [12] added veterinary science and education to this list of most popular subject choices among South-Asian women. Researchers, like, Abbas [1], related the choice of such traditional professional subjects to the strong influence of South-Asian Muslim and non-Muslim parents. Subjects such as Sociology, English, Psychology or Computer Science are not perceived by either parents or girls as serious academic qualifications that will gain good employment and be of value to wider society [3].

We believe that when it comes to school subjects in science, technology, mathematics and science (STEM), future career choice and parental influence appear to go hand-in-hand. As, Ing [14] showed a positive correlation between parental motivational practices and a growth in mathematics achievements from grade 7–12, and a persistence towards STEM related careers. Archer, DeWitt, Osborne, Dillon, Willis and Wong [2] believe the same, however they also indicated that most parents felt that:

Science careers are associated with masculinity and held a perception of science as being an area that more men than women study and work in…. over half [of parents] did view the sciences as dominated by men, although views differed considerably among parents as to the reasons for this imbalance, being divided between biological/genetic arguments and socio-cultural/structural arguments… (p. 181).

2. Methods and Methodology

The sample comprises six British Muslim female students, three (average age thirteen years) from a Muslim independent school. The school is located (locally) in West London. We employed a face-to-

face, audio-recorded, conversations taking place with us over a period of one year. The girls have been chosen here for their clear articulation of their stories, and of the issues involved – and their cases are intended, therefore, as illustrative rather than an exhaustive analysis of all the responses we gathered. We describe our data gathering approach as a series of ‘conversational interviews’, similar in vein to Reese, Yan, Jack, and Hayne’s [17] ‘Emerging Life Story Interview’: we have sought interpretative commonalities in our conversations with these three participants as they narrate personal events in their social and cultural worlds. We assured them of full confidentiality and they are happy with the pseudonyms we have assigned them to the writing of this and other papers. Each girl was interviewed 4, sometimes 5, times across the twelve-month period, conversations lasting between 30 and 45 minutes. Interview conversations took place within the school, in quiet, private areas, at times convenient to the girls. Our ‘stories’ below are derived from a range of data: not only the conversational interviews themselves, but also the observation of their work in science lessons and their reflective journals. We returned to the girls over the period of the academic year both to gather fresh data and also to engender respondent validation on data already collected and analysed. This study has involved aggregation of individual narrative identities that encompass larger social forces, along with individual agency mediated by various social agents. Our interview transcripts were first coded for emergent concepts and themes, where we moved back and forth between the data and analyses in an iterative process. The orientation here sees data analysis as a complex meaning-making process between researcher and evidence, the ends of which are provisional and fallible. The concepts and themes, and assertions that emerge from the analysis are probed to see how they stand up to the weight of evidence and counterclaims [7]. Cahill [6] has highlighted questions that need to be asked about research with young people, such as: Who benefits from the research? What (and whose) purpose does the research serve? Academic research concerning young people should not simply be an ‘exclusive conversation’ between ‘us’ as researchers, about ‘them’ as participants (p. 282), a greater degree of sharing and ownership is required. In taking our present route, we recognise that recalled experience is influenced and altered by memory and may not reflect the exact nature and sequence of events that took place - the mere act of participating in a conversational interview is an interactional event that can shape ideas and opinions, evoke emotions, alter the recall of experiences [18].
3. The girls’ stories

The three stories, one into science and two away from science, are given below. We overlay this movement towards and away from science with an indication of how we see them ‘wearing’ the influences of their culture in relation to their dispositions to (school) science. This layer of analysis portrays the influences of their culture, and the extent to which we see them engaging with this passively or agentically.

We present the three stories here from a third-person point of view. Through the use of narrative talk and writing, the girls have the opportunity to engage multiple aspects of learning [8]. The girls were happy with this form, narrating their actions, choices their schoolwork and out-of-school lives using third-person pronouns such as ‘she’ or ‘her’. This third person subjective narration has allowed them to describe their own thoughts, feelings, and knowledge of various situations, and those of other people, with some ‘distance from the action’, as if this leant some mild objectivity to their accounts. It allowed them to present evidence in the most straightforward way, effectively lending some greater integrity to their stories. They could also critically reflect on their prior learning experiences in ways that then allowed us to ‘re-story’ their accounts. Rich data requires interpretive techniques that provide a fair balance of flexibility, structure and fidelity, and we used successive iterations of discussion and writing to generate personal, domain-relevant stories. The abbreviated versions below are instances of our edited re-storying.

(i) Iman

Iman, a thirteen-year-old, Year 8 student, is reserved and shy with an inclination towards science despite being (by her own and school measures) a rather indifferent science student. She believes that her family has been influential in her performance of various religious practices. On one occasion, Iman mentioned that she wears a headscarf because of her mother and sisters. She portrays herself as an obedient daughter at different occasions - however, when it comes to science education and career choices, family members have not been influential because none of her parents or older siblings are interested in science. In conversation, she mentioned one significant occasion at the age of six, when she was taught at school about human body mechanisms using a human dummy. This, and related activities in her primary school, inspired her towards becoming a doctor and, more specifically, a heart surgeon. Things, though, have started to change with age, Iman’s science teacher has become less influential, and her interest in the school science curriculum has also waned. Where, her focus to help and cure heart patients with the

vision of helping humanity grew stronger. During this time Iman, mentioned experiences that might have moved her away from science, for example, when she received inadequate science grades. That said, these poor grades seem to have galvanised her, and have had the effect of making her think more critically about her science abilities and her subject choice preferences. At this point in time, Iman has undertaken to work harder towards developing a deeper understanding of science content knowledge, and as a result, made a good progress in her last set of tests and examinations.

In this first story, we see Iman as ‘wearing’ her home culture heavily while, at the same time, expressing a degree of agentic denial. The influences that dispose her towards science derived largely from herself and not from home - in all her conversations she focused principally on herself and her science lessons, science teachers and science examinations, and we see very little intersection between her stated passion to become a heart surgeon and the culture of home or the practice of her religion. We note her quite considerable personal agentic resilience in the face of her exam grades - her chosen direction does not derive directly from her culture or from immediate family.

(ii) Amal

Amal is a fourteen-year-old Year 9 student, is bright and confident - her parents want her to become a doctor. Amal, though, has never wanted to take up any science subjects at A-level (pre-university) or beyond. Unlike Iman, Amal is considered to be a ‘top-set student’ in science and mathematics, although her disinterest in science is very evident: she believes her inclination is towards non-science subjects only. In these respects, Amal does not exhibit the image of an obedient South Asian girl in pleasing either her parents or her school, her science teacher continuously urges her to pursue science-related education and a future career in science, not least because of her impressive science examination grades. In addition to excellent test results, Amal also seems to enjoy science lessons in science classroom settings, because science activities “are fun” and she likes to learn things she sees to be relevant to daily life. She is, however, dis-interested in most science content knowledge. While praying five times a day and reading the Quran regularly, she is also very interested in reading books written by Islamic scholars based on the lives of the twenty-five prophets mentioned in the Quran. She is also a very active member of the school’s religious education (RE) club where her main responsibility is to organise assemblies and update RE assigned display boards. Amal believes that Islamic teaching can answer all of the questions that a human can inquire and provides explanations for leading a successful life, including various daily life activities, for example, “good and
bad habits”, “helping people”, “hygiene” etc. In terms of future educational plans, Amal is clearly very persistent in exhibiting a strong drive to continue with the study of Islamic Studies, and sees herself as a future Alima (Islamic scholar/teacher).

Amal as wearing her religion heavily throughout our conversations. However, she clearly rejects her parents’ and teachers’ expectations of becoming a doctor, a ‘rebellious’ action away from being an obedient daughter. On a few occasions Amal indicated that her father gives some support to her passion of becoming an Alima, by encouraging her, for example, to talk about what she has “read about Prophets Adam or Abraham or Lot” during family dinner-time conversations, helping her to register with online Alima courses, and buying related books. We see her as displaying ‘agentic non-conformity’ away from science – despite the occasional support from her father.

(iii) Fiza

Fiza a twelve-year-old, Year 7 student, is serious about her studies, very organised and loves reading English literature. The one aspect she likes about school life is the provision of Islamic culture, and she follows strictly all the school policies based on Islamic practices, which many do not. In the beginning, along with the study of English, she wanted to choose mathematics - but slowly, over the period of our conversations, the choice of mathematics faded. At first, she exhibited the low influence of parents on her science subject choices at A-levels and beyond, she saw her parents be ‘like friends and never have or will force her to choose science or non-science subjects’. Later, though, she disclosed that the primary reason for choosing to continue with English is that ‘it runs in the family’, which exhibits the main trigger in shaping her to continue with English. Her strong inclination away from science was further apparent in choosing not to study science after age sixteen, as she said: ‘Just because I have done some interesting activities in science lessons does not mean I automatically like science, making me want to do it for A-level’. In future, she would most definitely like to study English at A-levels and wants to become an English teacher and writer. During our later conversation, she was increasingly disaffected with mathematics and believed that she would only continue with subjects that complement English – such as history. Furthermore, while she believes that a degree in science is important, she now believes that other subjects are also equally important in her future career choices.

Fiza wears religious and family culture heavily. The influence of her family, coupled with her own interests, translates into further study of English and a rejection of science and mathematics. We believe she exhibits cultural conformity away from science- as Fiza disowns scientific culture despite any of the enjoyment, engagement and understanding, she gained in classroom science. At the end of our sessions, she stated that the ‘world can survive without scientists and scientific discoveries’ if we properly follow Islamic teachings for living a successful life.

4. Discussions

Bagguley and Hussain [3] collected qualitative and quantitative data, showing an increase in the number of British South-Asian Muslim women in higher education from 1970 to the present day. Their results revealed that over this time, these women demonstrate personal agency to a much greater extent than before by ‘challenging parental and community pressure enforced by the parents and society linking to gender and South-Asian ethnic orientation’ (p. 57).

Aspirations towards science, being ‘sciencey’, can be established very early in some children [19] That said, many school students, and people later in life [20], do retain some ‘fluidity of identity’ – as according to Illeris [13], identity formation for some can take longer than twenty-five years. Iman, Amal and Fiza all seem clear and unambiguous in their choice of direction, there seems to be little wavering, unlike what is expected from them. By choosing to present a study of complex cases we will, inevitably, have missed numerous issues that might have been explored more widely – fluidity of identity is one. Measuring continuity in self-concept over an extended period of time, with these or more traditional measures, is difficult - making it problematic to estimate both qualitative and quantitative changes with age. One advantage of adopting a narrative approach to the study of self-development is that personal narratives are present from very early in childhood [17], and thus the way that the self is portrayed through narrative can be examined using similar methods across a wide span of ages. More extensive research on the fluidity of science identity is work for a future stage.

The three stories we discuss here reveal many implications for science in schools. For example, we see work to be done by schools and teachers to achieve ‘culturally responsive teaching’ by transforming any negative attitudes and beliefs based on cultural, gender, ethnic and racial diversities they may hold [19]. The impact of girls’ engagement with the science and society is an important implication and schools can implement schemes where girls engage with global challenges such as health, pollution or addiction in young adults. This would be of high importance for the girls like Iman, who are keen to ‘do something for the society and humanity’. All of the girls, portrayed themselves as having a religious identity and which was, for some, an integral
part of their identity. However, their narratives revealed that they do not link science to religion except, possibly, through Iman’s viewpoint on charity and saving lives. Therefore, we believe that schools, teachers and curriculum designers should incorporate teaching and learning about past and present scientists and their humanitarian work, who the girls can relate to with their religious identity and/or gender identity to avoid gender stereotyping rather than over emphasising the ignorance from within the majority and minority communities towards Muslim South-Asian women in particular.

5. References


Session 2: ICT in Education

Title: Benefits and Deficiencies of Mobile Foreign Language Learning Applications
(Authors: Predrag Oreški, Krunoslav Mikulan, Vladimir Legac)

Title: How Video Games and Digital Literacy Impacts Student Achievement and Development: An Analysis of Synergistic Integration
(Author: Mario Adkins)

Title: Web-based Andragogy in Open University – Enhancing the Meaningful Learning Process of Research Skills
(Authors: Leena Isosomppi, Minna Maunula)

Title: Internet Technology and Vocational Preference for People with Disabilities
(Author: Ju-Chun Chien)
Benefits and Deficiencies of Mobile Foreign Language Learning Applications

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Abstract

In recent years we have seen a considerable increase in the use of mobile applications specialized for independent foreign language learning. The opinions on the usefulness of such applications, their benefits and deficiencies vary from enthusiastic to negative. The paper is based on a research into opinions of students from the Faculty of Teacher Education, the University of Zagreb, Croatia, regarding the effectiveness and usefulness of online foreign language learning applications. 60% of the respondents of that research do not use any such application, while 21.9% use Duolingo and 24.5% claim that they use Google Translator to learn foreign languages. The percentage of all other applications is negligible. Due to these results the researchers have carried out a follow-up research in which students were asked to use a couple of mobile foreign language learning applications (Duolingo, Memrise) for a week, after which they were asked to form opinions on the benefits and deficiencies of these applications. The respondents’ opinion was that said applications had more advantages than disadvantages when compared with traditional teaching methods.

1. Introduction

Mobile-assisted language learning (MALL) as part of technology-enhanced language learning (TELL) is defined by McCarty et al. as “the formal or informal acquisition to some extent through study or exercise of a second or foreign language, utilizing handheld, portable, or wearable devices for the purpose of language learning.” [6] In recent years foreign language learning applications have been transformed into specialized smartphone or tablet apps that offer a high level of interactivity, learning while travelling, commuting, exercising or completing common repetitive chores, and a branching system that enables personalized learning.

Pedagogical, educational and cultural impact of said applications have been the topic of numerous studies. Two directions of research are usually mentioned – research under controlled conditions (i.e. in the classroom) and research outside of the classroom [10]. The authors of the studies into the use of mobile apps under controlled conditions often stress personalized learning as particularly important [1], as well as the need for adaptivity to learners’ abilities and preferences [10]. On the other hand, some researchers into the potential use of MALL in classrooms (e.g. in China) point out that only less than one third of the teachers interviewed supported the idea of using mobile devices in classroom teaching [5].

According to Stockwell, the studies into the use of mobile devices outside of the classroom have shown that learners express positive attitudes towards using mobile devices, but “this has not been translated directly into high levels of engagement to the tools that are provided to them” [10], due to the primary purpose of such devices, i.e. communication and fun, which lead users to perceive their mobile devices as not “appropriate vehicles for learning” [9]. Research by Rico et al. [7] discovered that the vast majority of students in Spain used mobile apps on a daily basis, but most of them were used for fun, and only in a few cases they were used for educational purposes. The apps used to learn foreign languages were mostly limited to dictionaries and translators. The research presented in this paper tells us that students in Croatia were often unaware of the available apps and their potential, but were willing to embrace them once they realized their positive aspects.

Liu et al. pointed out that while most ESL apps are form-focused, audio-lingual, and test-based, these apps are also effective in providing individual, extracurricular activities that can enhance learners’ motivation and autonomy in MALL [5]. Lai mentions that research has discovered that university language learners in particular favour mobile apps because they allowed them to practice language anywhere and anytime [2].

Two basic concepts of learning have been observed among the said apps – the behaviorist (information is delivered from the tutor, i.e. app, to the learner), and the constructivist (students are encouraged to actively build knowledge rather that to
be passive recipients) [5]. In order to avoid the trap of passive learning some language learning apps have introduced gamification as a way to enhance motivation of autonomous learning through interactivity. According to Rico et al. [7] gamification should be used to complement the traditional learning and it contributes to more positive learning outcomes due to a higher level of motivation on the part of learners. This is supported by Lewis who states that when gamification is “employed specifically to make routine tasks more interesting, studies have shown increased engagement from students” [4].

The research presented here has dealt with the use of two MALL apps, Duolingo and Memrise, by Croatian university students. Duolingo is free and has the largest number of downloads at the Google Play Store (currently 100 million). Its users' average grade is 4.7. It offers courses in 23 languages, including Spanish, French, German, Irish, Swedish, and English. Memrise has been downloaded 10 million times and it also has the grade 4.7. It’s free and offers the possibility to learn over 100 languages.

Both Duolingo and Memrise are gamified platforms, but Duolingo is more focused and contains a system of jumping points which allow students to choose on which level they want to start learning a foreign language. Moreover, Duolingo has been found to be visually attractive and possessing good usability and an element of fun, although researchers have observed some major flaws in content and pedagogy [8]. Using these two apps for learning English has not been taken into consideration because a vast majority of students in Croatia learn English as a second language from an early age, with German and Italian being learned to a much lesser degree, and primarily starting with the 4th grade of primary school.

The results of a questionnaire survey conducted by Legac, Mikulan and Oreškić [3] revealed that almost 60% of the surveyed students from the Faculty of Teacher Education of the University of Zagreb do not learn foreign languages by using any of the offered applications. Most often used application was Duolingo and it was used by just over one fifth of the students in the sample.

2. Aims of Research and Methodology

This section is subdivided into: The Aim of the Study, Instrument and procedure and Participants.

2.1 The Aim of the Study

The aims of the study presented below were the following:

a) to find out which languages students have chosen to learn
b) to see what Croatian university students think about the efficiency of learning foreign languages by means of Memrise and Duolingo applications
c) to detect major strengths and weaknesses of the two applications and to see whether any of them was more favoured than the other,
d) to see if there are any differences between students studying to become foreign language teachers and students studying to become nursery or primary school teachers of core subjects.

2.2. Instrument and procedure

The authors constructed an online questionnaire and posted it on the Internet. (https://goo.gl/forms/Dw4bhVZlI9rC168S2) It contained 35 items, but only 14 will be analyzed for the purpose of this research study because of the 6-page limit for the allowed text length. Most of them were five 5-point Likert scale items. On five items students were asked to write their own comments and three were multiple-choice. There were three additional multiple-choice items about students’ biodata. The survey was conducted between mid-December 2017 and early January 2018. The students were informed about the aims of the research and were asked to test Memrise and Duolingo applications for at least a week. They were free to choose the language they wanted to learn.

2.3. Participants

Research for this current study was carried out on a sample of 116 students from the Faculty of Teacher Education of the University of Zagreb (Croatia) studying to become either nursery school teachers (29 students), primary school teachers of core subjects (39 students) or primary school teachers of core subjects and primary school teachers of English as a foreign language (48 students). (Croatian primary school lasts eight years. Pupils attending grades 1-4 are taught all the subjects by one teacher qualified to teach all the six core subjects: Croatian, Mathematics, Science, Physical Education, Arts and Music. Foreign languages and Religion in Grades 1-4 are taught by teachers qualified for those subjects. In grades 5-8 each subject is taught by a qualified teacher for that subject.)

For the purpose of this study the students in the sample were divided into two groups. The first included students studying to become nursery school teachers and primary school teachers of core subjects and the second one consisted of students studying to become primary school teachers of foreign languages. The reason for this was that the former students had only been learning foreign languages for their own benefit whereas the latter were being trained to become professionals who would be teaching foreign languages. Five of respondents in our sample (4.3%) were men, and 111 (95.7%) were women. At the time of data collection, they were all between 19 and 25 years of age. During the experiment over three
quarters of the students in the sample (78.4%) used their smart phones to learn foreign languages for the purpose of this research study.

3. Results of the Research and Discussion

This section is subdivided into the following units: Students’ Foreign Language Choice, Differences in Efficiency between Memrise and Duolingo Application Forms, Benefits and Deficiencies of Memrise and Duolingo Seen from Students’ Comments and Differences between Prospective Primary School Teachers of EFL and Other Teachers.

3.1. Students’ Foreign Language Choice

The first aim of this research was to see what languages were chosen by the students in the sample. Memrise offers 20 different foreign languages to choose from and the questionnaire offered options for 30 languages for Duolingo. Despite the differences in the wide variety of languages offered by two mobile apps, there were no considerable differences in students’ results. Most students participating in the study have chosen Spanish (Memrise and Duolingo-46.6%), followed by German (Memrise - 20.7%; Duolingo – 19.9), Italian (Memrise - 13.8%; Duolingo – 12.9), French (Memrise - 10.3%; Duolingo – 10.3%). Other languages included Japanese, Portuguese in Memrise. Duolingo was used by a couple of students to learn Russian, Dutch, Norwegian, Swedish and Danish. The reason for the high percentage of Spanish has to be sought in the popularity of Spanish soap operas running currently on Croatian national and private TV channels. Percentages for German, French and Italian are probably a reflection of the traditional interest in these languages in Central and Eastern European countries, whereas small percentages for Scandinavian languages seem to disclose that Croatian students tend to see benefits of the familiarity with Scandinavian languages only for the purpose of seeking employment. The interest for Russian, Japanese and Portuguese was negligible.

3.2. Differences in Efficiency between Memrise and Duolingo Application Forms

The second aim targeted the perception of difference in efficiency between the two examined mobile applications for foreign language learning. One multiple-question item dealt with this issue. It can be seen from the Table 1 below that there was no single student that was completely unsatisfied with any of the two applications (Value 1= completely inefficient; Value 5= completely efficient). However, from the higher numbers and percentages of values 4 and 5 for Duolingo (value 4: 48 students or 41.4%; value 5: 44 students or 37.9%) than for Memrise (value 4: 41 students or 35.3%; value 5: 29 students or 25%) and higher numbers of value 2 and 3 for Memrise (value 2: 10 students or 8.6% and value 3: 36 students or 31%) it can be seen that students in this sample favoured Duolingo. Final proof that Duolingo was regarded as more efficient can be seen from the higher calculated value of the mean. It was 3.77 (st. dev.: 0.93) for Memrise and 4.15 (st. dev.: 0.8) for Duolingo.

There were some other additional differences. Some students complained about too many e-mail alerts and invitations to buy additional exercises from Memrise. They liked Duolingo system of rewards.

3.3. Benefits and Deficiencies of Memrise and Duolingo Seen from Students’ Comments

On five items there were blanks where students could write down and describe their own opinion about the two compared applications. Two items were reserved for benefits, strengths or advantages (one for Memrise and one for Duolingo) and two for deficiencies, disadvantages or weaknesses (one for Memrise and one for Duolingo) of learning by means of the two compared mobile applications, and on the fifth item they could write why they prefer one over the other. There were more praises than complaints about both applications. This means that the students in this sample have seen more benefits than deficiencies of the two tested mobile applications.

It was clear from the students’ comments that they compared their new experience of learning with the aid of these new ICT technologies with their earlier learning by using “classical” or “traditional” methods of foreign language learning. Many students wrote that Memrise and Duolingo courses provided them with good pronunciation models (because of native speakers that pronounce words and sentences) and enabled them to adopt correct pronunciation through lots of drills. They seem to have seen considerable advantages in being able to record their own pronunciation and being able to practice pronouncing individual vocabulary items until they were informed that their pronunciation was correct. This immediate feedback was also seen as an advantage.

Pronunciation practice and learning vocabulary was also seen as an advantage primarily because it was funnier and more interesting than ordinary school lessons. This was achieved by good videos and animations. It was also mentioned by some students that the applications were well designed. Generally, one can deduce that pictures, videos and the good layout of these applications lead many students to the conclusion that this kind of learning brought authenticity to foreign language learning.

Another thing that was praised by students was that learning was well designed from the methodological point of view, because the learner is
learning through small steps and students were somehow feeling that these small steps were constantly leading them forward and thus progress and advancement was made. Further examples for this methodological advantage was seen in the fact that the course started from the basics and it followed the didactic principle of proceeding from easier to more difficult tasks. The materials were divided according to different levels. At the end of each task students were able to see what grammar items or lexemes they had mastered. They were given points as rewards. Some students liked this and saw this as a kind of a motivating factor and positive reinforcement. “The learning person can thus feel that they are progressing”, was stated by one of the respondents.

Students also thought that they benefited from being able to learn at the time and place that suited them most. As one student put it: “I can learn whenever and wherever I want to.” This was the reason why learning by attending these courses was effective and easier than “ordinary” foreign language learning that they had been used to. According to some students, this effectiveness was achieved because the whole course seemed to be designed as a game. This learning through playing was also seen as a motivating factor.

A couple of things mentioned above that were seen as advantages by some students were also seen as disadvantages by some other students. Thus many students saw deficits of these applications because there were too many drills and repetitions. Whereas repetitions were praised as something that makes perfect and as “mater studiorum” by one group of students, there were many students who thought that it made learning monotonous, tedious or boring. These students thought that “easy” words were repeated too many times.

Some students saw another major deficit of these mobile apps in too many requests of literal translation. The fifth item of the questionnaire that was asked them to write down the reasons why they thought that one of the applications was better than the other. Again, these comments could be summarized by saying that many students thought that if was better designed, that it gave better explanations of the meaning of words and use of grammar, or because there was more fun in using it, and because if provided them with a more solid foundation for further foreign language learning. In terms of their efficiency regarding the acquisition of grammar rules, correct pronunciation and vocabulary items, participants in our study gave more positive comments about Duolingo than Memrise.

### 3.4. Differences between Prospective Primary School Teachers of EFL and Other Teachers

The comparison of the *t*-test results presented in Tables 2 and 3 below reveal that the two studied groups really belong to two populations in two examined variables (general interest in foreign language learning – *t* = 3.48; *p* < 0.01 and average grade in the first foreign language – *t* = 2.20; *p* < 0.05).

The same results show that it was the right choice: Students with higher general interest in foreign language learning and students with better average grades in the first foreign language have chosen to become primary school teachers of foreign languages.

In order to see the differences in students’ assessments of the two applications three variables dealing with the efficiency of the apps were chosen: efficiency for the acquisition of grammar rules, efficiency for the acquisition of correct pronunciation and efficiency for the acquisition of vocabulary items. It can be seen from the results presented in Tables 4-9 that only in one variable the difference between means in the two studied groups was statistically significant – the efficiency of Duolingo for the acquisition of grammar rules (*t*- 2.55, *p*<0.05). In all other variables the value of *t* was lower than the required 1.96 and the significance *p* was higher than 0.05). In that variable it can be seen that prospective EFL teachers were more critical about its potentials (the mean was 3.9 for general teachers and 3.44 for future EFL teachers). However, it can also be seen that all the values of mean are above the value of 3, meaning that students in both studied groups thought that the two mobile applications could be efficient for studying foreign languages.

**Table 1. Difference between means in efficiency of different mobile apps (t-test)**

<table>
<thead>
<tr>
<th>Type of Mobile App</th>
<th>Value 1</th>
<th>Value 2</th>
<th>Value 3</th>
<th>Value 4</th>
<th>Value 5</th>
<th>Mean</th>
<th>St. Dev.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Memrise</td>
<td>NS 0.0</td>
<td>NS 0.0</td>
<td>NS 36.0</td>
<td>NS 41.0</td>
<td>NS 29.0</td>
<td>3.77</td>
<td>0.93</td>
</tr>
<tr>
<td>Duolingo</td>
<td>0.0 3.0</td>
<td>10.6 31.0</td>
<td>41.0 48.0</td>
<td>29.0 44.0</td>
<td>25.0 37.9</td>
<td>4.15</td>
<td>0.8</td>
</tr>
</tbody>
</table>

NS= Number of Students; PS: Percentage of Students
Table 2. Difference between means in general interest in foreign language learning (t-test)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospective Nursery and Primary School Teachers of Core Subjects</td>
<td>68</td>
<td>4.03</td>
<td>0.79</td>
<td>3.48</td>
<td>0.01</td>
</tr>
<tr>
<td>Prospective Primary School Teachers of EFL and Core Subjects</td>
<td>48</td>
<td>4.58</td>
<td>0.76</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 3. Difference between means in average grade in the first foreign language (t-test)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospective Nursery and Primary School Teachers of Core Subjects</td>
<td>68</td>
<td>4.29</td>
<td>0.71</td>
<td>2.20</td>
<td>0.05</td>
</tr>
<tr>
<td>Prospective Primary School Teachers of EFL and Core Subjects</td>
<td>48</td>
<td>4.56</td>
<td>0.54</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 4. Difference between means in efficiency of Memrise for the acquisition of grammar rules (t-test)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospective Nursery and Primary School Teachers of Core Subjects</td>
<td>68</td>
<td>3.21</td>
<td>0.97</td>
<td>1.65</td>
<td>0.10</td>
</tr>
<tr>
<td>Prospective Primary School Teachers of EFL and Core Subjects</td>
<td>48</td>
<td>2.88</td>
<td>1.18</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 5. Difference between means in efficiency of Duolingo for the acquisition of grammar rules (t-test)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospective Nursery and Primary School Teachers of Core Subjects</td>
<td>68</td>
<td>3.9</td>
<td>0.85</td>
<td>2.55</td>
<td>0.05</td>
</tr>
<tr>
<td>Prospective Primary School Teachers of EFL and Core Subjects</td>
<td>48</td>
<td>3.44</td>
<td>1.09</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6. Difference between means in efficiency of Memrise for the acquisition of correct pronunciation (t-test)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospective Nursery and Primary School Teachers of Core Subjects</td>
<td>68</td>
<td>3.76</td>
<td>1.02</td>
<td>0.24</td>
<td>0.8</td>
</tr>
<tr>
<td>Prospective Primary School Teachers of EFL and Core Subjects</td>
<td>48</td>
<td>3.81</td>
<td>1.07</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 7. Difference between means in efficiency of Duolingo for the acquisition of correct pronunciation (t-test)

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>Mean</th>
<th>SD</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospective Nursery and Primary School Teachers of Core Subjects</td>
<td>68</td>
<td>4.22</td>
<td>0.83</td>
<td>0.18</td>
<td>0.86</td>
</tr>
<tr>
<td>Prospective Primary School Teachers of EFL and Core Subjects</td>
<td>48</td>
<td>4.25</td>
<td>0.96</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
In students’ opinion the gamification is one of the key elements that make the two apps particularly appealing. Further research is needed that would show whether the advancement of students using MALL applications is considerably higher as opposed to the students that learn foreign languages in a traditional manner, and whether the issues with tedious repetition that made learning monotonous expressed by some students would impair the learning process which could lead to the loss of interest.

5. References


4. Conclusion

The surveyed students from the Faculty of Teacher Education of the University of Zagreb seem to have seen more advantages than disadvantages in learning foreign languages with the aid of Memrise and Duolingo when compared with other traditional methods. Although they seem to have liked both applications, it was clear that they favoured Duolingo over Memrise. This was primarily seen from the higher calculated values of the mean on the item where they were asked about the efficiency of these two applications. It was 3.77 (st. dev.: 0.93) for Memrise and 4.15 (st. dev.: 0.8) for Duolingo.

That Duolingo was more preferred than Memrise could also be concluded from the students’ comments. In terms of the hypothesized difference between prospective primary school teachers of foreign languages and prospective nursery school and primary school teachers t-test results have shown that there was only one statistically significant difference - the latter thought that Duolingo was more efficient for acquiring grammar rules than Memrise.

<table>
<thead>
<tr>
<th>Table 8. Difference between means in efficiency of Memrise for the acquisition of new vocabulary items (t-test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospective Nursery and Primary School Teachers of Core Subjects</td>
</tr>
<tr>
<td>-------------------------------------</td>
</tr>
<tr>
<td>68</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 9. Difference between means in efficiency of Duolingo for the acquisition of new vocabulary items (t-test)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prospective Nursery and Primary School Teachers of Core Subjects</td>
</tr>
<tr>
<td>-------------------------------------</td>
</tr>
<tr>
<td>68</td>
</tr>
</tbody>
</table>

| Prospective Primary School Teachers of EFL and Core Subjects | N | Mean | SD | t | p |
|-------------------------------------|
| 48 | 4.38 | 0.70 | | | |

| Prospective Primary School Teachers of EFL and Core Subjects | N | Mean | SD | t | p |
|-------------------------------------|
| 48 | 4.48 | 0.80 | | | |
How Video Games and Digital Literacy Impacts Student Achievement and Development: An Analysis of Synergistic Integration

Mario Adkins
Aquinas College, United States of America

Abstract

Research has found that video games can boost technical, kinetic, social and linguistic skills in students. Furthermore, cognitive skills such as memory, reaction speed, and mental processing ability have also been shown to increase due to video game usage, yet the majority of primary, secondary and tertiary education systems have been unable to integrate video games consistently and successfully into teaching and learning curricula. Although the Digital Revolution has bestowed an immense array of constructive digital electronics and services within the 21st century, an analysis of two predominate academic and cognitive-based video games have prompted that educators, researchers, and video game developers intentionally collaborate to fully integrate video games into applicable educational environments.

1. Introduction

Digital literacy is expanding its presence within educational arenas. From specific departments specializing in technological services to workshops and training opportunities for staff, faculty and students, digital literacy mastery is becoming less optional and more necessary. This includes both the awareness and operation of different digital technologies. Educators are especially impacted by this due to the fluctuation of trends that impact teaching and learning.

For instance, blackboards and chalk used to be the norm until whiteboards and markers became the dominate tool. Though more complementary than a full successor to whiteboards, SMART Boards have emerged in selected classrooms, replacing projectors while simultaneously adding computerized features such as Internet and touch screen navigations to teaching and learning methods. Textual literacy via books, blackboard and whiteboard wordings, and hardcopy assignments are the standard method of conveying information to students. However, a new form of literacy has reevaluated and restructured the way many educators approach teaching and learning. Digital literacy, which includes operating, searching, navigating, integrating and troubleshooting different digital technologies, is emerging as a powerful and influential teaching and learning tool.

Another available, yet underused teaching tool is video games.

Video games are electronic devices that combine pictorial, textual, auditory and video rudiments into a single digital experience. Video games as educational tools have created mixed reception with educators, parents and other stakeholders. This is because video games are not simply supplemental devices (i.e., a digital screen to display information that could be written on a whiteboard or handed out on paper). This is a vital aspect to recognize and understand about video games. While pictorial, textual, auditory and video information can be accurately represented in a video game, the reverse is impossible because of the complex combination of these elements.

The majority of video games are coherently built through photos, audio, video and text; these are standalone components that make sense individually separated. However, one cannot experience a video game through a photo, audio, text or a video. Though a video may convey a complete video game experience, there is no direct control over the experience, thus this is not a congruence video game experience. A true video game experience requires the player to decode conveyed information and encode their own directives via a controller, touch screen, voice commands, kinetic commands or any other forms of incorporated interactivity.

2. Literature Review

Much of the scholarly research on video game digital literacy and its successful integration in academic endeavors are limited, yet thorough in overviewing particular areas. The interactivity and textual construction of video games can transition to learning outcomes because they are designed to be intellectually challenging and stimulating, thus involve critical thinking and strategic planning. Furthermore, video games can specifically provide students with complex and challenging problem solving spaces, allowing them to discover targeted learning outcomes and complete objectives based on these outcomes [5].
The majority of video games are built under a success or failure framework, allowing players to self-assess their progress after completing levels or objectives in these simulations. Because this variation of learning and assessment is used collaboratively, transcending this methodology of examination is ideal for a classroom setting [4]. In concurrence with successfully completing different types of video games, a variety of learnable skills have been identified. Video games have been proven to increase and develop spatial cognition, visual acuity, mental processing skills, multitasking, and central and peripheral attention skills [1].

Integrating video games into a classroom setting requires sufficient familiarity of technology and mastery of digital literacy. Digital literacy is defined as the amount of knowledge an individual has about technological endeavors and how to operate them successfully for a designated task [10]. Additionally, the decoding and encoding granted by video games allow for a level of interactivity not available in other mediums such as books, television and audio (2010).

This is a primary aspect why educators and researchers are interested in integrating video games into academic endeavors. Innovative ways of telling stories, more efficient interactions with subject materials, and time-efficient lessons are all services video games can provide to students if implemented in educational sectors [2]. Furthermore, providing students with a teacher or mentor well versed in video games and digital literacy is central for students in obtaining success and achievement while engaging in educational video games, regardless of video game content and context [5]. This is because applying video game learning outcomes to classroom subjects is vital for successful erudition and transferrable application of respective gaming experiences.

Navigating video games require players to understand both its controls and objectives. A study on cognitive style has identified four playing styles elementary students may take while engaging in video games. These include Trial-and-Error, where players adjust their playing style based on in-game successes and failures, Heuristic Thinking, where students avoid making perivous errors and focus on new methods, Analogical Thinking, where initial analytical processing is used to solve in-game objectives, and Fixated Thinking, where players remained repetitively consistent with their choices in one or two difficulty levels [7]. Identification of these patterns by educators and researchers could assist students excel in their educational video game experience, thus increasing academic learning outcomes.

The mobility of video games is also advantageous to students. With video games available on computers, consoles, hand-held devices and mobile phones, students would have access to these inside and outside the classroom [11]. This provides opportunity for supplemental lessons, innovative homework assignments, and simply engaging in class material and academic work outside of classroom walls. Early introduction to group work is another skill video games can introduce to students. Video games designed for 2–4 players promote teamwork, collaboration, and cooperative discourse between respective players [6].

As previously noted, video games have not been fully integrated into classroom teaching and learning; even though many research studies have proven positive learning outcomes from them. The status quo of video games as simply recreational pastimes, timewasters and negative influencers is still strong, even with predominate, research-bases educational games available [10]. Additional research is needed to examine how video games can be useful teaching tools in primary, secondary and tertiary education settings.

3. Analysis of ST Math and Lumosity Structures

Spatial-Temporal (ST) Math is a visual, interactive math instruction game for K-12 students. ST Math provides individualized assessments in fractions, proportional reasoning, arithmetic operations and symmetry in pictorial, interactive form. In ST Math, students complete mathematical equations and operations by visually selecting available options such as adding fractions, completing algebraic problems, and evaluating measurements. Because these mathematical problems are framed around an interactive video game, players are motivated to participate, become engaged in the experience, and are able to complete standard mathematical problems often times without traditional math symbols [9]. Additionally, students are more motivated to both finish ST Math problems and continue on with subsequent lessons because of their positive experience with the game (2010).

Lumosity, a set of cognitive development minigames (minigames are short, condensed variations of video games) created by neuroscientists to improve brain growth and improvement, has identified five focus areas its minigames seek to improve [8]. Memory-focused minigames aim to help users recall the location of objects, remember the names and titles of persons and entities respectively, learn new subjects more quickly and accurately, and keep track of several ideas at the same time. Attention-focused
minigames are designed to improve attention are designed to maintain focus on assignments, improve productivity and precision in different environments, improve concentration when learning new subjects, and avoid surrounding distractions. Speed-based minigames aim to develop decision-making during time-sensitive situations, speed up cognitive processes, quickly adapt to changing environments and situations, and improve overall reaction time. Flexibility-focused minigames assist player communicate clearer, improve critical thinking skills, help in avoiding errors, and assist in making multitasking more efficient. Finally, problem-solving minigames assist in dissecting complex arguments, making quick and accurate estimations, calculate figures mentally, and determine best practices both inside the classroom and in home environments.

4. Findings

Lumosity is one of the leading game developers that has intergraded games and education, yet the reception of Lumosity is mixed [3]. There are two main reasons for this. The first is that Lumosity is a commercial company with a monetary subscription. Many classroom teachers and postsecondary professors cannot afford or budget the cost. Though Lumosity has initiated free trials of its services to elementary schools in exchange for user data and feedback, this process is extremely limited and selective. The second reason Lumosity many not be effective is also related to why other video games fail to successfully integrate into the educational sector: the content is not relevant to educators, their curricula and learning outcomes do not transition outside of the game. ST Math also requires a monetary subscription. However, the learning experience and success differs from the incorporated academic subject; the learning outcomes in ST Math can transcend from the video game to pertinent student work. For Lumosity, the content may not directly be relevant to educators and their curricula, thus the learning outcomes do not transition outside of the game (see Table 1).

Table 1 shows the collaboration between a video game’s learning outcomes and the relevancy these learning outcomes are to academic subjects. Based on the design and structure of video games, only designated learning outcomes and skill-building abilities will be taught, in this instance, skills X, Y, and Z. Furthermore, each subject requires a specific proficiency unique to that subject. For instance, if the video game is based on historical facts, students may learn the “Z” skill. In this instance, the classroom teaching this exact lesson, so it is used as an effective teaching tool. This is why the two are connected in Table 1. However, this smooth connection is not always the case. For instance, if a student earns top scores in a Problem-solving Lumosity minigame, earning themselves the “E” skill, how can educators ensure their classroom and social environments will allow the “E” skill to be fully utilized? The three skills not connected in Table 1. Conveys this phenomenon where a subject requires specific proficiencies and learning outcomes not provided by the video game.

This is not to infer Lumosity or similar video games are not effective, it merely means educators must intentionally have knowledge of digital illiteracies, specifically for games and simulations, before implementing them in the classroom. It is noteworthy that Lumosity is a supplemental gaming activity, meaning used alone the activities may not be effective. For instance, if students are using the Flexibility-focused minigames, yet have no way to replicate this skill outside the game, empirically measuring learning outcomes becomes difficult. Research has shown that video game repetition can indeed assist students master said games; however, this can be accomplished by repeating and practicing almost any general activity [1]. Lumosity is designed to improve receptions to teaching methods through its cognitive development minigames, not teach subjects.

5. Recommendations

With the full integration of video games into academic environments currently nonexistent, this article offers the Digital Literacy Synergistic Measurement Scale (DLSMS) to outline if skills yielded from a video game truly align with the subjects necessary for respective curriculums. The article also will offer two categories of video games to be used in academic environments as identified through this study. Integrative Video Games (IVGs) and Situational Video Games (SVGs). IVGs, such as ST Math, are video games specifically designed to teach a specific set of academic skills for students. These video games are integrated into their respective subject matter, thus giving students a cohesive exposure to the necessary academics and skill-building lessons to persist through their
respective grades. IVGs will connect on the DLSMS if the learning outcome intentionally aligns with an educator’s designated curricula. SVGs are video games not designed to teach a specific set of academic-building skills, yet are situational in the fact that their learning outcomes may still benefit students in academic environments.

Lumosity is an example of a SVG; it may directly or indirectly influence academic achievement through its cognitive-building minigames, yet it was not designed to facilitate learning for a specific academic subject. Furthermore, SVGs may not connect on the DLSMS, so appropriate digital literacy is necessary when implementing these video games into academic curricula. This is particularly true in video games with teachable components, yet is non-academic like Lumosity.

Future research regarding the integration of video games into educational sectors should address three identified concerns. The first is developing more IVGs than currently available. ST Math is the ideal standard how educational video games should be built; intentional to the academic subject being taught and receptive to players. Teachers, researchers and video game designers must collaborate to design and develop IVGs, specifically for subjects and grade levels most in need of innovative course work. Next, allocating funds for educational institutions to purchase IVGs will be necessary. With full video game integration in educational institutions not the current status quo, having conversations between stakeholders and financial leaders would be the first step in video game integrations. Finally, adequate digital literacy is necessary to facilitate this type of learning. Educators must be knowledgeable of the positive effects of video games, well versed in the various software offered, and know how to successfully operate these technologies for the student they serve.

6. Conclusion

Research on consistently and successfully integrating video games into a wide array of specific primary, secondary and tertiary educational systems, subdivided by subjects, is currently nonexistent. Research on video games have focused on their positive and negative contributions to students, the constructive skills they can teach, identified patterns on how students play video games, and affirming students need dedicated guidance to assist them navigate video games in an academic context. Educators versed in adequate digital literacy are the primary individuals who can identify a need for innovative video game learning and assist in bringing them into their classroom for students.

7. References


Web-based Andragogy in Open University – Enhancing the Meaningful Learning Process of Research Skills

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University of Jyväskylä, Kokkola University Consortium Chydenius, Finland

Abstract

The research examines adult students studying on a web-based qualitative research methodology course in the Finnish open university context. The research questions concern adult student experiences of supportiveness of the learning environment, their studying orientations, and their relationship to andragogical assumptions of self-direction and collaboration. The research material consists of 47 learning diaries and was analysed by using abductive content analysis. The course script, initial stage orientation, teacher’s meta speech and sensitive supervision were experienced supportive for studying and learning. Three different studying orientations were summarised: the effectiveness orientation, the managing orientation and the learning orientation. The research makes visible connections of micro and macro levels of the open university web-based studying at an intersection of the market, equality policy and academic expert culture. The results also implicate that self-directness and collaboration can be supported by sensitive andragogical supervision relying on adult students’ responsibility and freedom.

1. Introduction

The andragogical studies concerning the adults’ academic web-based studying have extended the understanding of the possibilities for adult learning but also the restrictions in the online learning environments [1; 2; 7; 15]. The adult students who participate in open university education form a group with very heterogeneous starting points in regard to their educational history and their work history. These students’ consciousness of the academic culture and their readiness for web-based studying vary greatly. The resources to do with time-usage and other adhesions of an adult life restrict the adults’ possibilities to engage in education which may affect both the learning results and the studying activity [6; 9].

Andragogy, in the form that Knowles [14] presented it, contains the assumption of the qualitative difference in the learning of adults and that of children. Growing to adulthood means in andragogy the development into a self-directing learner. The ideal image of an adult learner is an active agent who has self-knowledge, utilises one’s own experiences, solves practical problems, and is internally learning oriented. [13]

Andragogical assumptions have met criticism which is directed at its psychologising idea of human being. According to Pratt [14], the assumptions of both self-direction and collaboration in the learning and studying of an adult have to be analytically examined as changing relations which change in time and place. We still take a contextualizing step in this study from the situational construct presented by Pratt to a reflection between the micro and macro levels. In this article we examine the studying experiences of Finnish open university students on a web-based research methodology course. We aim at understanding the different relations of the students to online studying (the degree of self-direction and collaboration) in the tension field formed by the logic of the open university’s macro level determinants, education market, adult education policy and the ideals of the academic autonomy of the universities.

2. Web-based learning as a solution for open university education

Individual, social and global preconditions set expectations, objectives and restrictions for the open university education internationally. In the education market academic adult education has become a commodity and capital to be purchased. Socio-politically examined the academic adult education should not only promote competitive ability but also more broadly the social equality and the strategy for lifelong learning [16]. These starting points that are sometimes laden with tensions become concrete in the operation of open university when adults from different social and educational starting points make education choices based on accessibility and student centredness.

High expectations are directed globally at adapting educational technology and web-based education in regard to lifelong learning and increasing equality. Web-based education, having grown over the last few decades, has indeed opened up new opportunities for the attainment of the objectives of lifelong learning [also 10]. However, the promise of the equality given
by the technology has not become unambiguously fulfilled according to international studies [16;18]. It is important to analyse the social effects of technological solutions in the contexts of adult education and higher education, for example, the online implementation of the processes of communal learning or the significance of limited online interaction from the point of view of understanding [8].

3. Open universities’ web-based learning in a Finnish context

There are no separate open universities in Finland, but universities have their own open university education units. Haltia [4] performs a research review in distance teaching in Finnish higher education. Web-based education is widely used in Finnish university education, and open university education has been, from the beginning of the 2000s, a forerunner and a laboratory of distance education in Finland. It has also remained so with its substantial and versatile distance learning opportunities. Participation in the open university education is not restricted according to previous education, age or any other criterion, but there are fees. A survey (2014) of Finnish open university and open polytechnics students shows, that the age of open university students has risen over the last ten years. Nowadays most of students are female adults in their thirties and forties and in professional positions. The students on web-based courses are older than other open university students. [5]

The motives of open university students are the development of vocational skills, general education, getting to know the subject field and studying towards a degree [5]. Students on web-based courses emphasize the importance of flexibility in terms of time and place and the opportunity to combine work, family and study. Flexibility of time and place, independent learning, the web as a study format, general flexibility, communication and counselling are seen as the advantages of web-based study. Open university students experienced more lack of personal feedback and counselling and demanding course contents as barriers than other students in Finnish university education [12.]

4. Open university case – research methods online

The empirical part of this research is directed at qualitative web-based research methodology studies in the field of education (bachelor level) in open university. The study module was compulsory for the students and worth 5 credits. The e-pedagogical solutions of the study module were based on the andragogical principles. Studying was reliant on self-direction and was carried out completely in the online learning environment. The main objectives were that the students would build their own relation to the scientific knowledge construction and to a research process.

The central starting point in the orientation period of the course was the heterogeneity of the adult students regarding the contents, objectives and e-study skills. Some of the students have plenty of earlier university level studies and understanding of the nature of research operation whereas a number of the students were novices in academic studies. Because of this, in the script of the study module attention was paid to make different ways of participation possible.

The script of the study module proceeded by adapting the process of the qualitative study. From the student’s point of view the studying consisted of online lectures, study counselling, the literature of the study module and of the online examination as well as the learning diary. The web-based learning environment comprised all the materials, and the interaction and participation possibilities of the study module. The aim was to clarify objectives and facilitate the course participation. The lectures (8) of the course were short, about 15 to 60 minutes, and only accessible as video recordings. The videos could be viewed according to the student’s own schedule. The studying was supported by synchronous counselling sessions, over the four weeks from the beginning of the course and they were also recorded. The study counselling was placed according to the study process amongst the lectures. In course pacing attention had been paid to the different needs, the possibility to proceed as a group or individually according to one’s own schedule.

The learning diary consisted of subtasks, which proceeded according to a qualitative research process, and of the students’ diary-like reflection. In the first task of the learning diary the students reflected their own starting points in relation to the course objectives and contents. Later parts of the task were created as a process in the research examination of the subject matter chosen by the student. In the last part of the task the students reflected upon their learning and especially their own way to participate online and the meaningfulness of the different ways for their own learning.

5. Research questions

The practices of web-based teaching and meaning giving by the adult students are examined in this study in relation to the social context of web-based teaching of the open university. At the same time the solutions of the online learning environment are reflected in relation to the andragogical assumptions of the adult’s self-direction and collaboration. In the study answers are sought for the following research questions:
1) What solutions of the web-based learning environment are considered as supportive for learning?
2) What kind of studying orientations adult students have, and how these orientations are negotiated?
3) How do the adult students’ orientations to web-based studying relate to the andragogical ideals of self-direction and collaboration?
4) How can the adult students’ studying orientations be understood in the social context of the web-based open university education?

6. Research material and method

The research material consisted of the 47 learning diaries (20 pages each) kept by academic adult students during the course into qualitative research methods. Such students’ learning diaries who evaluated themselves as novices with respect to the contents were selected from a wider material (63). The research material was analysed by adapting abductive content analysis. Our approach to reading was hermeneutically interpreting and understanding as the teachers, researchers and as colleagues. We utilised the researcher triangulation in the interpretation of the material. The adult students’ orientations to web-based studying were analysed through the three fundamental relationships of the studying activity: in relation to the studying environment (undertaking the web-based study module), to oneself as learner and student (the adult student’s identity) and in relation to the contents to be studied (the research methods and scientific thinking and practice). The parts in the material concerning these themes and negotiations of meaning were distinguished from material and categorized by themes. Orientations to web-based studying were categorized from these themes abductively. The concept of the negotiation of meaning is connected to the social learning theory [19]. In this context it refers to the meaning giving process the adults students participate in the open university’s web-based course community (a community of practice). The negotiations of meaning apply to the student’s self-direction and participation in the social learning of the web-based course (the conditions of the participation and the adult student’s possibilities) and reify in the learning diary texts (reification). The participants of the web-based course regulate their commitment and their participation in the action of the community of practice and in the negotiations of meaning.

7. Results

Sub-sections present the main results of this research. The theoretical framework and the analysis are focused on the andragogical process of e-pedagogical solutions for supporting learning and the adult students’ orientations to web-based studying in open university social context.

7.1. E-pedagogical solutions supporting learning

7.1.1. Planning the script of the web-based implementation of the study module. Versatile advance planning and the compilation of the script are significant stages of the process [also 8]. In this case the students were also provided with the opportunity to practise online the basic technical skills needed in the web-based studying and to test their own devices before the actual beginning of the web-based course. Clarity and ease of navigation support the learning in the online environment, such as Tallent-Runnels, Thomas, Lan, Cooper, Ahern, Shaw & Liu [17] emphasize. Realizing this, the material of the study module had been arranged to progress according to the process in the form of timed links in the online learning environment. According to the students these measures which pace and clarify the process were significant in regard to structuring the wholeness and in dividing one’s own study into sections. The students appreciated the general clear organization of the online environment.

7.1.2. The importance of the counselling at the initial andragogical stage. The study module began with a web-based counselling meeting, an introduction of the structure of the course and the operating principles. The start with a counselling removed students’ feelings of uncertainty and strengthened the experience of self-efficacy. The teacher’s orientational meta speech created the feeling of confidence and community from the point of view of the learning. According to the students, the introduction of the process-like progress as well as the structuring of the pedagogical script were also central. Students were able to perceive both the wholeness and the parts of it and the nature of contents. According to the students, “the studies progressed very logically and that is why it was easy to become absorbed in the matter and to understand it.”

7.1.3. Lectures in opening contents and the meaning of meta speech. The online lectures received good feedback. According to the students they clarified the core content of the whole study module and the challenging methodology literature which was included in it. The teacher’s clear lecturing style with meta speech extends the understanding. The students’ experience was that the everyday language facilitated learning which strengthened the more concrete personal structuring of the theoretical part. It also further reinforced the experience of participation and andragogical experience of self-efficacy. In
addition the examples of the teacher’s own experience relating to research and their reflection on a meta level were experienced as educational. One of the students reflected that, “the lectures were extremely clear, suitably summarizing in my opinion, and the notes supported the matter, they helped absolutely in perceiving the wholeness.”

7.1.4. Andragogical counselling and the feelings in the learning process. The number of students participating in the live study counselling was large at first but became uniformly smaller towards the end. According to the learning diaries the reason for the decreased need for counselling were the students’ slower study pace, which was caused by various reasons. The live counselling would not have been correctly timed considering their learning process. The schedule of the group proved to be a challenge but on the other hand, for some the tight schedule encouraged efficient and committed work. Again, it was experienced that sufficient support of one’s own learning was obtained from the counselling recordings and through exploiting the questions posed by others. Surprisingly many students said that they had felt nervous about participating in the counselling. Still some students participated actively. The teacher’s encouraging and understanding attitude proved to be the most significant contribution of counselling. “In counselling sessions I remained in the listener’s role because I did not participate in them live. But all the provided study counselling supported the course and it was clear.”

7.1.5 Student’s own learning as a process and the multiple dimensions of interaction. The students evaluated that emphasizing the process-like construction of personal understanding strengthened their learning. The process-like learning diary with its subtasks was also evaluated to be supportive of learning. The space for students’ own consideration in the tasks was inspiring and liberating for some students, whereas some missed a tighter structure.

The interaction and community of the web-based course were also supported in the form of a discussion area in the online learning environment. The students regarded the possibility of discussion as meaningful even though the use was minimal in the end. The entries consisted of the teacher’s messages of encouragement and a few questions by students which the teacher answered. The mutual interaction was not created amongst the students and the students did not experience that they had required it. However, the mutual interaction would create andragogical reflection and would deepen the understanding of the learning material as well as extend the understanding of the different study and research contexts [also 11; 3].

7.1.6. Critical observations. The adult students also presented critical observations concerning the script of the web-based course. A particular dissatisfaction if a student started the process distinctly later than the others. In that case the feeling of hurry and being an outsider affected the depth of the learning process and the experienced meaningfulness. As a whole, the amount of work in the study module was also evaluated as significant. On the other hand, the personal processing of the contents linking to one’s own research idea deepened the learning.

The majority of students told that at the beginning of their learning diary they had been motivated to learn the contents and that they would need them in the later stages of their studies. The frightening, distant and boring methodological content was becoming to be understandable and personally interesting and central.

The description of learning processes conveyed at times even an excessive easiness, which could be supported with the andragogical means. Learning was not directly differentiated, but encouraging supervision was offered to the students for making the meaningful choices [cf. 11]. So, the challenge on the course became the differentiation of the contents to be studied, finding the suitable level of challenge and the expert-like challenging of one’s own learning [cf. 3]. The adaptive functions of the web-based course would be perfectly suitable for the module, also with regard to andragogy. Also, the students’ mutual interaction would bring a new level of depth to studying. That would require aligned e-pedagogical and andragogical observations when drawing up a script.

7.2. Students’ orientations to web-based studying in the social context of open university

Relations of the adult students to themselves as learners (self-directiveness), to the collaborative ideas of the web-based course and to the contents to be studied can be read in the learning diaries as negotiations of meaning between effectiveness orientation, managing orientation and learning orientation. These relations also reflect the andragogical meanings of self-direction and collaboration in the material. In the following we describe these relations and the tensions between them in the adult students’ life contexts. Orientations to web-based studying that have been described above are contextualized at the same time to the social and cultural place of the open university at an intersection of the market, equality policy and academic expert culture.

The student customer’s effectiveness orientation to studying is connected to the emphasizing of individuality and independence enabled by the online learning environment. The adult students proportioned the resources (time, economy and energy) invested into studying in their particular situation in life to the output to be obtained from the
studying. Effectiveness-oriented students emphasized the significance of flexible and web-based method of implementation and expressed self-confidence in e-study skills required. The studying objectives had been clearly defined beforehand and an instrumental interest in knowledge was conveyed in the diary texts. The teacher’s support and supervision of learning were asked only for narrowly defined individual questions and other students appeared as insignificant regarding students’ personal learning. The web-based studies of the open university offer the customer of the education market a tailored online study package which supports the education career. In that case the dimensions of the academic expert knowledge remain on the sidelines in the orientation.

As a student expresses: “I did not experience community because I live in another locality and my studying is very independent. I work on the computer during the times that I have consciously chosen and give all my other time to my family members. Online studying is familiar for me and the positive experiences made me also choose it this time.”

The largest proportion of the novice students related themselves to studying in their diary texts according to the managing orientation. Confidence in their own learning, studying skills and managing in the web-based studies was first unclear or under internal negotiation. However, the relation lived and developed and many adult students described the confidence in their own learning having strengthened after the uncertain first stage. They thought about their own starting points, their situation in life as well as the demands of the studies and the nature of web-based studying. The diary texts can be read as the adult students’ identity construction in relation to the academic studies, and to the online learning environment. Some of the students told that they needed and appreciated the encouragement, support, and contents provided by the teacher. Some were also in need of the support of the student community in the studies or reflected their own skills or their progress with other students. The negotiations applied, not only from personal starting points, but also to the tension of participation into the interaction in the web-based course and from the time limits brought on by their own situation in life.

A few of the students reflected the significance of the community: “I experienced the community even though I was not even able to participate in the live lectures. When you follow the discussion forum you feel like you belong to the group. Even though I wasn’t on the live lectures they were nice to view and it felt like I was in the lecture even though it was not. This affected learning in a meaningful way, when I thought of a questions and similar question was asked. On the lecture they also told about the matters which I had understood correctly and some others quite wrongly. It gave self-assurance that I had indeed done the things right.”

The web-based teaching of the open university appears to the adult students struggling with their student identity and their situations in life as the enabler of studies and the constructor of cultural democracy. The confidence in one’s own learning may have strengthened with the support of the counselling interaction as the following learning diary excerpts from the beginning of the web-based course describe: “I was calmed down by the teachers comment that a process cannot be learned by forcing it but you have to give it time. You cannot become a researcher in a moment but the experience and the knowledge are gathered little by little. So I try to be hopeful. I will learn as well.”

In the learning diaries it was also possible to read plenty of internal commitment for the learning itself in the spirit of andragogy and the enjoyment from the insights gained from studying. Moreover, a place and mindset for lifelong studying and learning was found. Self-direction is manifested in acknowledged setting of objectives and in active relation to the studied contents.

“The course required personal activity and ability to plan things. And with the activity I mean that one had to digest, to think, and to examine matters also outside of the studying space. I also read a lot of literature surrounding the subject and diligently browsed the net, which I feel have been an advantage for understanding the matters.”

In these descriptions the features of the different dimensions of expert knowledge and the understanding of the understanding cumulative emphasis of academic knowledge were found.

8. Discussion

The adult students’ dynamic orientations to web-based studying reflect except individual variables also the social structures in the open university education. The principles of self-direction and collaboration must be seen as an objective of adult education, not as a starting point.

The conclusions of this research study support the principles of planning an andragogical learning process as presented by Knowles [10]. At the beginning of the studies the support by andragogical facilitator was connected to being acknowledging the adult student’s own existential state, own resources and objectives. The target of counselling is the evaluation of students’ own starting points and setting their own objectives in relation to the wholeness of the course. At the beginning stage of the web-based course the initiation of students to andragogical educational thinking and supporting to self-directional studying are at the centre of the study counselling. At the same time, it is good to remember in the planning of the web-based course that too much freedom in the course structure makes it more difficult for the students to finish the course. Clearly planned courses with limited individual flexibility are found to be more efficient.

The development into an expert and into a self-directing e-learner are supported by the script of the web-based course, which is clear and supportive of interaction, teacher’s study counselling which is
sensitive towards feelings and the students’ responsibility, and freedom that have been made possible in process of their own learning according to the principle of andragogy.

9. References


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Internet Technology and Vocational Preference for People with Disabilities

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Abstract

The main purposes of this evidence-based study were (1) to explore the employment outcomes for Taiwanese people with disabilities, especially by considering their learning motive and emotional management skills; (2) to examine whether there was a significant preference difference between general employment and telework; (3) to determine predictors of employment intention and telework preference, respectively. Among 341 valid participants, they were very eager to be employed but only 42.2% (n = 144) of them currently had jobs. Employment intention and telework preference were independent attributes to each other for people with disabilities; In addition, they were more interested in general employment than telework. The variables that best predicted employment intention were learning motive, age, emotional management, not interested in IT jobs, and currently unemployed. The variables that best predicted telework preference were couldn’t go to work independently, age, emotional management, not interested in IT jobs, and currently unemployed.

1. Introduction

Even though there might be some different reasons for people to choose to work, employment should be a positive thing for all individuals. For people with disabilities, having a job meant a really important way of reinforcing their sense of self-worth, greater economic self-sufficiency, and more active participation in community life [1] - [2]. However, the employment rate for people with disabilities was quite low [3]. The Possible reasons for this employment gap included: (1) employers’ bias against them [4]; (2) the accommodation costs [5]; (3) lacking needed workplace skills [6]; (4) individual factors – their disabilities [7].

Telework was often referred to as an employment mechanism of how information and communication technologies (ICTs) evolved to reduce the need for employees to maintain a physical presence in the workplace in order to be productive. Telework could be a reasonable accommodation for people with disabilities [8] - [9].

In general, the main benefits to telework for individuals with disabilities would be to remove barriers presented in traditional work environments [10]. However, there were some disadvantages of teleworking for people with disabilities: (1) Employers’ perspectives and policies on telework [11]. (2) Social and professional isolation [12]. (3) Insufficient telework opportunities [12].

A social enterprise was a business with a social or environmental mission that sold goods and/or services in the market place. One of the social enterprises in Taiwan, the company believed that by means of appropriate training, most people with disabilities could go to work when given the opportunity. Therefore, one of their employment projects was to promote teleworking. The main idea of this project was to provide necessary facilities and training program for those who would be eligible.

However, very few investigations and/or studies in Taiwan were highlighted in this field. In order to figure out the feasibility of telework for Taiwanese people with disabilities, this social enterprise decided to conduct an evidence-based survey in 2017.

In the present study, there were three main objectives: (1) To explore the employment outcomes for Taiwanese people with disabilities, especially by considering their learning motive and emotional management skills. (2) To examine whether there was a significant preference difference between general employment and telework for people with disabilities. (3) To determine predictors of employment intention and telework preference for
people with disabilities, respectively. Figure 1 displayed the variables used in the analyses in this study.

2. Literature review

2.1. People with disabilities and employment

Disability referred to someone who had difficulty carrying out normal daily activities due to physical or mental health impairment [13]. Labor market statistics from different countries revealed that people with disabilities had poorer employment rates than people without disabilities [14].

Many countries set up a quota system to demand public and private sectors, especially for those over a certain amount of employees, to employ a certain percentage of staff members who were people with disabilities. The rationale would be that without this obligation most employers might not hire people with disabilities because they seemed to be less overtly competitive. According to a survey conducted by Lin, even though the majority of participants had a mild disability, about 41% of them (n = 145) were never employed. Furthermore, participants who had employment histories were more likely to experience mental distress than those who never worked [6].

On the other hand, according to the Report of Disabled People’s Living Condition and Demand Survey in 2016, which had been conducted regularly by the Ministry of Health and welfare in Taiwan, the overall rate of people with disabilities in general population was 4.97% (N = 1170199). About 39.02% of them were classified as having a mild disability. The labor force participation rate for working-age people with disabilities was 20.41% (N = 229876). The employment rate of people with disabilities was 75.18%. The unemployment rate of disabled people was 9.17% (the overall unemployment rate in Taiwan in 2016 was 3.92%). The majority of people with disabilities engaged in physical work and entry level mechanic jobs. Most of them worked in the manufacturing field (20.93%). The main obstructions for working-age people with disabilities were the low salaries, lacking physical competence, and work overload.

Comparing the above results to other countries, such as Romania [15], South Korea [16], Australia [17], and the United States [18], it seemed that the People with Disabilities Rights Protection Act was a great civil rights victory for people with disabilities in Taiwan.

2.2. Telework and people with disabilities

Telework was one of the various job flexible employment mechanisms. It often took place in the home, by using information and communication technologies (ICTs) to remove barriers in traditional workplace environments. The telework jobs could range from higher levels of workforce skills such as systems design and programming to entry level jobs such as customer service, data coding, and word processing. The general advantages of telework were: (1) increased productivity, (2) higher job satisfaction, (3) increased flexibility, (4) better work-life balance, and (5) reduced commuting time. On the other hand, the disadvantages of telework included: (1) social isolation, (2) lack of management support, and (3) longer working hours.

In general, telework created a successful accommodation for people with disabilities [19] - [22].

According to Lin, et al. in 2015, a social enterprise referred to “an organization that takes a commercial approach to solving social problems. It’s both a profit and nonprofit company, with revenues and earnings. Its surplus is mainly used to invest in social enterprises like themselves, and continue to address the social or environmental issues, rather than seek the best interests of investors or owners” (p.502) [23]. One of the social enterprises in Taiwan, the company believed that by means of appropriate training, most people with disabilities could go to work when given the opportunity. One of their employment projects was to promote teleworking. However, very few investigations and/or studies in Taiwan were highlighted in this field.

In order to figure out the feasibility of telework for Taiwanese people with disabilities, this social enterprise decided to conduct the following survey. Additionally, they regarded learning motive and emotional management skills as two key factors for people to engage in the workplace and/or to complete the whole training program.

Taken together, the main aims of this study were to find out the employment outcomes for Taiwanese people with disabilities towards telework and empirically evaluate which (demographic) characteristics cause the participants to be more likely to take up telework.

3. Methods

3.1. Participants

The population of this study was comprised by all disabled people in Taiwan (N = 1167450, 2017). The participants were recruited by means of convenience sampling. A pilot study was conducted on 30 people with disabilities in April 2017 to test the feasibility of the self-developed instrument – online and paper surveys. A total of 359 participants were recruited (online:79.39% and paper: 20.61%) and the valid participants were 341 (95%) between the ages of 13 – 67 (M = 35.08, SD = 11.69) in this study.
There were more female (182, 53.4%) than male (159, 46.6%) in this study. The most common type of disabilities was Moving Functional Limitation (194, 56.9%). About 39.9% (n = 136) of them were classified as having a severe disability. More than half of them were able to go to work by themselves (184, 54.0%) and to live without any assistance (195, 57.2%). The majority of them earned a bachelor’s degree (147, 43.1%), and the second-largest group got a high school diploma (103, 30.2%). About 42.2% (n = 144) of people with disabilities were currently employed. About 33.4% (n = 114) had work experience but were not presently working, and 12.6% (n = 43) had no work experience. Governmental agencies were the most frequently used channel for disabled people to find jobs (108, 31.7%). The next popular channel was recommended by friends and relatives (86, 25.2%). The third one was online job boards (85, 24.9%).

4.2. Instruments

There were 5 elements of self-developed survey in this study: the Employment Intention Scale (EIS), the Telework Preference Scale (TPS), the Learning Motive Scale (LMS), the Emotional Management Scale (EMS), and personal information.

Item analysis, item-to-total correlations, and the exploratory factor analysis (EFA) were used to examine each scale’s construct validity. Content Validity Index, Cronbach’s alpha coefficients were used to examine their reliability. Six experts performed content validity. The Content Validity Index (CVI) was .99. The results revealed that this self-developed survey was a well-developed instrument. Table 1 illustrated summary of the validity and reliability of this Survey.

4. Results

4.1. Gender to EI, TP, LM, EM

One-way ANOVA was conducted to detect any significant differences between males and females on employment intention, telework preference, learning motive, and emotional management, respectively.

The results revealed that there was no significant difference between two groups. In other words, gender did not have any significant effects on their response to employment intention, telework preference, learning motive, and emotional management, respectively. See Table 2.

4.2. Education levels to EI, TP, LM, EM

A one-way ANOVA was used to determine whether education levels had any statistically significant differences on employment intention, telework preference, learning motive, and emotional management, respectively. The only significant result was that for those with high school diplomas revealed greater telework preference than those with bachelor’s degree (F (6, 334) = 2.89, p < .01). See Table 3.

4.3. Independent living to EI, TP, LM, EM

A one-way ANOVA was used to determine whether independent-living levels had any statistically significant differences on employment intention, telework preference, learning motive, and emotional management, respectively. The results showed that for those could live without any assistance had higher learning motive (F (2, 338) = 6.18, p < .01) and greater emotional management (F (2, 338) = 4.86, p < .01) than those sometimes requiring help with activities of daily living. For those couldn’t live independently revealed greater
teleshop work preference \( F (2, 338) = 4.64, p < .05 \). See Table 4.

| Table 4. One-way ANOVA of EI, TP, LM, EM by independent living |
|---------------|-------|-----|---|---|---|
| Sources       | independent-living | M   | SD | N  | F  | P  |
| Employment Intention |
| Yes (1)       | 6.50 | 0.69 | 195 | 1.91 |
| No (2)        | 6.39 | 0.67 | 88  |     |
| Sometimes (3) | 6.30 | 0.90 | 58  |     |
| Total         | 6.44 | 0.73 | 341 |     |
| Teleshop Preference |
| Yes (1)       | 5.35 | 1.31 | 195 | 4.64* |
| No (2)        | 5.86 | 1.29 | 88  | 2 > 1 |
| Sometimes (3) | 5.48 | 1.25 | 58  |     |
| Total         | 5.50 | 1.31 | 341 |     |
| Learning Motive |
| Yes (1)       | 6.33 | 0.73 | 195 | 6.18** |
| No (2)        | 6.13 | 0.74 | 88  | 1 > 3 |
| Sometimes (3) | 5.97 | 0.86 | 58  |     |
| Total         | 6.22 | 0.77 | 341 |     |
| Emotional Management |
| Yes (1)       | 5.80 | 1.01 | 195 | 4.86** |
| No (2)        | 5.57 | 0.98 | 88  | 1 > 3 |
| Sometimes (3) | 5.36 | 0.94 | 58  |     |
| Total         | 5.66 | 1.00 | 341 |     |

4.4. Independent working to EI, TP, LM, EM

A one-way ANOVA was used to determine whether independent-working levels had any statistically significant differences on employment intention, telework preference, learning motive, and emotional management, respectively. The results showed that for those who could go to work by themselves had higher employment intention \( F (2, 338) = 3.94, p < .05 \) and learning motive \( F (2, 338) = 4.91, p < .01 \) than those sometimes requiring the assistance of others. For those couldn’t work independently revealed the most telework preference \( F (2, 338) = 8.23, p < .01 \). See Table 5.

| Table 5. One-way ANOVA of EI, TP, LM, EM by independent working |
|---------------|-------|-----|---|---|---|
| Sources       | independent-working | M   | SD | N  | F  | P  |
| Employment Intention |
| Yes (1)       | 6.53 | 0.65 | 184 | 3.94* |
| No (2)        | 6.38 | 0.85 | 101 |     |
| Sometimes (3) | 6.24 | 0.71 | 56  |     |
| Total         | 6.44 | 0.73 | 341 |     |
| Teleshop Preference |
| Yes (1)       | 5.17 | 1.33 | 184 | 18.23** |
| No (2)        | 6.10 | 1.07 | 101 | 2 > 3 |
| Sometimes (3) | 5.54 | 1.27 | 56  |     |
| Total         | 5.50 | 1.31 | 341 |     |
| Learning Motive |
| Yes (1)       | 6.31 | 0.74 | 184 | 4.91** |
| No (2)        | 6.20 | 0.79 | 101 | 1 > 3 |
| Sometimes (3) | 5.95 | 0.77 | 56  |     |
| Total         | 6.22 | 0.77 | 341 |     |
| Emotional Management |
| Yes (1)       | 5.75 | 1.00 | 184 | 1.70 |
| No (2)        | 5.60 | 1.06 | 101 |     |
| Sometimes (3) | 5.50 | 0.86 | 56  |     |
| Total         | 5.66 | 1.00 | 341 |     |

4.5. General Employment vs. Telework

A paired-samples \( t \) test was conducted to evaluate whether people with disabilities were more interested in general employment or telework. The results indicated that the mean for employment intention \( M = 6.44, SD = .73 \) was significantly greater than the mean for telework preference \( M = 5.50, SD = 1.31 \), \( t(340) = 11.85, p < .01 \). In other words, people with disabilities were more interested in general employment than telework.

4.6. Correlation between main variables

Pearson’s correlation was performed to illustrate the correlation between the main continuous variables. The results indicated that employment intention was positively correlated with learning motive and emotional management, respectively. In addition, telework preference was positively correlated with learning motive, emotional management, and age, respectively. However, there was no relationship between the variables of employment intention and telework preference. See Table 6.

| Table 6. Pearson’s correlation between continuous variables |
|---------------|-------|---|---|---|
| Age (1)       | 1     | 2 | 3 | 4 |
| Learning Motive (2) |    | 3 | 5 | 6 |
| Emotional Management (3) |   |   |   |   |
| Teleshop Preference (4) | |   |   |   |
| Employment Intention (5) | |   |   |   |

Spearman’s correlations were used to test for linear relationships between the variables measured on the interval or ordinal scale. The results indicated that employment intention was positively correlated with independent-living and interested in IT jobs, respectively. Telework preference was positively correlated with degrees of disability and interested in IT jobs, respectively. In addition, telework preference was also negatively correlated with education levels, independent-living and independent-working, respectively. See Table 7.

| Table 7. Spearman’s correlation between variables |
|---------------|-------|---|---|---|---|---|---|---|---|---|---|
| employment intention (1) | - .07 | .04 | .04 | 12** | .10 | 25** | .07 |
| teleshop preference (2) | - .20** | .24** | - .18** | .33** | .12** | .06 |
| education levels(3) | - .21** | .08 | .22** | .05 | .09 |
| degrees of disability(4) | - .31** | .25** | .01 | .03 |
| independent-living (5) | - .50** | .00 | .00 |
| independent-working (6) | - .05 | .01 |
| interested in IT jobs (7) | - .10** |   |
| male_D (8) | -   |   |

4.7. Testing variables for predicting EI

A stepwise multiple regression analysis was applied to determine which variables were the best predictors of disabled people’s employment intention. The overall model was significant, \( F (5, 335) = 31.43, R = .57, \) adjusted \( R^2 = .32, p < .01 \). The variables that best predicted disabled people’s employment intention were learning motive \( (\beta = .39) \), age \( (\beta = .20) \), emotional management \( (\beta = .18) \), not interested in IT jobs \( (\beta = .16) \), and currently unemployed \( (\beta = .09) \). The whole model
explained 31% of the variation in EI. The values of the VIF were small. Therefore, there was no significant evidence of multicollinearity. See Table 8.

Table 8. Stepwise multiple regression analysis on EI

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<th>Standardized Coefficients</th>
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<td>Emotional M.</td>
<td>.13</td>
<td>.04</td>
<td>.18</td>
<td>2.97**</td>
<td>1.81</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Jobs–No</td>
<td>-.44</td>
<td>.12</td>
<td>-.16</td>
<td>-3.56**</td>
<td>1.02</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td>-.13</td>
<td>.07</td>
<td>-.09</td>
<td>-1.98*</td>
<td>1.05</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dependent Variable: Employment Intention

4.8. Testing variables for predicting TP

A stepwise multiple regression analysis was applied to determine which variables were the best predictors of disabled people’s telework preference. The overall model was significant, \( F (5, 335) = 21.03, R = .49, \) adjusted \( R² = .23, p < .01. \)

The variables that best predicted disabled people’s telework preference couldn’t go to work independently \( (\beta = .28), \) age \( (\beta = .24), \) emotional management \( (\beta = .19), \) not interested in IT jobs \( (\beta = -.17), \) and currently unemployed \( (\beta = .15). \) The whole model explained 23% of the variation in TP. The values of the VIF were small. Therefore, there was no significant evidence of multicollinearity. See Table 9.

Table 9. Stepwise multiple regression analysis on TP

<table>
<thead>
<tr>
<th>Sources</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>B</th>
<th>Std. Error</th>
<th>t</th>
<th>F</th>
<th>R</th>
<th>R²</th>
<th>R²adj</th>
<th>VIF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Model</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td></td>
<td>2.73</td>
<td>.39</td>
<td>7.02**</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Independent working = NO</td>
<td></td>
<td></td>
<td>.79</td>
<td>.14</td>
<td>.28</td>
<td>5.74**</td>
<td>1.02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td>.03</td>
<td>.01</td>
<td>.24</td>
<td>4.81**</td>
<td>1.11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional M.</td>
<td></td>
<td></td>
<td>.25</td>
<td>.07</td>
<td>.19</td>
<td>3.86**</td>
<td>1.10</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>IT Jobs–No</td>
<td></td>
<td></td>
<td>-.82</td>
<td>.23</td>
<td>-.17</td>
<td>-3.34**</td>
<td>1.02</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unemployed</td>
<td></td>
<td></td>
<td>-.40</td>
<td>.13</td>
<td>-.15</td>
<td>3.09**</td>
<td>1.03</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Dependent Variable: Telework Preference

5. Conclusion

People with disabilities were very eager to be employed. Moreover, they were more interested in general employment than telework. Learning motive, emotional management skills and had interests in IT jobs were positively correlated to both employment intention and telework preference. For those who couldn’t live and/or work independently showed a greater preference on telework. Employment intention was not correlated with telework preference. In other words, for people with disabilities, the two attributes were independent to each other. The variables that best predicted employment intention were learning motive, age, emotional management, not interested in IT jobs, and currently unemployed. The variables that best predicted telework preference were couldn’t go to work independently, age, emotional management, not interested in IT jobs, and currently unemployed.

It seemed that telework might not be the first choice for Taiwanese people with disabilities. However, telework might be a new option for people with more severe degree of disabilities, older, currently unemployed, and better emotional management skills.

6. References


Session 3: Business Education

Title: Interrogating the Efficacy of University Entrepreneurship Curriculum
(Authors: Doreen Nkala, Tsungai Machingura)

Title: Industry Perspectives on Supply Chain Curriculums in South Africa
(Authors: Gert J Heyns, Rose Luke)

Title: Thai Educational Reforms: The Role of Technology and Service in Educating the Next Generation
(Author: Yupawan Vannavanit)
Interrogating the Efficacy of University Entrepreneurship Curriculum

Doreen Nkala, Tsungai Machingura
Midlands State University
Gweru, Zimbabwe
Tem Foundation
Harare, Zimbabwe

Abstract

Universities in Zimbabwe churn out graduates every year but the business community absorbing the students finds their credibility questionable. The efficacy of the university entrepreneurship curriculum should perforce be scrutinised with the view to improve it. This paper interrogated the efficacy of university entrepreneurship curriculum at a selected university with the view to improve it. The research adopted a positivist paradigmatic dimension in which a case study shaped by exploratory and descriptive research designs was employed. A representative sample of 189 students was drawn from a population of 32 029 respondents using a model developed by Krejcie and Morgan in 1970. Stratified and convenience sampling methods were used. Data were collected using telephonic interviews and a questionnaire adapted from Koh’s (1996) entrepreneurial self-assessment tool. It emerged out of the study that university curriculum partly empowered and motivated students to engage in entrepreneurial activities after graduating. It was recommended that the university curriculum should furnish students with a full package of entrepreneurial skills they need to be propelled to start a business.

References


Industry Perspectives on Supply Chain Curriculums in South Africa

Gert J Heyns, Rose Luke
University of Johannesburg, South Africa

Abstract

The shortage of supply chain management skills in South Africa is a major constraint to sustainable economic growth and development. Academic institutions educate thousands of students every year, however the supply chain talent shortage still remains acute. This implies that not enough individuals are being trained to meet the growing demand for skills or curriculums have not evolved to meet the changing needs of the dynamic supply chain industry. The purpose of this paper is to review the skills required by the supply chain industry and to determine whether current educational offerings are meeting these needs. This paper provides the results from an industry survey, conducted in 2016, which indicate that current educational programmes are ill-equipped to meet the complex demands of modern supply chains. The research provides evidence of gaps within the current supply chain education programmes and suggests some educational interventions to create the types of supply chains that are needed in developing economies.

1. Introduction

The shortage of skills in general and supply chain skills in particular is well documented in South Africa [1-6]. Sharp [7] states that “Most economists agree that South Africa’s skills shortage poses a significant limitation on the country’s long-term economic growth potential. Due to a lack of needed skills, including managerial, professional and technical skills, viable economic opportunities cannot be productively tapped.” In the current economy, where South Africa’s economic growth is highly constrained [8],[9] and given South Africa’s natural trade disadvantages, such as long distances to markets, it has become critical that supply chains function at high levels of effectiveness.

2. Literature review

Despite the recognition of the importance of effective supply chains to the functioning of the economy, the supply chain skills shortage has remained acute. The World Bank suggests that these issues are structural, reflecting that the quality of primary education is rated at 127 out of 140 countries. At higher education levels, the quality of education is ranked at 138 of 140 and the quality of maths and science education as 140 of 140 countries. Internet access in schools is rated as 119 of 140 countries. Although not solely associated with education, but considerably impacted by the quality thereof, labour productivity in South Africa is ranked at 127 of 140 countries [5]. The implication is that the lack of appropriate skills is impacting the ability to do business within the country, as well as to trade with the country. Supply chains are inevitably affected.

To mitigate against the poor quality of primary and secondary education, tertiary institutions and private sector businesses have had to intervene with high quality services to fill the gaps left by the school system. Local availability of specialised training services is ranked at 41 of 140, the extent of staff training as 19 of 140 and the quality of management schools as 24 of 140 countries [5]. Supply chain training is extensive with dedicated supply chain qualifications being provided by at least eight academic or technological universities, in addition to supply chain modules or courses provided by various academic and other tertiary institutions. The University of Johannesburg alone trains approximately 5000 students per annum on supply chain qualification ranging from certificates to PhDs. Professional bodies such as the Chartered Institute of Logistics and Transport (CILT), Chartered Institute of Procurement and Supply (CIPS), Association for Operations Management of Southern Africa (SAPICS) and the Council of Supply Chain Management Professionals (CSCMP) offer their own accredited certifications.

Despite the extent of supply chain training provision, the skills shortage within the supply chain industry remains acute. Noble [10] states that about 45% South African supply chain managers admit to not having the skills they need to get the job done. This is supported by Luke and Heyns [11] who found that 27% of practitioners found it difficult to fill operational level supply chain positions, 47% had difficulty in filling tactical level positions and 57% had problems filling strategic level positions. The difficulty in filling more senior positions suggest that the issue may be with developing the softer skills associated with higher levels of management rather than the harder skills that are taught in university and other courses. Noble [10] suggests that the “problem is not just about the skill level of supply chain
managers, but whether they have the right balance of abilities.” Waller [36] recognised this in 2012 by stating that “it’s not just that we are short of people with skills, but we are short of people with the right skills …” It can thus be concluded that, for supply chains to be successful, the most appropriate skills need to be developed and retained in the supply chain.

A literature analysis was conducted of contemporary supply chain research to determine the skills required by supply chain practitioners to successfully compete in a competitive global economy. For the purposes of this study mainly academic articles, but also other relevant sources (e.g. talent management opinions) were studied to obtain a broad list of skills required by supply chain practitioners. A summary of the literature review identifying the key skills are shown in Table 1 below.

Table 1. Literature review

<table>
<thead>
<tr>
<th>Author</th>
<th>Skills items</th>
</tr>
</thead>
<tbody>
<tr>
<td>[12]</td>
<td>Strategic supply chain management, project management, technical knowledge, Global business leadership, integrated business, planning business communication</td>
</tr>
<tr>
<td>[13]</td>
<td>Performance, trade-offs, warehouse management, transportation management, supply chain synchronization, risk management, sustainability, location facilities, distribution, warehousing, logistics, international regulations, strategic sourcing and supplier relationship, customer relationship management, applying lean and six sigma tools, enabling technology, math, statistics and applied science and technology, supply chain fundamentals, foundations of business management, operations and enterprise economics, Problem solving and decision making, teamwork and collaboration, accountability and responsibility, customer focus (internal and external), planning and organizing, conflict management, analytical thinking, reading and writing for comprehension, personal effectiveness competencies, awareness of the needs of others, integrity, continuous learning, effective communication, interpersonal skills, creativity</td>
</tr>
<tr>
<td>[14]</td>
<td>Process management, strategic, quantitative, people management, decision-making, behavioural, negotiation</td>
</tr>
<tr>
<td>[15]</td>
<td>Communications and analytical skills, technology, interpersonal and customer service skills</td>
</tr>
<tr>
<td>[16]</td>
<td>Strategic global perspective, ability to manage change processes and to balance the external needs of the function with the internal vision of efficiency, translate “client vision” into strategic and operational practices, Expertise to manage risk and uncertainty, motivate people for mutualism and cooperation, obtain positive operating performance of work teams, good communication (written and oral) to influence their subordinates and other parties related to the business (including external partners), establish metrics and reward systems aligned and coherent across functional areas.</td>
</tr>
<tr>
<td>[17]</td>
<td>Technical, analytic, leadership, strategic and critical thinking, problem-solving skills, creativity and imagination, people development/mentoring/coaching skills</td>
</tr>
<tr>
<td>[18]</td>
<td>Creating and communicating a vision, promoting and bringing about change, building partnerships, capturing and acting on insightful information, seizing and creating opportunity at the right place and time, consistently modelling honourable behaviour and best practices, serving the best interests of the organisation without being self-serving</td>
</tr>
<tr>
<td>[19]</td>
<td>Analytical skills, strong category knowledge, software knowledge, computer skills, understanding of finance/ cost of ownership, knowledge of global geography/ economy, written and verbal communication skills, negotiation skills, business acumen/ understanding of overall business, presentation ability/ polish, ability to forge strong relationships with stakeholders</td>
</tr>
<tr>
<td>[20]</td>
<td>Problem solving, decision making, teamwork, ability to see the big picture, prioritising, supply chain awareness, cross-functional awareness and written and oral communication</td>
</tr>
<tr>
<td>[21]</td>
<td>Supplier development, information systems, market understanding, supply chain knowledge management, performance measurement/prioritising supply chain improvements, complexity management, inter-firm relationship skills/relationship management within process, proactive management/risk management, skills/talent management</td>
</tr>
<tr>
<td>[22]</td>
<td>Customer service required, good communications skills required for efficient coordination, good skills in fully automated information systems, critical analysis, adaptability to changing requirements and an open mind</td>
</tr>
<tr>
<td>[23]</td>
<td>Information technology and automation knowledge, economics and market dynamics, understanding cost-to-serve, project management, flexibility, ability to get the best from people</td>
</tr>
<tr>
<td>[24]</td>
<td>Knowledge of logistics, supply chain management and transportation, financial planning, forecasting, workflow optimization, general management and business, international business practices, knowledge of laws and regulations, mechanical, language skills</td>
</tr>
<tr>
<td>[25]</td>
<td>General skills - finance, IT and management / strategy, logistics / SCM skills - analytical, interpersonal, leadership, change management and project management skills</td>
</tr>
<tr>
<td>[26]</td>
<td>Communications / negotiations, computers / IT, general experience, logistics / supply chain management and people management</td>
</tr>
<tr>
<td>[27]</td>
<td>Technical competencies (enabling them to tackle, for example, complex aspects of risk management, statistical modelling, and...</td>
</tr>
</tbody>
</table>
multitier management), strategic thinking and problem solving, leadership and professional competencies (valuable in problem solving, change management, and talent development)

3. Methods and methodology

The aim of this paper is to evaluate the skills sets typically required by logistics and supply chain organisations in Southern Africa and to determine whether current educational offerings are meeting these needs. By means of a literature review of appropriate logistics and supply chain skills, an initial and broad list of important skills were identified. A selected panel of six academics and specialists in the field of logistics and supply chain management considered the initial skills list and agreed on a final list of 30 key skills that are essential to the supply chain industry.

To ascertain any trends with regard to the current logistics skills requirements, a survey was conducted and 2016 at the annual SAPICS (Association for Operations Management in Southern Africa) conference. The annual SAPICS conference is seen by practitioners as the principal logistics and supply chain management conference in Southern Africa and was attended by more than 1000 supply chain management professionals. A convenience sampling approach was used, whereby responses was elicited from delegates at the SAPICS conference, who is perceived to be supply chain industry specialists.

A self-administered web-based survey containing five separate sections was utilised to collect data. Section one included questions regarding the respondent’s demographic and employment related characteristics; section two asked questions regarding the difficulties in recruitment and the preparedness of candidates; section three asked questions regarding the education and work experience practitioners perceive to be required for the different management levels; section four asked practitioners to rate the importance of the 30 supply chain related skills items; and finally, section five requested respondents identify strategies that would better prepare students for industry.

In the survey, respondents were requested to rate the perceived importance of the selected skills items typically required by logistics and supply chain organisations on a four-point Likert-type scale (anchored with 1 = to no extent and 4 = to a large extent). The survey was completed by 155 respondents which represent an approximate response rate of 14%, which was deemed adequate for the purposes of the study. Although the number of respondents could be viewed as a limitation of the study the researchers believe that the specific sampling pool provided an acceptable number of responses from supply chain professionals which could be seen as adequately representative of the practitioners’ perspective. The survey data was analysed using SPSS for Windows version 24.

4. Discussion

The majority of the respondents are from the transport, storage and communication and manufacturing sectors (60.6%). Nearly 77% of the respondents were middle and senior managers, hinting that they can be considered as the decision-makers within their individual organisations.

The average work experience of the respondents was over 16 years, with the average experience in the area of logistics and supply chain management being over 8.5. More than 90% of the respondents have attained tertiary qualifications. To assess the internal consistency and the reliability of the measurement scale, Cronbach’s \( \alpha \) value was determined. The
overall Cronbach’s $\alpha$ value for all the skills items was 0.950, which suggests that the survey is very reliable [35].

Based on the list of skills identified in the literature review, 30 logistics and supply chain skills were selected and respondents were asked to rate the importance of these skills when recruiting employees. The mean and standard deviation were calculated to derive the descriptive profile of the skill items, thus establishing the ranking of the skills in terms of their perceived importance (see Table 2). The results indicate that the top ten highest ranking skills comprise mostly ‘softer’ (i.e. Behavioural/Interpersonal) and very broad management skills (i.e. General Management).

The respondents were also requested to indicate the level of education they believe to be required at various employment levels (i.e. operational, tactical and strategic). This is depicted in Figure 1. The results indicate that practitioners are of the opinion that some education is important at all levels. As the requirements for tactical and strategic level positions increase, tertiary education becomes more imperative. Practitioners think a certificate or diploma is the needed tertiary qualification to obtain an entry level or operational level position. For tactical level positions practitioners place a higher premium on bachelor. For strategic level positions, the majority of practitioners indicated that at least an honours degree is required.

![Figure 1. Education requirements](image1)

![Figure 2. Work experience requirements](image2)

The respondents were also requested to indicate the work experience they believe is required at the various employment levels. This is shown Figure 2. The results show that work experience, at all managerial levels, is important but more so at strategic level. The majority of the respondents (67%) are of the opinion that at least 5 years work experience is required to function at the strategic management.

As indicated earlier, practitioners find it difficult to find suitable candidates to fill tactical and strategic level positions. This is amplified by respondents indicated that supply chain education are not adequately preparing students for employment in the supply chain industry. When asked indicate those areas of competencies were students are well-prepared, respondents generally indicated that candidates do not have adequate levels of preparation in most of the “hard” and “soft” skills areas. This suggests that current supply chain education offerings

<table>
<thead>
<tr>
<th>Rank</th>
<th>Skills Item</th>
<th>Mean</th>
<th>Std. Dev</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Problem solving</td>
<td>3.67</td>
<td>0.56</td>
</tr>
<tr>
<td>2</td>
<td>Ability to see big picture</td>
<td>3.64</td>
<td>0.56</td>
</tr>
<tr>
<td>3</td>
<td>Team work</td>
<td>3.63</td>
<td>0.55</td>
</tr>
<tr>
<td>4</td>
<td>Communication skills</td>
<td>3.62</td>
<td>0.59</td>
</tr>
<tr>
<td>5</td>
<td>Ability to plan and prioritise</td>
<td>3.61</td>
<td>0.62</td>
</tr>
<tr>
<td>6</td>
<td>Business ethics</td>
<td>3.60</td>
<td>0.63</td>
</tr>
<tr>
<td>7</td>
<td>Ability to think outside the box</td>
<td>3.57</td>
<td>0.64</td>
</tr>
<tr>
<td>8</td>
<td>Decision making</td>
<td>3.54</td>
<td>0.61</td>
</tr>
<tr>
<td>9</td>
<td>Customer focus</td>
<td>3.53</td>
<td>0.65</td>
</tr>
<tr>
<td>10</td>
<td>Business process improvement</td>
<td>3.46</td>
<td>0.63</td>
</tr>
<tr>
<td>11</td>
<td>Cross-functional coordination</td>
<td>3.45</td>
<td>0.68</td>
</tr>
<tr>
<td>12</td>
<td>Leadership</td>
<td>3.39</td>
<td>0.67</td>
</tr>
<tr>
<td>13</td>
<td>WHS/MH management</td>
<td>3.37</td>
<td>0.65</td>
</tr>
<tr>
<td>14</td>
<td>Supply chain cost knowledge</td>
<td>3.34</td>
<td>0.73</td>
</tr>
<tr>
<td>15</td>
<td>Inventory management</td>
<td>3.33</td>
<td>0.71</td>
</tr>
<tr>
<td>16</td>
<td>Motivation skills</td>
<td>3.33</td>
<td>0.68</td>
</tr>
<tr>
<td>17</td>
<td>Knowledge of the industry</td>
<td>3.32</td>
<td>0.72</td>
</tr>
<tr>
<td>18</td>
<td>Negotiating skill</td>
<td>3.31</td>
<td>0.77</td>
</tr>
<tr>
<td>19</td>
<td>Change management</td>
<td>3.30</td>
<td>0.80</td>
</tr>
<tr>
<td>20</td>
<td>Demand forecasting</td>
<td>3.30</td>
<td>0.77</td>
</tr>
<tr>
<td>21</td>
<td>Quantitative/statistical skills</td>
<td>3.28</td>
<td>0.75</td>
</tr>
<tr>
<td>22</td>
<td>Quality management</td>
<td>3.26</td>
<td>0.73</td>
</tr>
<tr>
<td>23</td>
<td>Transport management</td>
<td>3.26</td>
<td>0.74</td>
</tr>
<tr>
<td>24</td>
<td>Supply chain design</td>
<td>3.24</td>
<td>0.75</td>
</tr>
<tr>
<td>25</td>
<td>Procurement/Purchasing</td>
<td>3.20</td>
<td>0.76</td>
</tr>
<tr>
<td>26</td>
<td>Reverse logistics</td>
<td>3.20</td>
<td>0.74</td>
</tr>
<tr>
<td>27</td>
<td>Spreadsheet abilities</td>
<td>3.20</td>
<td>0.78</td>
</tr>
<tr>
<td>28</td>
<td>IT skills/software knowledge</td>
<td>3.14</td>
<td>0.75</td>
</tr>
<tr>
<td>29</td>
<td>Laws and regulations</td>
<td>3.09</td>
<td>0.77</td>
</tr>
<tr>
<td>30</td>
<td>Green logistics/environmental</td>
<td>3.05</td>
<td>0.76</td>
</tr>
</tbody>
</table>
is clearly failing to meet the technical and ‘soft skills’ requirements. The results are indicated in Figure 3.

When asked what universities could do to better prepare students for a career in the supply chain industry, practitioners indicated a strong need for additional practical application. The three highest suggested solutions support more practical exposure, i.e. more hands-on experience; interaction with practitioners and industry thought leaders and exposure to real-world examples through case study teaching.

Figure 3. Competency of students

These findings support the results presented on required work experience (see Figure 2) where practitioners revealed a much higher need for work place experience. Furthermore, the practitioners also indicated the need to develop soft skills which corroborate the finding that soft skills are those most sought after by supply chain practitioners in South Africa (see Table 2).

4. Conclusion

The purpose of this paper was to assess the skills that industry practitioners perceive as important within South African supply chains. Additionally, the educational and experience levels required to function appropriately at varying employment levels were considered. The final analysis sought to determine whether educational programmes are providing the skills necessary to function effectively within the country’s supply chains. In the final analysis regarding the skills required for effective supply chains, South African practitioners clearly indicated that, whilst hard skills remain important, to compete within global supply chains, emphasis should be placed on the development of those soft skills that are typically required in supply chains, i.e. the skills that assist practitioners to manage supply chains that cross borders, disciplines and company boundaries. The practitioners also indicated that high levels of education and work experience were required to fill higher-level positions. Although this result is expected, it is also provides an indication of the belief that skills required to function in higher level positions in the supply chain are gained through high levels of education, but more particularly, that high levels of experience are required to gain the “big picture” management skills that supply chains typically require. Organisations are increasingly seeking better-qualified and more experienced resources to fill managerial posts. The implication is furthermore that incumbents are underequipped to perform at an appropriate level in their current positions. This suggests that existing supply chain education programmes are not providing candidates with the required technical and “soft” skills as well as practical experience demanded from modern supply chains. This is supported by the industry indication that candidates need to be better prepared in almost all disciplines required for effective supply chain practitioners. This research thus suggests that, if supply chains are to be created that can enhance global competiveness and sustainability, supply chain education must be relevant. This implies a review of existing service offerings and consideration of the inclusion of “soft” skill teaching and practical work experience. Further research should therefore be focused on methods to incorporate these aspects into university and other trainings institutions’ curriculums. It is suggested that failure to adapt education to modern supply chain requirements will restrict South African supply chains to being less than competitive in a globalised economy. From a training perspective, it is thus clear that “soft” skills need to cater for in curriculum design. The ability to function within an industry, which crosses cultural and organisational boundaries, requires skill sets that transcend the skills that are taught within the traditional South African supply chain curriculums. For hard skills, emphasis should also be placed on skills that are more cross-cutting, such as analytical skills, industry awareness, etc. Curriculums in supply chain teaching in South Africa will need to be adapted to avoid silo approaches to supply chain elements and focus on cross-functional issues within the broader supply chain context.

5. References


Thai Educational Reforms: The Role of Technology and Service in Educating the Next Generation

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Abstract

In recent years, technology has played an important role in our daily life including work-related activity, personal communication and entertainment. There can be no doubt that it has a variety of benefits such as cost reduction and an increase of flexibility and convenience, to various sectors including education. The study aims to determine the role of technology and service from university professors and learners in implementing various kinds of technology in education system and learning process, focusing at graduated level. Thai government long term mission has been set with an ultimate goal of creating innovation, active learners with competitive skills including ICT, language proficiency and mathematic, in order to build the next generation to become a future pillar to move Thailand away from emerging market. The role of professors and lecturers are not being replaced by technology but the way to deliver their message and pass on their words need to be changed. Some potential ways are to technologically literate, to guide learners in processing the information, to deliver message or content with interactive visual presentation, to closely and widely communicate via various kind of interactive channels and to monitor and track student activeness and performance.

1. Introduction

Swift technological advancement, greatly driven by the coming digital era has widely transformed, various Thai fundamental sectors, not least of which the educational sectors. Those new technologies and IT innovations such as e-learning, online interactive class and internet based materials are reshaping the educational boundary in a major way. Whist numerous of positive aspects that are being witnessed, there are many opportunities and challenges in the role of professors in the adoption these innovations to create a better educational process and outcome.

In response to this coming opportunities and challenges, Thai government’s long-term mission has been set to create innovation, active learners with competitive skills including ICT, language proficiency and mathematic, in order to build the next generation to become a future pillar to move Thailand away from emerging market. To accomplish that long term goal, the study aims to determine the role of technology and service from university professors’ perspective in implementing these technological features to improve various kinds of teaching and learning process, culminating in greater education system. Statistically, internet and computer has played an important part in students’ daily life as the number of internet users in all educational levels and ages has grown dramatically. This implies that it is a powerful and low-cost channel to deliver educational contents and messages. The paper also discusses some positive aspects of technology in Thai educational environment

Our intended outcome is to suggest some positive ways that allow Thai education system to largely benefit from advance innovation and new technology. Hence, we have recommend five key roles and services, involving internet usage and various kinds of technological adoptions which should be done by professors in order to reap full benefits on educational innovations. Those services could be mainly divided into five categories namely, to technologically literate, to guide learners in processing the information, to deliver message or content with interactive visual presentation, to closely and widely communicate via various kind of interactive channels and to monitor and track student activeness and performance. Our recommendation aims to align any necessary actions from professors and teachers with a forthcoming government policy.

The term of technology in this paper includes intangible tools, such as applications and operating systems, and tangible tools, including laptops, tablet and the like. The paper is divided into seven main sections namely, (1) introduction, (2) the technological revolution in Thai educational system, (3) methodology, (4) great benefits of technology in Thai educational environment (5) The role of professors and teachers in implementing technological education (6) conclusion (7) references
2. The technological revolution in Thai educational system

In recent years, the rapid development of technology has been widely seen across South East Asia, especially in Singapore, Malaysia and Thailand. This is a result of the fact that it having low cost and generating many kinds of benefit. The upward trend of new technology adoption is expected to have a long term impact on our society in a major way including culture, life style and educational process. It is slowly apparent that digital revolution in how students study has started to become an interesting and important issue, stemming from the change in classroom culture and behavior. A good example of this is, in Thailand, especially Bangkok and large provinces, most of university’s and high school students usually take extra tutorials during their free time mainly on weekend and weekday evening in order to review and study in advance of ordinary class room lesson. Those tutorials are not taken place in a classical classroom environment but it is interestingly conducted in an interactive online classroom. Not only can extra tutorial boost their confident and expertise, but it also allows a wide range of flexibility for their time management which leads to an increase in learners’ activeness, productivity and effectiveness. In Thailand, statistically, there was an increasing trend in the portion of internet users in Thailand in every generation. According to Figure 1, the percentage of teenager users went up sharply from around 40% in 2011, doubling to almost 80% 4 years later.

![Figure 1](image1.png)

Source: Annual Thai educational statistic, Office of the Education Council

To be more specific, university students and polytechnic learners contributed over 80% and 60% of their total group respectively, related statistics are presented in Figure 2.

![Figure 2](image2.png)

Source: Survey of household statistic, National Statistical Office 2015

3. Methodology

It is apparent that graduated level are the most active and productive learning environment in Thailand in the perspective of user numbers, users’ experience in adopting recent educational technologies and technological benefits. This is mainly driven by mature and the readiness of the students as users will be able to reap full advantages of technological adoption. Hence, we have chosen to gather our primary data by deeply interviewing with university students and colleges’ professors, in the area of business administration who have adopted technological devices, gadget and so on in their learning and teaching process make some possible recommendations.

4. Great benefits of technology in Thai educational environment

There is no doubt that fundamental role of technology in education is to improve and augment the efficiency and effectiveness of education process and outcome. Overall, benefits of technology in education can manifest itself in many broad ways including improve the quality of learning, shorten students time spending by cutting through some complexity, enhance lecturers’ capacity and save large amount of cost without much effect on output quality. However, to be more specific these benefits
can be highlighted practically in two distinct dimensions with respect to the functionality of the technological tools, namely tangible and intangible aspect.

As for intangible tools, including applications and software, these advance technologies provide the world new tools which could be used to teach and learn. A good illustration of this is that instead of writing with pens and paper, one can use voice typing with automated spelling verification or check. Besides sitting together in a small local class room, students can participate in a real time online class that allows them to be with other student across the world. The tools like this truly make learning more creative, productive and efficient.

In terms of those tangible which include smartphones and tablets, having multiple useful functions such as capturing and video or voice recording could shorten students’ preparation time, widen their horizon and deepen their analysis. In short, a process of taking note in the paper or waiting for liquid paper to dry would be soon disappear.

All in all, a wide spectrum of great benefits from technological adoption is clearly seen. First, there is a massive cost reduction mainly in materials, transportation as well as communication. This is a positive consequence of having free WiFi and social applications such as Wechat, Skype and Facebook. Next, the level of mobility and flexibility to study will raise as one could study anywhere anytime, from any class online. An endless range of global network and connectivity is another powerful value in studying. Adopting technology such as e-learning will enhance students view and network and also connect them to global data source and material. All those benefits could culminate in a large increase in educational efficiency and effectiveness, resulting in better opportunity for the adolescent to access, to learn and to become the change for the future.

5. The role of professors and teachers in implementing technological education

The ultimate outcome of the learning and teaching process is to make them more effective and attractive in the most possible way. Since technology obviously plays an important role in educational process and provide various kinds of positive aspects to the education systems as mention in the previous section, professors and teachers are the key factor to drive the process of technological implementation and change to finally reach that outcome. From our preliminary survey and short interview, our recommendation in the role of professors in technological implication in the universities could be mainly divided into five categories namely, (1) to technologically literate, (2) to guide learners in processing the information, (3) to deliver message or content with interactive visual presentation, (4) to closely and widely communicate via various kind of interactive channels and (5) to monitor and track student activeness and performance. According to our suggestions above, they are not a linear process but instead are potential and possible actions that should be simultaneously done in order to reap full benefit from multiple types of advanced technology to improve Thai education process and system.

To technologically literate, broadly speaking, students must have full access to both local and global databases, freely use and fully understand and aware of the proper way to use new technologies. In other words, rich information are valuable extensively when they are widely accessible. The availability and readiness of any precious tool and paperless material is meaningless if there is a shortage of intention to use it. Educators must make sure that there are adequate transparency and efficiency with supporting staff and network in accessing to any data or system. Indexing and ready-to-use manual are highly recommended before launching any program or web-application. All of this could be done by first increase both professors and students knowledge and experience in information technology IT skills and ability to use.

To guide learners in processing the information, thanks to numerous free searching engines worldwide, getting any information such as PDF text book or published academic paper could easily be done by anyone who has internet access within a second. Hence, this change directly impact the way professors should deliver their message. Telling class only theory and definition is not attractive and beneficial enough for future classroom attention. To solve this predicted issue in advance, it is important for teachers to guide students to systematically process unlimited information, to develop new idea and deepen their knowledge. In order to completely achieve this task, a creative learning environment need to be built, allowing students to exchange idea and working together as a group to share and learn from others as well as develop their social, problem solving and critical thinking skill.

To deliver message or content with visual presentation, visual content should be freely posted and distributed online, allowing students to flexibly access and learn. Primarily, college students learn by listening to the professors in class and do some reading from text books at home or library, also practice by doing any written homework or exercise in writing. One free online application, namely Youtube has seriously change this current learning culture. Millions of students with the exception of those who cannot access to the internet can simply learn almost any content from someone who post the link on the website. This is the result of Youtube having unrivalled flexibility to use. In normal class room environment, it is not possible to pause, stop and speed up. In other words, it is quite linear, while all of those features can easily be done in Youtube. Given those contents are correct, the implication of this is making the lesson more visual could largely
benefit a great number of visually oriented students. In addition, the lesson can be played back as many time as they wish, until students fully and finally understand.

To closely and widely communicate via various kind of interactive channels, creating local social network such as class room line group and Skype group would enormously help both learners and educators to easily and quickly, ask, answer, assist alert remind and so on. In this electronic communication environment, the communication channel between those two has been expanded to the world outside of the class room. This also allows professor to monitor student progress and participation informally. Not only can this group being used to communicate, but it is also made for sharing. This powerful network is subject to access right designation, unlike e-mail. Several interactive and super easy features allows much more informal message to instantly deliver and equally distribute to all group members. To illustrate, most of Thai professor set up line group chat to response to any coming questions appointment and meeting, by evenly sharing this information, others class member can instantly see and update themselves with latest information related to their class. Another obvious benefit of group communication is to reduce the number of redundant and repeated questions that professors have to answer.

To monitor and track activeness and performance level, in the old day, students’ performance only measure by examination result and class room participation however, when the relationship between those two measurements may no longer exist due to new way of learning via numerous online sources. This is where teachers could potentially use the software feature to keep tracking of reading or task achieving record. Moreover, using artificial-intelligence technique could automatically provide students with related and helpful material or lesson which directly subject to their need or weakness. For instance, artificial-intelligence will keep track of students exercise score and error patterns and compliment them with related lessons which could potentially help them to see the root cause or their common mistakes and deeply understand how to wisely fix their problems and correctly solve the questions, not just simply reveal the answer. Machine learning is effectively adopted in many lucrative industries. Slowly but surely, universities and schools are the next destination. Despite nowadays it not being so wise, but it is absolutely useful. At this stage, it is immediately apparent that the accountability of professors in promoting the adoption of technology in education is dramatically increasing and the role of them is necessary to be changed, stemming from digital revolution. According to a forthcoming policy from Thai government, innovation in education is their ultimate goal, and stimulate the use of technology in education by various means mention above is some long term potential solutions. However, the government need to place an important on professors and teachers reasonable incentive and nationwide sufficient training, emphasizing on the important of educators role and morale. In addition, they need to close technology gap between young adolescent nationwide. Developing educational process and system, particularly technological adoption, is not only educators’ prerogative, but also it is the main responsibility for the society including family and the government to create IT friendly environment to welcome technology in educating people.

6. Conclusion

The world of Thai education is rapidly changing due to the technological advancement. The role of professors and teachers are not being replaced by technology but the way to deliver their message and pass on their words need to change, adding our five key task including the adoption of technology in technological literacy, processing information, presentation, communication and monitoring. They are still the one who facilitate, inspire, motivate and raise their students up to become a better future generation.

7. References


Session 4: Curriculum, Research and Development

Title: Teachers’ Attitudes Towards Textbooks, Authentic Texts and Language Varieties
(Authors: Katica Sobo, Blaženka Filipan Žignić, Vladimir Legac)

Title: Teaching Chemistry Using Mixed Mode Delivery Method for Foundation Year Health Students
(Authors: Abdullah Karaksha, Nicolette Fozzard)

Title: Optimization and Development of The Curriculum: Concept and Methodology
(Authors: Argentina Chiriac, Vladimir Guţu, Tatiana Trebeş)

Title: Lecturers’ Perceptions of Students’ Mathematical Preparedness for Higher Education in One
Institute of Technology
(Authors: Louise Duggan, Pamela Cowan, Ian Cantley)
Teachers' Attitudes Towards Textbooks, Authentic Texts and Language Varieties

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¹University of Applied Sciences in Karlovac,
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Abstract

Communication competence as a goal of teaching foreign languages cannot be achieved without the inclusion of authentic texts in which in addition to standard varieties non-standard varieties (medialect, sociolect, functiolect, and regiolect) are also represented. Since teachers are creators of teaching, and as the textbook is the basic teaching tool, the aim of this research was to explore the attitudes of teachers about the elements that are crucial for the choice of textbooks as well as their attitudes about the authentic texts and language varieties. The results of the research indicate that non-standard foreign language varieties are insufficiently represented in Croatian primary school textbooks as well as that negative attitudes of teachers towards authentic texts and non-standard language varieties prevail. The focus of teachers on the standard language and their negative attitudes towards other language varieties are certainly linked to the lack of teachers' familiarity with the language varieties themselves.

1. Introduction

There has been a consensus in second language acquisition theory for several decades that in foreign language (FL) teaching communicative method must be most widely used with the purpose of achieving satisfactory communicative competence. It implies that FL learners need to acquire it actively, and in an environment where true communication takes place in a FL. The first step in achieving this goal is to create teaching that will be based on authentic language situations. As teaching is basically based on textbooks, it is extremely important to work on improving FL textbooks.

Due to the complexity of language communities and specific functional interactions one can notice a non-insignificant development of variability in language. Therefore, this moment should be taken into account and authentic contexts from real life in which communication actually takes place should be included in FL teaching as much as possible, because it is only through linguistic authenticity that the situational authenticity, i.e. the ability of a student to use authentic language varieties in communication can be achieved.

Results of research studies point to the fact that communication competence has been inadequately mastered by FL students. Results of a research study on the sample of students of German and English [1] have shown that students do not achieve a sufficient level of communicative competence, but given the comparison of the two foreign languages, the results support the English language teaching in which students achieve a higher level of communication competence than students who learn German, especially at the B1 level. The results of another Croatian research study [2] have shown that the coping with real communicative situations of students of German as a FL is mediocre, whereas students who study English as a FL usually get by well. The situation in other FLs is also unsatisfactory.

The main cause for lower achievement in mastering of communicative competence in the German language lies certainly in the fact, that the German learners are not sufficiently exposed to the German language outside their classrooms and thus cannot gain sufficient language experience. Therefore, it is extremely important that as much authenticity as possible can be integrated into German lessons. Successful teaching results depend
on the authentic experience, which can be attained on different levels.

According to Kaikkonen [3], authenticity in FL teaching can be realized through certain experiences. These experiences are based on various encounters that can arise through the use of authentic texts, foreign cultural contacts and through authentic encounters in the school. Since the teacher can neither have influence on the authentic foreign cultural contacts nor the authentic encounters in the school, the authentic text often remain as the only source of authenticity. Therefore, teachers should use the authentic text specifically as the main source medium of the authentic language in the classroom to meet the needs of modern young generations for real communication patterns and colloquial language varieties. In real communication situations, difficulties often occur whenever learners of German and English meet native speakers who express themselves in various non-standard language varieties. In German lessons, linguistic diversity, pluricentrism and non-standard language varieties are still not sufficiently taken into consideration.

Adequate communication competence can only be achieved with the help of authentic texts in which in addition to the standard variety non-standard varieties (medialect, sociolect, functiolect and regiolect) also occur.

These varieties are particularly evident in the spoken language. Learners will encounter different language varieties in everyday situations, and it is therefore important to prepare them that there are also the Austrian and German national standard languages, which differ from the German standard language and that they are not inferior but equal to it. German should receive the same kind of treatment as it has long been the case with the English language in which the British and American varieties are considered equal. However, in the teaching of German as a FL, the teachers consider only the German standard variety as the norm to be followed and all the other language varieties are seen as deviations from the norm [4]. This attitude leads to other language varieties being perceived by teachers as deficient language usage [5]. The standard variety or standard-language structures are considered by the teachers to be better, more correct or more valuable than language forms outside standard language [6].

2. Previous research studies

Today the textbook is not the only medium in teaching, but it still "guides" teachers through teaching. Marsh [7] notes that textbooks have a significant influence on what teachers teach and how they teach, even though the teachers themselves are often unaware of it. Research studies that have been conducted in America show that the use of textbooks in teaching relates to over 70% of the total work of the classroom lessons in the fifth grade [8]. Marsh states that 72% of the classroom lesson time is spent on working with the textbook. In FL teaching the textbook time is 44% of the total time [8]. Therefore, the importance of textbooks in teaching is still indisputable. In the first place, however, is the quality of the teacher because s/he is the one who chooses the textbook and how to apply it. When selecting textbooks, each teacher has his own criteria. This has also been confirmed by the research results, in which teachers have had to choose the elements they consider important when choosing textbooks. The results have shown that according to teachers the most important is the appropriateness of the content to students' age (77%), followed by actuality (55.7%), personal experience (50.8%), compliance with the curriculum (36%), and at least important of all is the language used in the textbook, i.e. the representation of different language varieties.

When asked what they use to prepare classes, four options were offered: textbook, teacher manual, workbook or something else. This questionnaire item has shown that 81.1% of the respondents in that study [9] use the textbook in their preparation of their lessons, which definitely confirms the importance of textbook in FL teaching.

The same above-mentioned survey has also shown that among teachers in Croatia, the strict orientation towards the standard German used in the Federal Republic of Germany prevails, which is imposed in the textbooks as the "correct" and therefore the only acceptable language variety. The results have shown that 40.3% of the surveyed teachers strongly agree with this statement and 8.1% even absolutely agree with that statement. When asked about the language variety used in the classroom, 6.6% of the respondents have said they never use any other varieties (except the standard) in class, and as many as 55.7% of the respondents have said that they rarely use other language varieties in the classroom. Only 4.9% of the respondents almost always use different language varieties in the classroom [9].

The analysis of the item dealing with the use of authentic texts in FL teaching has shown that 0.80% of the teachers use them almost always, 41.80% use them often, 53.30% never use them, and 0.80% have no opinion about the use of authentic texts in FL teaching [9].

The research conducted by Ransmayer [10] has shown that most respondents in Great Britain, France, the Czech Republic and Germany believe
that only the German language variety spoken in Germany (Federal German Standard) should be taken as the only used norm, whereas only Hungarian and Austrian teachers think that it is necessary that all three standard varieties (Federal German Standard, Austrian Standard and Swiss Standard varieties) should be included.

Čermakova [11] examining the practice of correcting student work, comes to the conclusion that the teachers consider the German Standard (Bundesdeutsche Standardsprache) to be the only acceptable of all the standard varieties as well as that they regularly correct the Austrian or Swiss varieties even if the used forms and expressions are regarded correct in those two other standard varieties (ibid.).

The precondition for equal representation of all the varieties in FL teaching is the teacher's awareness of the fact that there is not only one correct variety. Dovalil [12] points to the fact that the standard variety is regarded as the only target language variety of German as a FL has been most influenced by teachers.

3. Aims, hypotheses and methodology

The goal of this here presented research study was to learn how FL teachers teach FLs with regard to the use of authentic texts in textbooks and particularly regarding the inclusion of non-standard varieties in FL teaching.

The first aim was to find out the elements that are regarded as crucial by teachers in their selection when choosing textbooks.

The second aim was to explore the attitudes of FL teachers about the use of different language varieties in textbook for learning German as a FL as well as teachers' attitudes about the use of authentic texts in FL textbooks.

The starting hypothesis was that teachers' attitudes vary depending on gender, number of years of teaching experience, type of university course, and whether the language they teach is students' first or second FL. In Croatia, students learn FLs from first grade on and their parents can choose which FL to learn (English or German).

For the purpose of this research study, a questionnaire was used as an instrument. The survey included 217 teachers of German from 18 (of the total of 20) Croatian counties. In Croatia primary school lasts eight years, and students learn the first FL from the first to the eighth grade, whereas the second FL is learnt from the fourth to the eighth grade and is usually optional and students can choose it from several subjects offered. The survey for the purpose of this research study included teachers from schools in urban and rural areas, teachers teaching German as the first and / or the second FL, and teachers who had graduated from faculties of humanities and social studies and those who had graduated from faculties of teacher education.

The teacher's attitudes about the elements that matter to them in their selection of textbooks were assessed by a set of 11 items whereas the teacher's attitudes about language varieties in the textbooks included 10 items. Gender, years of work experience, qualifications (type of completed university study) and subject status (mandatory or optional FL) were independent variables, and the basic statistics, i.e. absolute (frequency) and relative values (percentages) were calculated. For the analysis of the results Dell Statistica computer program was used.

4. Results

In this research, the first aim was to identify elements that are important for teachers when selecting textbooks to teach German. This analysis was intended to show that compliance with the curriculum and personal experience play a more important role in teachers' selection of their FL textbooks than representation of different language varieties. The analysis in this part of the survey included 11 variables: In my selection of textbooks, it is important for me to have standard language exclusively (STL); In my selection of textbooks, it is important for me to have a representation of regiolects (REGIOL); In my selection of textbooks, it is important for me to have a representation of various language varieties (VLV); In my selection of textbooks, the name of the publisher is important (PUBL); In my selection of textbooks, the opinion of colleagues plays an important role (OPCOL); In my selection of textbooks, it is important for me to have a representation of sociolects (SOCIOL); In my selection of textbooks, the compliance of the textbook with the curriculum is important for me (COMPCUR); In my selection of textbooks, the name of the publisher is important (PUBL); In my selection of textbooks, the name of the author is important (AUTHOR); In my selection of textbooks, my personal experience is important (PEREXP); In my selection of textbooks, it is important for me to have a representation of medialects (MEDIOL); In my selection of textbooks, it is important for me to have a representation of regiolects (REGIOL).

In this part of our research study, the non-parametric median and mode were selected as the measures of central tendency. Table 1 shows that the most common values of the median were 4 (I agree) and 3 (I neither agree nor disagree). In other words, teachers from the sample either agreed with or were hesitant about eight statements in their assessment.
Table 1. Descriptive statistics for variables

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Legend: Min. – minimal value; Max. – maximal value; Skew. – Skewness of distribution; Kurt – roundness of distribution

Table 2. Sums of ranks and the average rank

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<th>Ranks of years of work experience</th>
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<th>Sum of ranks</th>
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Table 3. Descriptive statistics of the variable

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</table>

Legend: Min. – minimal value; Max. – maximal value; Skew. – Skewness of distribution; Kurt – roundness of distribution

They did not agree at all with two statements – the statement about the importance of textbook authors and the statement referring to the importance of the publisher. The variability of mode was slightly bigger. Specifically, its values show that there were some respondents (108) who completely disagreed
with the statement that personal experience was the most important factor in their selection of textbooks. This confirmed the results obtained in the aforementioned previous research [9] which also showed that teachers did not consider the language of the textbook or the representation of different language varieties as crucial elements in the choice of FL textbooks.

Kruskal-Wallis test showed a statistically significant difference (p < 0.05) among the three ranks of respondents with regard to the number of years of work experience in only one variable, namely that it is important for teachers that exclusively standard language should be represented in the textbook - H (2, 217) = 8.564; p = 0.014 - (see Table 2).

It can be seen from Table 3, in which non-parametric descriptive statistics are shown, that the curves indicating the distribution of the frequency of degrees of agreement with the statements from the questionnaire tend to be negatively skewed in all the variables. The kurtosis of the curves of the frequency of distributions also suggests a deviation from the normal distribution of results.

Regarding the attitudes of teachers about the use of various language varieties in German language textbooks by gender, Mann-Whitney U test did not show any statistically significant differences (p > 0.05) on any of the 10 items belonging to that part of the questionnaire. As for the number of years of work experience, Kruskal-Wallis analysis of variance showed a statistically significant difference - H (2, 197) = 7.183; p = 0.028 - only for one item: the textbook should include more examples of sociolects. The analysis showed that the respondents with the lowest and middle number of years of work experience agreed with the statement. By contrast, respondents with the highest number of years of work experience apparently think that tools should not include more examples of sociolects. In terms of the status of the subject, i.e. whether it is being taught as a mandatory or optional subject and in terms of the fact whether it is being taught as a first foreign language or as a second foreign language, Kruskal-Wallis analysis of variance did not show statistically significant differences among the three groups of respondents for any of the variables included in this current research study.

5. Conclusion

It can be concluded from the results of the previous and from this research study that representation of various language varieties is not one of the key elements when it comes to the selection of FL textbooks. It seems that regardless of the type of the institution they graduated from and the number of years of work experience and the status of the subject (optional / mandatory) the most important element in their selection of textbooks is personal experience. The item with reference to the importance of the representation of various language varieties for teachers' selection of textbooks has shown that the majority of teachers are indecisive because a considerable number of teachers have circled the neutral option that they "neither agree nor disagree", suggesting their insufficient familiarity with language varieties.

In the item In my selection of textbooks, it is important for me to have standard language exclusively, the respondents with the highest number of years of work experience are standing out because they most often agreed with this statement about the exclusive representation of the standard language as the key factor for their selection of textbooks with the statement on the exclusive representation of the standard language as a key factor for the choice of textbooks.

The majority of the teachers with a lower number of years of work experience said that they completely agreed with the above statement, but there were also those who did not agree with that statement. This suggests that teachers with fewer years of work experience are more open and more tolerant of language varieties other than the standard and they think that textbooks may include other language varieties in addition to the standard language.

The analysis of teachers' attitudes with reference to the representation of language varieties in FL textbooks showed that teachers had largely agreed with all the statements, presumably suggesting that the standard language should prevail. They were solely indecisive on the item referring to fact that the texts in which language varieties occur, i.e. authentic texts, are difficult for their students. One can thus assume that teachers, precisely because they believe that students are unable to master other language varieties in addition to the standard variety, think that textbooks should not include more examples of other additional language varieties. In the language, however, the distinction should not be made between "difficult" and "easy" vocabulary, but one should concentrate and focus attention on what is close to students (e.g. sociolects and medialects) and thus help them to deal with everyday real situations in the target language countries. Such realistic lects can be found in authentic texts, and precisely such texts should find their place in FL textbooks, and teachers would have to use them in their teaching lessons without any fear that they might possibly endanger the standard language. The first step towards such a
positive trend regarding the inclusion of other language varieties in addition to the standard in FL teaching are FL textbooks with more authentic texts.

6. References


Teaching Chemistry Using Mixed Mode Delivery Method for Foundation Year Health Students

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Abstract

Higher education students are expected to become independent learners, but they often drop their study due to considerable challenges in their first year. Aims and objectives of this research is to assess the benefit of a more-structured course for foundation year students. Method: A retrospective study was conducted to compare the results from a Chemistry of Biological Systems I course that is offered twice in foundation year. The comparison is between the traditional delivery of the course versus the mixed mode of the course for the academic years 2016 and 2017. Results: 113 students enrolled in this chemistry course in Trimester 2 (T2), 2016. Of those, 76 were considered repeaters (they failed in the previous iteration of the course). The majority of the repeaters (75%) passed the mixed mode course in T2. Likewise, 185 students enrolled in 1001MSC course in T2, 2017. Of those 103 students were considered repeaters and most of them (68%) passed the mixed mode course in T2. Conclusion: Students in the first year of their university study might not be ready to become independent learners. Courses that offer more support and structure are helping students to transition into university without delaying their degree and increasing retention of students in the university.

1. Introduction

Higher education has been undergoing a paradigm shift, moving away from teaching-as-instruction (what lecturers teach) towards student-centred learning approaches (what students do to learn) [1]. There has been great emphasis on the importance of developing and implementing educational plans and strategies to evolve students from dependent to independent learners [2]. For dependent learners, teachers are the directors of learning and the student role is to respond to the direction brought by the teacher. In other words, teachers tell the student what, how and when the content is or has to be learnt [3, 4]. Independent learners, on the other hand, are self-directing their learning activities; they can plan their study effectively without the need for teacher directions. For independent learners, the teacher’s role is limited to providing information and advice when needed [3, 4]. However, this approach might not benefit students in first year as there is a substantial gap between school and university life [5]. This warrants for additional support to help student transition to university and increase retention.

School of Medical Science, Griffith University is currently offering flexibility for students doing foundation year in health programs. Chemistry of Biological Systems I is offered in trimester I (T1) in traditional mode (face-to-face lectures, labs and drop-in workshops). The course is also offered in trimester II (T2) to permit mid-year intake. Additionally, students who fail in trimester I are able to repeat the course in T2, thereby allowing for their continued progression in their degree. The chemistry course is delivered in mixed mode in T2. All lectures are pre-recorded and uploaded online to allow flexibility to students. To ensure students remain engaged, the course comprises of face-to-face compulsory tutorial sessions. The tutorial sessions are 2 hours long, delivered weekly and structured on principles of active learning activities. Students discuss concepts learnt in the online lecture in small groups (5 – 10 students) in the first part of the tutorial. A tutorial workbook is designed to let help them check their understanding by completing a set of questions related to the weekly topic. In the second half of the tutorial, the whole class come together, and the lecturer goes through the difficult concepts on the board. Students are awarded 1% for every tutorial session they attend and once they complete the workbook questions, adding to the total of 10% from their overall grade. Students are advised to try and solve the workbook questions before they attend the tutorial, so they can identify the concepts for which they need further clarification and support.

2. Method

A retrospective study was conducted to compare the results from a chemistry of biological systems I course that is offered twice in foundation year. The comparison is between the traditional delivery of the course versus the mixed mode of the course for the academic years: 2016 and 2017.
Repeat Students (those who failed the course in T1 and enrolled again in T2) were sent an online survey to seek their views on both courses. The survey was delivered at the end of T2 so students can comment on their experience in the two offerings of the course. The survey was anonymous, and students responded voluntarily.

3. Results

113 students enrolled in 1001MSC course in T2, 2016. Of those 76 were considered repeaters. Only 9 repeaters responded to the online survey. 88% on them felt that they were not supported when they studied the traditional offering of the course. However, all of them felt they were supported in T2 offering of the course. The respondents were also asked to indicate the reasons for their performance in T1. Six students indicated that they failed in T1 because of the lack of time management.

185 students enrolled in 1001MSC course in T2, 2017. Of those 103 students were considered repeaters. 28 repeaters responded to the online survey. 80% of them felt they were not supported in T1 offering. On the other hand, 100% indicated they felt supported in the mixed mode offering of the course in T2.

In terms of reasons for their performance in T1, 16 students reported lack of time management as the contributing factor for their result in T1.

Participants from both years reported that the tutorial sessions and tutorial workbook were the main things that contributed to their learning and better performance in the mixed mode offering of the course. The results of the surveys were supported by the students’ performance.

For instance, most of the repeaters (68%) passed the mixed mode course in T2. The grade distribution of students who passed was Pass (45%), Credit (15%), Distinction (8%) and High distinction (2%).

Similarly, the majority of the repeaters (75%) passed the mixed mode course in T2. The grade distribution of students who passed was Pass (42%), Credit (24%), Distinction (4%) and High distinction (1%) e title.

4. Discussion

As showed in the results, the majority of repeat students, who failed the course in a previous offering, were able to pass the course in the mixed mode delivery in T2. All students who responded to the online survey indicated that they felt supported in the mixed mode courses versus being not supported in the traditional delivery of this course. This might be an indicator that students in first year are still transitioning into university from high school and they need structured courses that give them more directions while allowing for flexibility at the same time [3, 4]. Those students might not be ready to be independent learners yet and thus offering such courses will reduce the anxiety of attending university and increase student success.

A limitation of this study is that part of the reason repeaters may have such a high level of passing is because they are doing the course for the second time. This second exposure to the materials might have helped in achieving their results. This point will be further investigated in future studies. However, students’ qualitative data clearly indicate their preference towards the mixed mode over the traditional delivery course.

5. References


Optimization and Development of The Curriculum: Concept And Methodology

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Abstract

This article deals with the problem of educational curriculum optimization at the theoretical level, principles of teaching and curriculum development methodology. In the same time, the work argues for the concept of “curriculum development” from different perspectives: the theoretical framework, the structural framework, and the content framework.

1. Introduction

The term “optimal” (from Latin Optimus – the best) can be defined as “the adequate model” or as “the adequate variant” of activity, referring to the realization of the conditions and objectives specified in the context of concrete criteria/indicators. The criterion/indicator of optimization is a parameter which is based on the realization of a comparative evaluation of all possible decisions/activities and the result of that activity.

The problem of optimization, including curriculum, isn’t new. During history, the “optimization” was treated as the principle, as the method/methodology, as the strategy of obtaining the best results.

In the last decades, "optimization" is treated as an approach/theory based on educational principles and regularities because the process of optimization implies the conscious/scientific choices and models of activity in education.

From our point of view, optimization is not a method or a specific proceeding, but a theory that helps us to organize and to improve the learning process, and which deals with a system of didactic principles, educational content, teaching forms and methods and students’ real possibilities, and after a complex analyze can be taken conscious decisions that are scientifically grounded.

In this context can be established:

1) the principle of optimizing the educational process, as the part of the respective theory, that is based on a set of rules:

- the independence of objectives, of contents from the students' learning possibility;
- the interdependence and the connection between the tempo and learning efficiency;
- the learning efficiency is determined by the motivation versus an educational act;
- the learning efficiency is determined by the optimal combination of didactic methods and the forms of the learning organization;
- 2) criteria and methods of realization the optimization:

- the criterion of performance reached by every student in a specific context and in a specific period in comparison with the real level of students' knowledge;
- the criterion of realization the established time for teachers and for students, referring to the achieving the learning objectives;
- the criterion of adequate applications of efforts for an efficient realization of the learning process.

In fact, the process of optimization indicates teaching optimization (teacher’s activity) and learning, optimization (student's activities), that are based on the following ways:

- systemic and contextual projection of the learning activities;
- continued modernization of content and learning tasks, identifying main aspects;
- establish rational methods of teaching to achieve the projected objectives; the individual and differentiated approach to the teaching process;
- creation of specific conditions to assure the efficiency of learning;
- identification of different activities in order to economize time and to establish the optimal tempo of teaching-learning process;
- analyzing teaching results regard the criteria of teaching optimization;

Therefore, has proposed a unity (complex) approach of optimizing the learning process, that implies:
• in the proceedings of optimization include all the components of the learning process;
• taking into consideration the whole set of didactic principles;
• the consecutive realization of planned objectives, knowledge of students’ possibilities and of the potential of the learning activities, knowledge of the contents specific and of the learning forms in the process of establishing/identifying the didactic methods and the diversification of learning methods etc.

2. Literature Review

A modern educational curriculum optimization approach can be found in the work of Negreț-Dobridor the general theory of educational curriculum [4]. Negreț-Dobridor tries to develop the Dewe’s ideas, referring to the notions “curriculum development” and “curriculum improvement”, that in the author's opinion, they are close synonyms, although they are “relative distinct” phenomena [4].

The curriculum development refers to the projection of an absolutely new curriculum. The curriculum optimization refers to its improvement - to make to be better things that are already good. Actually, the idea of curriculum optimization rises to the rank of didactic principle. It must be mentioned that expression “curriculum development” can have different meanings:

• the appearance of new approaches in the framework of curriculum theory;
• the appearance of new elements or components in the curriculum structure;
• the appearance of the new curriculum products;
• the appearance of the new educational strategies.

As a rule, in the educational practice, the terms “curriculum optimization” and “curriculum modernization” are used as synonyms.

The same thing, Negreț-Dobridor does in his work [4], establishing the pentaphasic model of optimization the modern curriculum: the notions "curriculum development” and “curriculum optimization”, from the perspective of management changing, are considered synonyms. Therefore, it his convergent vision on the optimization of the modern curriculum, the author distinguishes 2 independent fundamental aspects:

• deontological aspect;
• Technical aspect.

The first refers to the expected and unexpected effects that can appear after the realization of some theoretical and applicative damages in the framework of educational curriculum optimization.

The second implies a specific technology based on the systemic, praxiological and methodological approach and on the rules of curriculum design. Negreț-Dobridor proposes a pentaphasic model of modern curriculum optimization/development:

1. Curriculum research: the diagnosis of the present state, the analysis of the curriculum and the prognosis of the development tendencies.
2. The curriculum projection: the reference concepts - a compulsory component of the curriculum, the principles, and instruments of curriculum projection.
3. The curriculum project evaluation through the expertise and critical analysis and by experiments.
4. The curriculum validation by the official authorities (for instance: the ministry of education.
5. The curriculum implementation that must be realized by the specialists in the framework of the curriculum management [4].

A general approach, referring to the curriculum development is that of Cristea, who analyzes models of curriculum development through construction, reconstruction, and deconstruction [1]. The author correlates these three models of curriculum with the educational paradigms: premodern, modern, and postmodern. In fact, from the postmodern perspective, the focus is on the continued curriculum reconstruction in relation to changes taking place in society.

If the educational approach through deconstruction generated the appearance of some domains/branches that are new between educational sciences, and, firstly, of the general theory of curriculum, then the educational approach through reconstruction refers to the permanent reconstruction of a whole: education, learning, and the curriculum projecting of education and learning [1].

Analyzed from the reconstruction perspective, the curriculum paradigm refers to the optimal realization of relations between psihocentrism and sociocentrism aspects, between educator and educated, between objectives-contents-methodology-assessment, and between teaching-learning-assessment. Therefore:

1. The “phenomenon” of optimization in education is approached at the level of theory;
2. The “phenomenon” of optimization is treated as didactic principle (Negreț-Dobridor);
3. The term “optimization” is not the synonym of the term “development”, but in educational practice, they are frequently used with the same meaning.
4. The “curriculum development” implies elaboration/projection of new curricula, but “curriculum optimization” implies a continued improvement of the existing curricula.
3. Contribution to Knowledge

From our point of view, the concepts “optimization” and “development” are part of a set of factors that assure the curriculum quality at the level of a product and at the level of a process, namely: research, projecting, implementation, monitoring, management. Each of these factors/dimensions realizes specific functions in concrete contexts.

The development of educational curriculum is a concept and an activity that implies:
- the development of curricular theory through new approaches/concepts etc.;
- the development of content and structural framework through the introduction of new curricular components/elements;
- creation of new curricular products/documents;
- elaboration of new educational technologies.

The curriculum development is a continuous process and it has the goal to adapt the curriculum to the permanent changes and tendencies of the curriculum development at the national and international level. The curriculum development is based on:
- the result of the scientific research;
- the experience of curricula implementation in universities;
- technological transfer, etc.

The educational curriculum optimization is a principle and an activity that implies “the improvement”, or “the correction of things that go wrong or are, no longer, good, or to do better things that are already good” [4].

Actually, the optimization means to do something to be better, with minimum effort and instruments, in a short time and to obtain quality and efficiency with optimal methods. Referring to curriculum, the principle of optimization is applied in the following contexts:

- In the case of projecting / re-projecting of educational curriculum with the goal of obtaining optimal curricular products, from the point of view of the educational process organization/realization.
- In this case, the curriculum can be designed or re-projected in relation with the initial approach, but the connection between curricular components must be better established, and the learning finalities must be adequate formulated. In this case, the optimization does not imply the curriculum development. It should be mentioned and the opposite phenomenon: the curriculum development not always assure its optimization.

For instance, the curriculum development from the perspective of focusing on competencies does not assure automatically the fact that this curriculum is an optimal document from the quality point of view. But, usually, curriculum optimization, in this context, is synchronized with curriculum development.

- In the case of learning process through the objectives redefining, the content reorganization, the choosing of didactic methods and principles, the learning individualization and differentiation; time monitoring, the creation of adequate conditions for learning, diversification of the forms of learning organization etc.

The efficient realization of the optimization principle at the level of process implies:
- the quality of the textbooks and of the methodological guides;
- the teacher professionalism;
- the students’ level of motivation and development;
- the quality of the conditions in which the educational process is done etc.

The efficient realization of the optimization principle at the level of process implies:
- the quality of the textbooks and of the methodological guides;
- the teacher professionalism;
- the students’ level of motivation and development;
- the quality of the conditions in which the educational process is done, etc.

Therefore, the concept of curriculum optimization is a part of a large approach that ensures the quality of learning. This concept can be presented as follows:

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Figure 1. Development / optimization in the curricular context
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The optimal curriculum at the level of the product is determined by:
- the experts in the curriculum in relation to the existence/established criteria;
- teachers in the process of implementation;
• students’ results in relation to the curriculum finalities.

The optimal curriculum at the level of the process is determined by:
• the inspectors/monitors in the domain;
• teachers through auto-evaluation;
• students' results in relation to the curriculum finalities.

Which curriculum can be named optimal at the level of the product?
• That curriculum that assures the efficient organization of the educational process at the level of the system and at the level of the process.
• That curriculum that is positive appreciated by the experts and by the teachers in relation to the criteria of quality.
• That curriculum that assures the student's development and formation in relation to his potential.

Which curriculum can be named optimal at the level of the process?
• That curriculum that through its structure, its logic, and its content can assure the curricular finalities achieving.
• That curriculum that through active/interactive didactic strategies can assure the curricular finalities realization.
• That curriculum that allows the achieving the objectives in the content of the time allowed.

The optimal curriculum does not mean the best curriculum, in general, but the best/the most efficient curriculum:
a) for a specific context, for the concrete conditions, and for teachers possibilities;
b) for a concrete phase and in relation with the students' level of preparation.

4. Conclusion

We can conclude that the learning results of one student or of a group of students can be optimized, but the results of another student or another group of students cannot be optimal. In other words, for each student must be established a proper optimal result. Therefore, the methods of curriculum development/optimization are deduced from the theories, from the principles, from the rules of the curriculum project, and from the rules of educational process realization.

It must be mentioned that does not exist a unique variant of curriculum optimization/development, but a diversity of variants. The problem lies in choosing of the most suitable variant in a given context. The theoretical foundation for developing the methodology for choosing the optimal variant is the systemic approach.

1. The curriculum optimization/development is a part of a larger theory - the educational curriculum projecting and implementation, realizing specific functions of this.
2. The curriculum optimization/development can be treated as a theory, as a principle, as a way of assuring the quality of the curricular documents and of the educational process.
3. The notions optimization, development, modernization, projecting / re-projecting, conception are not synonyms, each of them has a proper meaning and a specific function.
4. The process of optimization/development the curriculum is determined by the adequate conditions.
5. The curriculum optimization/development is a continued process, determined by the needs and the tendencies of the education at the national and international levels.

5. References
Lecturers’ Perceptions of Students’ Mathematical Preparedness for Higher Education in One Institute of Technology

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Abstract

Mathematics instruction in Ireland has undergone significant reform in recent times with the introduction of the Project Maths curriculum. As well as significant changes to curriculum content, changes were also made to the method of delivery – a particular requirement was the need to move away from traditional rote learning approaches which were viewed as endemic in mathematics classes in Ireland. Although mathematics is not a strictly compulsory subject in Ireland, almost all students in post-primary schools’ study mathematics for the Irish Leaving Certificate, due to matriculation requirements for higher education. Mathematics is considered an important component of many degree programmes [1]. Consequently, any changes in the delivery of mathematics in post-primary schools will inevitably impact on students as they transition to tertiary education. As part of a larger study, investigating students’ perceptions of their mathematical preparedness for higher education, a series of interviews were conducted with a number of lecturers with the responsibility of teaching first year mathematics across a variety of academic disciplines. The interviews investigated lecturers’ perceptions of new undergraduates’ mathematical skills according to the five strands of mathematical proficiency and their perceptions of the Project Maths curriculum. The findings of this study build on existing research that suggests that lecturers perceive new undergraduates to be struggling with mathematics during the transition to higher education [2–4].

1. Introduction

It is generally agreed that the transition to tertiary mathematics is difficult for many students [2]. The issue of mathematical preparedness is often referred to as the ‘mathematics problem’ in the literature which specifically refers to the level of mathematical preparedness and skills of students as they commence their undergraduate studies [6]. The ‘mathematics problem’ is not confined to mathematics intensive courses such as those within the Science, Technology, Engineering and Mathematics (STEM) disciplines [1]. The number of disciplines affected by the existence of the ‘mathematics problem’ has broadened to include disciplines that are classified as soft pure and soft applied, for example health and social sciences as well as other soft disciplines [1]. Lack of preparedness for undergraduate study have been reported in computing, engineering and science [7-9] and psychology, medicine and economics [10-12].

A number of studies in the UK [6, 14], expressed concerns about undergraduates’ mathematical fluency and their inability to deal with basic mathematical constructs upon entry to higher education. It was argued by [7], that the issue of mathematical preparedness was a result of the falling number of students taking A-level (advanced) mathematics, rather than the content of the qualification. It was stated that the existing A-level curriculum was sufficiently rigorous, but because of its perceived difficulty, it was off-putting for students. Consequently, this results in a much smaller pool of mathematically capable students presenting at third level education, and many third level institutions now have to accept much weaker students.

Several reasons are said to have contributed to the ‘mathematics problem’ within the Irish context including the policy of widening access to higher education which inevitably leads to variability in mathematical entry standards, large class sizes in higher education, changes in pedagogical approaches and general difficulties associated with the transition to higher education [15]. The Irish Leaving Certificate and the points system which is primarily used for selection purposes to higher education have exacerbated the situation [16]. The consequence of the ‘mathematics problem’ is such that many higher-level institutions in Ireland now provide remedial support for those learners deemed ‘at risk’.

2. Mathematics education in Ireland

The vast majority of students who progress to tertiary education have studied mathematics
throughout their time in secondary school [13]. Although, mathematics is not a strictly compulsory subject, matriculation requirements for entry to tertiary education requires students to study mathematics in their senior years of schooling [20]. During secondary school, students are formally assessed on two occasions, the Junior Certificate and the Leaving Certificate. The Leaving Certificate is the final examinations in the Irish secondary school system. These examinations are overseen by the State Examinations Commission (SEC). Students usually complete the Leaving Certificate at the age of 17-18 years.

Matriculation is administered by the Central Applications Office (CAO), following requirements set out by third level institutions and universities. In order to gain entry to tertiary education, students need to have passed English, Irish and Mathematics. Some courses have specific requirements’, for example, engineering and science disciplines require mathematics and/or a physical science. When demand exceeds supply of a course, the CAO awards points to candidates based on their performance on six subjects. The majority of students take between six and eight subjects, so points are awarded based on the six highest scoring subjects. Each subject is examined at one of three levels: Higher, Ordinary or Foundation. Foundation level can only be completed in two subjects: mathematics and Irish, all other subjects must be taken at either Higher level or Ordinary level.

3. The Leaving Certificate Mathematics curriculum

According to the NCCA [5], the objectives of Leaving Certificate Mathematics are that learners develop mathematical proficiency as characterised by five key areas:

- **Conceptual understanding** - comprehension of mathematical concepts, operations, and relations
- **Procedural fluency**: skill in carrying out procedures flexibly, accurately, efficiently, and appropriately
- **Strategic competence**: ability to formulate, represent, and solve mathematical problems in both familiar and unfamiliar contexts
- **Adaptive reasoning**: capacity for logical thought, reflection, explanation, justification and communication
- **Productive disposition**: habitual inclination to see mathematics as sensible, useful, and worthwhile, coupled with a belief in diligence, perseverance and one’s own efficacy (p. 6).

The syllabus content is set out in five strands: Statistics and Probability; Geometry and Trigonometry; Number; Algebra and Functions. Students can choose to complete mathematics at one of three levels: Foundation, Ordinary and Higher. The levels are progressive, meaning that a student working at Ordinary Level is expected to be competent at Foundation Level material. Similarly, Higher Level students are expected to have engaged with learning outcomes at both Foundation and Ordinary levels.

4. The current study

Given the recent reforms to mathematics instruction in Ireland with the introduction of Project Maths, as well as the wide range of degrees potentially affected, it was desirable to understand how these changes have impacted on students as they transition to tertiary level. We were particularly interested in lecturers’ perceptions of students’ mathematical capabilities upon entry to tertiary level and their opinions of the Project Maths curriculum. This formed part of a larger study investigating students’ experiences of mathematics in post-primary school and their perceptions of how it prepared them for tertiary level.

5. Methodology

5.1. Sampling

Semi-structured interviews were conducted with a selection of lecturers from a wide variety of academic disciplines. Participants were invited to be interviewed regarding their opinions of Project Maths and the mathematical capabilities of first year undergraduates. These lecturers were purposefully selected based on their experiences of teaching first year mathematics and were invited via email to participate in face-to-face interviews. In total, nine lecturers consented to the face-to-face interviews. Table 1 indicates the number of participants per academic discipline as well as discipline classification.

<table>
<thead>
<tr>
<th>Discipline</th>
<th>N Gender</th>
<th>Hard/Soft Pure/Applied</th>
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<tbody>
<tr>
<td>Engineering</td>
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<td>Hard applied</td>
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<td>Computing</td>
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<tr>
<td>Science</td>
<td>2 (1 M, 1 F)</td>
<td>Hard pure</td>
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<tr>
<td>Accountancy</td>
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<td>Soft applied</td>
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<tr>
<td>Business</td>
<td>1 (F)</td>
<td>Soft applied</td>
</tr>
<tr>
<td>Learning Support</td>
<td>1 (F)</td>
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</table>
5.2. Procedure

During the interviews, the participants were asked about the:

- Mathematical preparedness of first year undergraduates according to the five strands of mathematical proficiency (conceptual understanding, procedural fluency, strategic competence, adaptive reasoning and productive disposition).
- Project Maths curriculum, in terms of whether they think the ‘mathematics problem’ exists today, and whether the Project Maths curriculum has alleviated the ‘mathematics problem’.

5.3. Analysis

Interviews lasting on average 35 minutes were digitally recorded, summarised, transcribed and coded in order to identify common themes. Prior to the data analysis phase, all of the participants were debriefed on the summarised data to confirm that the main themes were an accurate reflection of their beliefs and to edit if necessary.

6. Findings

6.1. Overall perceptions

Regardless of academic discipline (STEM versus non-STEM), several common themes emerged from the data. Eight of the nine lecturers suggested that many undergraduates lacked conceptual understanding upon entry to higher education. The ‘missing basics’ varied according to academic discipline. One of the lecturers within a STEM discipline claimed that new undergraduates were unfamiliar with the language associated with mathematics and the missing basics included powers, indices, logarithms, number bases, dimensions, areas and volumes and changing from one unit to another. This lecturer further added that students struggle with fractions and it is necessary to begin with the fundamental core concepts. These sentiments were echoed by the remaining four STEM lecturers and simple algebra, transposing formulae, using symbols and mathematical language were also cited as problematic areas for new undergraduates.

Apart from one non-STEM lecturer, the remaining non-STEM participants tended to agree with the beliefs of the STEM lecturers. One of these lecturers suggested that grade inflation was partially to blame, while a further two suggested that students were too calculator-dependent. Only one non-STEM lecturer indicated that students had a ‘grasp of the basics’, but suggested that some very low-level skills were still missing, such as fractions and using a calculator effectively. All nine lecturers agreed that the majority of new undergraduates within this particular Institute of Technology would have completed the Ordinary level Project Maths curriculum. These lecturers claimed that it was easy to identify students who had completed the Higher-level curriculum as they usually ‘stand out’ in terms of their mathematical ability and are typically more confident, and are more willing to participate in class discussion.

Five STEM and two non-STEM lecturers suggested that incoming undergraduates were not procedurally fluent upon entry to higher education and all lecturers indicated that incoming undergraduates were not strategically competent. It was the opinion of these lecturers that new undergraduates require instruction and guidance in order to solve both familiar and unfamiliar problems. Only one STEM lecturer claimed that incoming tertiary students were ‘not bad problem-solvers’, adding that ‘language of mathematics is a barrier to learning mathematics and solving problems in general. They are better than they think, confidence is an issue’.

Four STEM lecturers claimed that incoming tertiary students were not aware of the importance of mathematics for their academic discipline. One of these lecturers described the ‘culture shock’ experienced by students when they realise the importance of mathematics to their STEM discipline. These four lecturers claimed that students do not have the necessary language skills, are not able to apply mathematics to real-life situations and generally lack confidence in their mathematical ability. Only one STEM lecturer indicated that apart from statistics, students in general have difficulty accepting the need for mathematics. Only one of the non-STEM lecturers claimed that students were aware of the importance of mathematics for their particular discipline and further added that the Project Maths curriculum advantaged this particular discipline due to the increased emphasis on probability and statistics. The remaining non-STEM participants tended to agree with the STEM participants, that students have difficulty accepting the need for mathematical thinking across all areas.

All of the lecturers indicated that many new undergraduates were unable to articulate their understanding of mathematical problems. Three STEM lecturers claimed that students do not have the necessary language skills, with one claiming that their language is almost ‘child-like’ and ‘totally inappropriate’. Only one STEM lecturer claimed that students have the ability, but lack confidence, although it is ‘not justified’. Two non-STEM lecturers agreed that students do not have the necessary mathematical language skills upon entry to higher education. Both of these lecturers agreed that stronger students have the ability, but weaker students generally struggle.
Eight of the nine lecturers suggested that there is an issue of ‘mathematical preparedness’ for new undergraduates. One of the STEM lecturers described the ‘fear’ that students experience during the transition to higher education. This lecturer further added that students entering higher education with a D3 or even a C3 in the Ordinary level (Grade C or below A-level equivalent) curriculum are ‘definitely not prepared’. Another STEM lecturer described the ‘snowball effect’ of mathematical under-preparedness which not only affects first year of undergraduate study but can manifest itself in later years due to a ‘fundamental lack of ability’. This lecturer also added that students seem to ‘fall at the lowest fences’ due to their lack of confidence. Two STEM lecturers claimed that Institutes of Technology are more susceptible to the ‘mathematics problem’, as the majority of undergraduates who present at IOT’s are more likely to have completed the Ordinary level curriculum. One of the STEM lecturers claimed that Project Maths has made the ‘mathematics problem’ ‘worse’, as ‘a lot of the basics have been lost’. The final STEM lecturer claimed that the lecture system which is characteristic of higher education ‘does not work’ and ‘secondary school kids are nearly always lost in the background’, with a tendency to be more interested in the social aspects of higher education.

A non-STEM lecturer claimed that new undergraduates were not only mathematically deficient, but also lacked English proficiency – ‘their written English skills are very modest’. This lecturer further added that ‘I see students with 3 and 400 points coming in and they would have been good students once upon a time – but it doesn’t seem to be the case anymore’. A different non-STEM lecturer described the situation as ‘frightening’ and that ‘of all the things I’ve seen in my academic career – the level of maths and IT, it’s getting worse – but the maths is really, really a problem’. The non-STEM lecturer who claimed that the ‘mathematics problem’ does not exist today indicated that there is a ‘fear of maths’, and totally disagreed with the 25 bonus points being awarded to students who sat the Higher level examination. This lecturer added that the Higher-level curriculum was much too difficult and ‘if the paper was easier’, it would encourage more students to complete the Higher-level examination which could solve the problem of ‘underpreparedness’ for third level study.

One non-STEM lecturer who has been lecturing mathematics for 25 years, indicated that in comparison to mathematical preparedness of students 10 years ago only a ‘slight decrease was evident’ from the introduction of Project Maths. Eight of the nine lecturers agreed with these sentiments. One of the STEM lecturers claimed that students entering higher education were much better prepared 10 years ago as ‘they had their basic algebra’. Two STEM lecturers specifically mentioned the literacy demands that Project Maths places on the learner with both stating that they were ‘unnecessary’, and one of these lecturers added that more emphasis is required on ‘mathematical foundations’ and less ‘emphasis on applications’ stating that Project Maths is ‘okay for business type disciplines’. Two STEM lecturers specifically mentioned the omission of key topics as a concern for STEM type disciplines. One of these STEM (non-engineering) lecturers added that ‘I can’t see how it’s preparing them for engineering’ adding that the removal of key topics such as linear algebra was particularly concerning.

Three non-STEM lecturers claimed that students 10 years ago would have been much better prepared for their disciplines. One of these lecturers added that students were entering higher education today with a much ‘better tally of points – but that isn’t being translated in the level of preparedness’ adding that it must be a ‘worry’ for the engineering discipline where ‘maths is a strong underlying component’. Another non-STEM lecturer added that students 10 years ago ‘would have understood the basics’ as well as having a ‘good grasp of basic algebra’. Another non-STEM lecturer remarked that even though students are ‘more academically inclined’ and are entering higher education with much better Leaving Certificate points, a ‘slight decrease in mathematical skills’ was evident. Only one non-STEM lecturer saw the benefit of Project Maths stating that students are ‘better prepared now’ compared to 10 years ago and attributed this directly to the Project Maths curriculum being ‘more practical’, so it better prepares students for this particular non-STEM discipline.

7. Discussion

The findings of this study build on existing literature that suggests that lecturers perceive new undergraduates to struggle mathematically during the transition to tertiary mathematics [2–4]. Despite the wide range of disciplines, there were several common findings regarding perceptions of Project Maths and the ‘mathematical preparedness’ of new undergraduates. One of the main issues regarding conceptual understanding was that many new undergraduates lack some very basic concepts and skills, such as algebraic manipulation, fractions and the appropriate use of units. This finding was particularly concerning for lecturers within the STEM disciplines, and lecturers were quite surprised by student’s general lack of ability. The case of the ‘missing basics’ resonates with a similar study by [2], in which 78% of the lecturers who participated in their study, reported that new undergraduates had problems with basic algebra, such as formula manipulation and solving equations.

Many of the participants in this current study indicated that the majority of new undergraduates were not procedurally fluent nor strategically
Many of the lecturers agreed that students required guidance when solving both familiar and unfamiliar problems. In terms of familiar problems, one lecturer described it as a ‘hand-holding’ activity and some students were often reluctant to ‘put pen to paper’, and in terms of unfamiliar problems, another lecturer claimed that if the information is ‘skewed in any way – they would struggle’. These findings also resonate with the findings of [2], in which it was claimed that students often struggle to start a problem and if presented with a template, they typically do much better.

All of the participants suggested that new undergraduates had difficulty applying mathematics into unfamiliar contexts and typically manifests itself with difficulty ‘translating’ between mathematics and their particular discipline. Additionally, in STEM disciplines, which are more mathematically inclined, lecturers tended to agree and were quite surprised that new undergraduates failed to see the relevance of mathematics for their discipline. However, the nonSTEM lecturers agreed with these sentiments. This is in spite of the fact, that one of the underlying principles of the Project Maths curriculum is the application of mathematics using real-world problems. All of the lecturers fundamentally agreed that students who take the Higher-level Leaving Certificate mathematics examination paper are much more mathematically prepared for higher education, a finding which is consistent with a recent study [2].

The lecturers who participated in this study suggested that it was easy to identify new undergraduates who experienced the Higher-level Project Maths curriculum, as they tended to be more confident in their mathematical ability, a finding which also resonates with [2]. Research also suggests that mathematical confidence can influence students’ ability in first year tertiary mathematics [17]. Lecturers in this current study suggested that students are often reluctant to speak in class and take part in discussion and lack of confidence was cited as a possible reason, a finding which was reverberated by [18]. Several of the lecturers in this current study indicated that many new undergraduates struggle with the language associated with mathematics. This finding also resonates with research conducted by [18], who also suggested that many students struggle with the correct use of terminology and notation and indicated that ‘their use of notation often is characterized by an instrumental approach based on manipulation rather than an understanding of the underlying concepts’. This has a ‘knock-on’ effect in that it makes it more difficult for students to understand definitions which in-turn affects their ability to ask sensible questions, or to contribute in classroom discussions.

The majority of lecturers in this study suggested that the ‘mathematics problem’ still exists today inspite of the introduction of the Project Maths curriculum. This was particularly concerning for STEM lecturers who expected that new undergraduates would have a firm understanding of basic mathematical constructs such as logarithms, powers, indices and fractions. However, the nonSTEM lecturers confirmed that many new undergraduates were not exempt from the ‘mathematics problem’ as similar concerns were raised. Only one of the non-STEM lecturers suggested that the ‘mathematics problem’ does not exist today and indicated that the Project Maths curriculum has alleviated the situation and undergraduates entering higher education today were much better prepared than those who entered higher education 10 years ago. Three lecturers (two STEM and one non-STEM) expressed concerns in relation to how Project Maths could possibly prepare students for their engineering discipline, with one of these lecturers citing that because of the removal of key topics ‘I cannot see how it is preparing them for engineering, they don’t do linear algebra, matrices. Cannot do engineering without linear algebra – it’s core’. This particular finding supports concerns raised by Engineers Ireland in 2010 [18], about the dropping of vectors, matrices and reduction in integral calculus in the Leaving Certificate syllabus.

8. Conclusion

One of the primary aims of the Project Maths curriculum was to improve the transition to tertiary education and to equip students with the necessary skills in order to cope with mathematical demands at third level [19]. However, the findings of this study suggest that this may not be presently the case, a finding which resonates with other recent studies [2,34, 19]. Students who have been taught under the Project Maths curriculum have been entering higher education since 2012, and eight of the nine lecturers in this study suggested that they have been no marked improvement in ability. The study carried out by Prendergast et al. [19] was published in 2017, with data collected from lecturing participants in 2015, and participants were informed that the researchers were neither condemning nor endorsing the Project Maths curriculum, as it was still in its infancy, but were primarily concerned with how the reform was affecting the transition to tertiary education. The findings of this current study suggest that students are still experiencing difficulties with the transition to tertiary education, and Project Maths has not alleviated the situation. While it was acknowledged in [19] that it would be 2017 before the first cohort of new undergraduates who had experienced all five strands of Project Maths would enter higher education, this current study would agree with [19] that since Project Maths is still in its infancy, perhaps it is suffering ‘implementation problems’.
All of the lecturers in this current study suggested that undergraduates who experienced the Higher-level curriculum tended to be much better prepared mathematically for higher education than their counterparts who completed the Ordinary level curriculum. Perhaps a solution to this problem is to increase the rigor of the Ordinary level curriculum while simultaneously ‘softening’ the Higher-level curriculum and possibly re-introducing some of the topics which had been part of the preceding curriculum. Increasing the rigor of the Ordinary level curriculum and the reintroduction of topics would benefit students wishing to pursue STEM disciplines and could alleviate concerns identified by a number of lecturers in this study as well as address Engineers Ireland concerns [18]. Softening the Higher-level curriculum as suggested by one of the lecturers who participated in this research could also encourage more students to undertake the Higher-level Leaving Certificate examination paper.

9. References


Session 5: Global Issues in Education and Research

Title: Plagiarism: Student Perspectives  
(Authors: Noleen M. Pisa, Sumayah Goolam-Nabee)

Title: Transforming the Irish Higher Education System through Merger and the Creation of Technological Universities: Facilitatory and Inhibitory Factors  
(Author: Allison M. Kenneally)

Title: Teachers’ Broken Relationship with Teacher Education: Living the Reality and Rethinking Practices  
(Author: Mohammad Manasreh)

Title: Antecedent-Based Learning Environments: An Exploration of Implementation in the Community for Individuals with Autism Spectrum Disorders  
(Author: Camille M. Brandt)
Plagiarism: Student Perspectives

Pisa, Noleen M and Goolam-Nabee, Sumayah
Department of Transport and Supply Chain Management, University of Johannesburg
South Africa

Abstract

Context. Universities are often required to lay the ethical foundation of student behaviour and none is more prevalent than the issue of plagiarism. Plagiarism is a violation of academic integrity although it is not specific to the academic community alone. The aim of this paper is to assess students’ understanding of plagiarism and plagiarism policies, the extent to which they engage in plagiarism practices, and their perceptions on the adequacy of training workshops on writing practices for undergraduate and post-graduate students at a metropolitan university in South Africa. Problem and results. Contradictory evidence was found about the students’ understanding of plagiarism. The prevalence of plagiarism was perceived as low amongst students. The students seemed to understand plagiarism policies as the majority indicated awareness of departmental penalties for student plagiarism and perceived these penalties to be fair. Additionally, the results revealed that different faculty departments placed equal emphasis on plagiarism and that the students perceived the university and the department’s workshops on academic writing and plagiarism to be adequate. Solution. This study highlights that South African universities mirror the global trend of increasing student plagiarism practices and that efforts to improve academic integrity should adopt global best practices while taking into account local characteristics.

1. Introduction

The requirements of higher education have evolved to incorporate higher demand against limited capacity, rising cost of tuition fees and the inclusion of non-Eurocentric voices. According to Siemens and Matheos [1] today’s contemporary university must balance the challenges of globalisation, mass expansion and economic uncertainty while linking new technology with new learning methods and content. Universities are often required to lay the ethical foundation of student behaviour and none is more prevalent than the issue of plagiarism. Plagiarism is a violation of academic integrity although it is not specific to the academic community alone. Some well-known examples of plagiarism by academics include social movement leader, Martin Luther King Jr., German minister of education, Anette Schavan, and, in the non-academic context, musician Ed Sheeran. While accusations of plagiarism did not hinder King’s leadership, Schavan was forced to resign and Sheeran had to settle a $20 million lawsuit [2]. Plagiarism is a widespread practice driven by readily available information from internet sources. This in turn places more pressure on students to be more accountable and to create original work as the use of similarity detection tools, such as Turnitin, have become more widespread. Furthermore, institutions have differentiating strategies and attitudes towards plagiarism; either failing to warn students about plagiarism and its consequences or imposing such serious consequences that discourage any unoriginal work [3]. The aim of this paper is to assess students’ level of understanding of plagiarism, the extent to which they engage in plagiarism (plagiarism practices), their understanding of their department’s plagiarism policy and their perceptions on the adequacy of the University’s and the department’s training workshops on writing practices and plagiarism amongst undergraduate and post-graduate (Honours and BTech) transport and logistics students at a metropolitan university in South Africa. The department refers to the specific department in which the students’ major subjects were housed.

2. Literature review

The earliest case of plagiarism can be found in Rome, when poet Martial discovered that his work was being copied and recited without acknowledgement [4]. Modern ideologies around plagiarism are based on legal accounts of literary property in eighteenth-century England [5]. There are no absolute definitions of plagiarism and as a result the act may include a range of actions from misquoting to fraud [6]. It is generally accepted that plagiarism refers to “the action of presenting another person’s work or ideas as one’s own” [7:196]. According to Hoxham [8:1] academic plagiarism occurs when, “a writer repeatedly uses more than four words from a printed source without the use of quotation marks and a precise reference to the original source in a work presented as the author’s own research and scholarship”. Hoxham [8] further includes continuous paraphrasing without argument of other perspectives as plagiarism. Devlin and Gray
[9:182] group academic plagiarism with “other cheating behaviour such as taking notes into the exam, fabricating a bibliography, lying about personal circumstances to get special considerations and other similar actions”. Turnitin, which is touted as the leading academic plagiarism detector reports ten types of unoriginal work, known as the plagiarism spectrum [10]. The spectrum is a result of a worldwide survey of almost 900 secondary and higher education institutions and reflects the role that the internet and social media plays in student writing.

2.1 General plagiarism trends in higher education

Plagiarism is a global pandemic. In 1991, a study by Rutgers University reported that from a sample of 16,000 students at 31 United States universities, 66% had admitted to plagiarism [11]. A survey by McCabe [12] of 83 different universities across the US and Canada revealed that a significant number of students had admitted to either; working with others on an individual assignment (68%), paraphrasing or copying from a written source without footnotes (63%), paraphrasing or copying from internet sources without footnotes (60%) or receiving unpermitted help from someone on an assignment (37%).


2.2 Causes of plagiarism in higher education institutions

The practice of plagiarism is not new in the era of extensive internet access. Research has, however, indicated that mass sharing of media and other resources on the internet compels students to consciously plagiarise either owing to laziness or convenience [9]. In self-reported cases of plagiarism, students cited time constraints and deadlines (67%), overloaded course requirements (62%), difficulty of assignments or projects (56%) and the desire to obtain high grades (56%) to justify plagiarism [21].

Other notable reasons for high incidences of plagiarism are the fear of failure [9, 22, 23], pressure to perform academically well [23-26], financial concerns [9] and personal or family problems [23]. In 2015, British Universities were affected by thousands of cases of academic misconduct. Of these, 35% were cases from non-EU students [27]. Stereotyping non-native English speakers as more prone to plagiarism is speculative [28]. However, cultural perspectives, in terms of language and learning methodologies impact the inclination of students to plagiarise at Western institutions [14]. Chien [16] expresses that for non-English speaking students to understand plagiarism, English proficiency and basic academic writing skills need to be rooted in their native culture. Lund [29] is of the opinion that universities need to understand the cultural dynamics of second language English speakers and incorporate these findings into plagiarism policies.

With a greater number of higher education institutions moving towards e-learning, there is a perceived notion that distance education learners are more inclined to plagiarism. However, Ison [30] have found no significant difference between online and traditional learning environments as students mostly use the same research sources. The nature of the assignment may also determine the propensity to plagiarise. Youmans [31] found less similarity and plagiarism in written assignments where the number of citations students used remained optional. As such, there remains no definitive answer as to why students in higher education institutions plagiarise.

3. Methodology

3.1 Respondents and procedure

In 2016, the researchers administered a questionnaire to students enrolled for transport economics and logistics management modules at a metropolitan university in South Africa. Participation in the survey was during class time and was both voluntary and anonymous. The students were primarily drawn from the undergraduate pool, namely the first, second, and third year students, as well as the post-graduate pool, which comprised BCom Honours and BTech students. The questionnaires were administered in the second semester of the year in which the data was collected. This was deemed to be important so as to ensure that first year students would have completed some assessments at university, which required research and would therefore have learnt about plagiarism.

3.2 Survey Instrument

The four part self-completed questionnaire was designed to collect information on four measures. These were namely: the students’ understanding of plagiarism (7 items), the extent to which they engage in plagiarism (plagiarism practices; 9 items), their understanding of department’s plagiarism policy (6 items) and their perceptions on the adequacy of the
University’s and the department’s training workshops on writing practices (4 items). The items were rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The reliability of the four measures was tested by calculating the Cronbach alpha coefficients as shown in Table 1. The reliability scores for understanding of department’s plagiarism policy and adequacy of the University’s and the department’s training workshops were above 0.7 indicating that these scales were reliable. On the contrary, the measures for understanding plagiarism and plagiarism practices had lower alpha values of 0.596 and 0.694 respectively, although an alpha value of 0.5 is sufficient [32]. Descriptive statistics were applied to the data collected on the four measures. Additionally, data on the students’ age, academic discipline and time spent at university were collected.

Table 1. Reliability scores

<table>
<thead>
<tr>
<th>Measure</th>
<th>Cronbach alpha</th>
</tr>
</thead>
<tbody>
<tr>
<td>Understanding of plagiarism</td>
<td>0.596</td>
</tr>
<tr>
<td>Plagiarism practices</td>
<td>0.694</td>
</tr>
<tr>
<td>Understanding of DTSCM’s plagiarism policy</td>
<td>0.725</td>
</tr>
<tr>
<td>Adequacy of the University’s and the DTSCM’s training workshops</td>
<td>0.745</td>
</tr>
</tbody>
</table>

4. Results and discussion

The data were tested for normality, skewness, kurtosis and outliers and were found to be sufficiently normally distributed.

4.1 Demographic profile of the respondents

Of the 289 students who completed the questionnaire (Table 2), 45.7% were males while 54.3% were females. The racial profile of the respondents comprised Blacks (74%), Whites (14.9%), Indians (7.6%), Coloured’s (3.1%) and Asians (0.3%). As the target population was students enrolled for Logistics and Transport Management modules, 76.8% and 12.8% of the respondents were enrolled for these degrees respectively. The rest (10.4%) of the respondents majored in Marketing Management, Retail, Information and Hospitality Management. With regard to the academic year in which the students were enrolled for, 60 were first year, 110 second year, 87 third year undergraduate study while the post-graduate proportion comprised 5 Btech and 27 BCom Honours students respectively (see Table 2).

Table 2. Demographic profile of the respondents

<table>
<thead>
<tr>
<th>Gender</th>
<th>n</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>132</td>
<td>45.7</td>
</tr>
<tr>
<td>Female</td>
<td>157</td>
<td>54.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Race</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Black</td>
<td>214</td>
<td>74.0</td>
</tr>
<tr>
<td>White</td>
<td>43</td>
<td>14.9</td>
</tr>
<tr>
<td>Indian</td>
<td>22</td>
<td>7.6</td>
</tr>
<tr>
<td>Coloured</td>
<td>9</td>
<td>3.1</td>
</tr>
<tr>
<td>Asian</td>
<td>1</td>
<td>0.3</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Degree registered</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Logistics Management</td>
<td>222</td>
<td>76.8</td>
</tr>
<tr>
<td>Transportation Management</td>
<td>37</td>
<td>12.8</td>
</tr>
<tr>
<td>Marketing Management</td>
<td>20</td>
<td>6.9</td>
</tr>
<tr>
<td>Retail Management</td>
<td>3</td>
<td>1.0</td>
</tr>
<tr>
<td>Hospitality Management</td>
<td>1</td>
<td>0.3</td>
</tr>
<tr>
<td>Information Management</td>
<td>4</td>
<td>1.4</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
<td>2.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Academic year</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Year Undergraduate</td>
<td>60</td>
<td>20.8</td>
</tr>
<tr>
<td>2nd Year Undergraduate</td>
<td>110</td>
<td>38.1</td>
</tr>
<tr>
<td>3rd Year Undergraduate</td>
<td>87</td>
<td>30.1</td>
</tr>
<tr>
<td>4th Year BTech</td>
<td>5</td>
<td>1.7</td>
</tr>
<tr>
<td>4th Year Honours</td>
<td>27</td>
<td>9.3</td>
</tr>
</tbody>
</table>

4.2 Plagiarism perceptions

The scores for ‘strongly disagree’ and ‘partially disagree’, as well as for ‘partially agree’ and ‘strongly agree’ were combined into a single score for all measures. A mean score above 3 implies that the majority of the students agree with the statement. A mean score of less than 3 implies that the majority of respondents disagree with the statement. Table 3 shows the frequencies, percentages and mean scores of the students’ understanding of plagiarism. The majority of the students seemed to understand what plagiarism is, as the mean scores of four of the seven statements were above 3. However, a closer analysis of the statements with mean scores less than 3 suggests that the students are not fully aware what plagiarism entails. For the statement with the lowest mean score, “Information on the internet is freely available and therefore it is acceptable to copy and paste passages without citation” (Mean = 1.88) 73.7% of the students strongly/ partially disagreed with the statement. The high incidence of internet plagiarism can be attributed to students viewing the internet as “fair use” [33:161], easy access essay hubs and paper mills [12] and the simplicity of illicit cutting and pasting [33]. Unintentional plagiarism resulting from ignorance of plagiarism conventions, inadequate training or a lack of understanding of what plagiarism actually is accounts for a large percentage of academic dishonesty [34-36]. Many student consider intentional plagiarism and getting
Students’ understanding of plagiarism

Caught to be trivial matters especially if they consider the risk to be low [37:13, 38:2].

Table 4 shows that the prevalence of plagiarism practices is low. The mean scores for eight of the nine statements were below 3. The statement “Plagiarism at the university is widespread” had a mean score of 3.09 implying that the majority of the students were neutral (neither agree nor disagree).

Table 4. Frequencies and mean scores of students’ plagiarism practices

<table>
<thead>
<tr>
<th>Understanding Plagiarism</th>
<th>Strongly Disagree/Partially disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Partially agree/Strongly agree</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>An assignment submitted with passages copied directly from a book or article without citation is considered plagiarism.</td>
<td>30</td>
<td>18</td>
<td>241</td>
<td>4.41</td>
</tr>
<tr>
<td>Information on the internet is freely available and therefore it is acceptable to copy and paste passages without citation.</td>
<td>213</td>
<td>29</td>
<td>47</td>
<td>1.88</td>
</tr>
<tr>
<td>Copying text directly from sources (books, articles, internet etc.) is a means for me to survive the academic world.</td>
<td>187</td>
<td>57</td>
<td>45</td>
<td>2.09</td>
</tr>
<tr>
<td>I do not know how to reference a source.</td>
<td>189</td>
<td>41</td>
<td>59</td>
<td>2.22</td>
</tr>
<tr>
<td>Turn-it-in is a fair tool to assess plagiarism.</td>
<td>63</td>
<td>32</td>
<td>194</td>
<td>3.74</td>
</tr>
<tr>
<td>I am more aware of plagiarism because of Turn-it-in.</td>
<td>34</td>
<td>34</td>
<td>221</td>
<td>4.05</td>
</tr>
<tr>
<td>Paraphrasing is not plagiarism.</td>
<td>74</td>
<td>68</td>
<td>147</td>
<td>3.35</td>
</tr>
</tbody>
</table>

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If I have knowledge that a fellow student has plagiarised, I will report it to my lecturer.

The results (Table 5) reveal that the students partially agreed to understanding the department’s policies on plagiarism as the majority partially agreed that they were aware of the department’s penalties for student plagiarism (mean=3.52) and that they perceived these penalties to be fair (mean=3.60). Additionally, the results revealed that the department compared to other departments in the faculty, and that it places the same emphasis on plagiarism (Table 5).

<table>
<thead>
<tr>
<th>Understanding of departmental plagiarism policy</th>
<th>Strongly Disagree/Partially disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Partially agree/Strongly agree</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>I am aware of the departmental policy on penalties for student plagiarism.</td>
<td>72</td>
<td>46</td>
<td>171</td>
<td>3.52</td>
</tr>
<tr>
<td></td>
<td>24.9%</td>
<td>15.9%</td>
<td>59.2%</td>
<td></td>
</tr>
<tr>
<td>I feel that the penalties for student plagiarism according to the departmental policy are fair.</td>
<td>42</td>
<td>93</td>
<td>154</td>
<td>3.60</td>
</tr>
<tr>
<td></td>
<td>14.5%</td>
<td>32.2%</td>
<td>53.3%</td>
<td></td>
</tr>
<tr>
<td>I do not understand the penalties for student plagiarism according to the departmental policy.</td>
<td>158</td>
<td>79</td>
<td>52</td>
<td>2.38</td>
</tr>
<tr>
<td></td>
<td>54.7%</td>
<td>27.3%</td>
<td>18%</td>
<td></td>
</tr>
<tr>
<td>This department is not concerned with plagiarism.</td>
<td>168</td>
<td>79</td>
<td>42</td>
<td>2.19</td>
</tr>
<tr>
<td></td>
<td>58.1%</td>
<td>27.3%</td>
<td>14.6%</td>
<td></td>
</tr>
<tr>
<td>Compared to this department other departments in this faculty are not concerned with the use of Turn-it-in.</td>
<td>117</td>
<td>104</td>
<td>68</td>
<td>2.68</td>
</tr>
<tr>
<td></td>
<td>40.5%</td>
<td>36.0%</td>
<td>23.5%</td>
<td></td>
</tr>
<tr>
<td>Compared to this department, other departments in the Faculty of Management are not concerned with plagiarism</td>
<td>134</td>
<td>99</td>
<td>56</td>
<td>2.51</td>
</tr>
<tr>
<td></td>
<td>46.4%</td>
<td>34.3%</td>
<td>19.4%</td>
<td></td>
</tr>
</tbody>
</table>

Table 5. Frequencies and mean scores of students’ understanding of departmental plagiarism policy

<table>
<thead>
<tr>
<th>Adequacy of university and departmental training</th>
<th>Strongly Disagree/Partially disagree</th>
<th>Neither Agree nor Disagree</th>
<th>Partially agree/Strongly agree</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Academic writing should be offered as a first year semester course as part of my curriculum.</td>
<td>52</td>
<td>28</td>
<td>209</td>
<td>3.96</td>
</tr>
<tr>
<td></td>
<td>18%</td>
<td>9.7%</td>
<td>72.3%</td>
<td></td>
</tr>
<tr>
<td>A revision assignment will enable me to improve my academic writing.</td>
<td>35</td>
<td>40</td>
<td>214</td>
<td>4.04</td>
</tr>
<tr>
<td></td>
<td>12.1%</td>
<td>13.8%</td>
<td>74%</td>
<td></td>
</tr>
<tr>
<td>Attending the university’s academic writing and plagiarism workshops has improved my academic integrity.</td>
<td>38</td>
<td>122</td>
<td>129</td>
<td>3.47</td>
</tr>
<tr>
<td></td>
<td>13.1%</td>
<td>42.2%</td>
<td>44.6%</td>
<td></td>
</tr>
<tr>
<td>Attending departmental academic writing and plagiarism workshops has improved my academic integrity.</td>
<td>40</td>
<td>136</td>
<td>113</td>
<td>3.36</td>
</tr>
<tr>
<td></td>
<td>13.8%</td>
<td>47.1%</td>
<td>39.1%</td>
<td></td>
</tr>
</tbody>
</table>

Lastly, as shown in Table 6, the study investigated the adequacy of the university and departmental training workshops on academic writing and plagiarism. The majority of the students (74%) partially/strongly agreed with the statement “A revision assignment will enable me to improve...
my academic writing” (Mean = 4.04). Similarly, the majority of students (72.3%) partially/ strongly agreed that “Academic writing should be offered as a first semester course as part of my curriculum” (Mean = 3.96). The results also revealed that the students perceived the university and the department’s workshops on academic writing and plagiarism to be adequate.

5. Conclusion

The aim of this study was to assess students’ understanding of plagiarism; the extent to which they engage in plagiarism (plagiarism practices); their understanding of department’s plagiarism policy and their perceptions on the adequacy of the university’s and the department’s training workshops on writing practices and plagiarism. The survey was conducted amongst undergraduate and post-graduate (Honours and BTech) transport and logistics students at a metropolitan university in South Africa. The research had been conducted because contradictory evidence had been found with regards to the students’ understanding of plagiarism.

An assessment of the plagiarism practices showed that prevalence of plagiarism was low among students. The results revealed that the students understood the departmental policies on plagiarism as the majority indicated that they were aware of departmental penalties for student plagiarism and that they perceived these penalties to be fair. Additionally, the results revealed that the specific department the students were originating from compared to other departments in the faculty, placed the same emphasis on plagiarism. The results also revealed that the students perceived the university and the department’s workshops on academic writing and plagiarism to be adequate. In conclusion, South African universities mirror the global trend of an increase in student plagiarism. Sentleng and King [39] observed that most students had committed some form of plagiarism, primarily through the use of the internet as a source. Ellery [40] concluded that despite addressing the issue of plagiarism in academic writing tutorials, students continued to plagiarise, though there was little evidence to suggest that this was done deliberately. Then again, students are not the only perpetrators of plagiarism. A study conducted by Thomas and de Bruin [41] investigated 371 articles published in 19 South African management journals for incidences of plagiarism. The study found that almost 50% of the articles contained “high and excessive” plagiarism. Efforts to improve academic integrity should adopt global best practices while taking into account the local characteristics. Future research can compare the actual similarity indices of submitted assignments to students’ perceived plagiarism practices.

6. References


Transforming the Irish Higher Education System through Merger and the Creation of Technological Universities: Facilitatory and Inhibitory Factors

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Abstract

This paper examines the Irish Institute of Technology sector as it prepares to undergo a period of reconfiguration and transformation, to be brought about through a series of institutional mergers to create Technological Universities. This research seeks to identify the key factors which are impacting upon the merger and re-designation process in the sector, with a view to informing future practice. Drawing upon higher education literature, international best practice and a thematic analysis of data gathered from three Alliances of Institutes of Technology who are undergoing the merger and re-designation process, this research identifies and categorises the key factors which have acted to facilitate on the one hand, or inhibit on the other, the merger and re-designation process to date. A framework consisting of political, strategic, operational, emotive and historic and cultural factors is proposed, examined and discussed. This research makes a theoretical contribution to knowledge, by adding to the relatively scant body of literature on the nature of and the factors impacting upon the merger process in higher education, and of mergers in the Irish higher education context. It also makes a practical contribution by providing guidance for governments, policy makers, legislators and institutions themselves on what factors can facilitate or inhibit merger processes, thus contributing towards the achievement of national and institutional policy objectives.

1. Introduction

The Irish Institute of Technology (hereinafter referred to as IoT) sector is poised to undergo a period of transformation, consolidation and system reconfiguration, to be brought about through a series of institutional mergers, collaborations and alliances. The National Strategy for Higher Education to 2030 [1] called for the development of a coherent set of higher education institutions, each of significant strength, scale and capacity, and envisaged that “based upon demonstrated strong performance against mission-relevant criteria some (IoTs) could apply for re-designation as technological universities” (hereinafter referred to as TUs) [1].

The opportunity to apply for re-designation as a university is naturally an attractive proposition for IoTs, who suffer from a variety of second sector difficulties. IoTs are not only less well funded than traditional universities, but also carry the burden of being more heavily regulated and having significantly less autonomy and flexibility than the universities. The IoT label is often not readily understood internationally, which can make it more difficult for the sector to attract international students. It can also limit the potential positive dynamic effect which a HEI can have on a region in terms of attracting foreign direct investment and industry to the region.

Following the publication of the National Strategy, the HEA published ‘Towards a Future Higher Education Landscape’ [2]. This provided further details on the the process and criteria which IoTs must undertake to apply for re-designation as a TU. Controversially, this included a requirement to merge with at least one other IoT before TU status could be conferred upon an existing IoT. The aim of government policy in this respect was twofold. Firstly, they had in mind a ‘mopping-up’ exercise, to reduce the overall number of IoTs and reduce fragmentation in the sector, creating critical mass and scale. Secondly, policy makers envisaged the creation of a third ‘TU’ sector in the Irish Higher Education landscape. To achieve these dual aims, the National Strategy linked the creation of new TU’s to consolidation of the existing IoT sector. Government policy has continued along these lines, culminating in the enactment of the Technological Universities Act 2018 [3], which enshrines the merger requirement into law. This requirement has been heavily criticised and is not reflective of the position in many other countries, which have allowed similar system reconfiguration and re-designations to take place using looser transitional federation models, rather than requiring a full merger. The merger pre-requisite has caused significant difficulties and dilemmas for Irish policymakers and individual IoT’s, which must now undergo a full legal merger in order to be re-designated as a TU.
2. Literature Review

A decision to merge is likely to be the most difficult and far-reaching decision a HEI will ever take [4]. Mergers of HEIs involve either the dissolution of one or more partners and assimilation into another partner (typically a take-over), or the dissolution of all partners and the creation of a new institution (typically a ‘full-merger’) [5]. A full merger involves the dissolution of both partners (with the subsequent loss of autonomy), and the creation of a new legal entity, which is comprised of both/all partners. This new entity assumes new unitary governance and management structures, staffing arrangements, budget, and academic mission, policies and procedures [6].

Many countries have experienced significant waves of merger activity in HEIs, including Australia, the United States, Norway, Finland, the Netherlands, and Canada. In the UK, HEFCE [5] reported that 40 mergers took place between HEIs during the period of 1994 to 2008. Ireland, by contrast, has seen little merger activity amongst HEIs.

A HE merger can be divided into three distinct phases – Pre Merger, Merger and Post Merger (see Figure 1 below.) Much of the published research regarding mergers in higher education focuses on evaluating the outcomes of merger and identifying success factors, and does not focus to a great extent on the merger process itself. Thus there is a limited literature base on the factors which positively or adversely affect that process in HE [7].

![Figure 1: Phases in higher education mergers](image)

**Figure 1: Phases in higher education mergers**

HEFCE [5], Harman and Harman [8] [9] [10] [11], Davies J [6] and Brown et al [7], amongst others, have identified a number of factors which, based on lessons learnt from previous mergers, can have a critical impact on the process. Research undertaken by Brown et al [7] is particularly useful, as the focus of their study was on the factors in the merger process which led to some merger discussions being abandoned while others led to implementation, rather than focusing on evaluating the outcome one single merger. Brown et al had initially envisaged that their study would result in a checklist of ‘do’s and don’ts’ for HE mergers, which would be easily attributable to either the successful or failed merger proposals. However, after analysing data collected from their case studies, they found that this was not possible. Rather, they found that same key themes and issues arose in most of the proposed mergers they examined, and they concluded that it is the combination in which these themes/factors occurred, and how they were addressed within the particular context of each merger that determines the outcome.

This is an interesting finding and one which has not been given the attention it deserves in subsequent literature, which all too often seeks to produce a hard and fast guide to merger success. Instead, perhaps, it could be argued that the success or failure of a purported merger is heavily dependent on context specific factors.

This research has adopted and subsequently adapted the key themes identified by Brown et al [7], to include additional themes identified as relevant to the merger process from the wider body of HE merger and collaboration literature. This facilitated the development of a conceptual framework presented in Figure 2 below, which formed the theoretical basis of this research.

![Figure 2: Key factors impacting upon the merger process in higher education](image)

**Figure 2: Key factors impacting upon the merger process in higher education**

3. Methods and Methodologies

In order to investigate the specific factors which are facilitating and/or inhibiting the journey of Irish IoT’s towards merger and subsequent re-designation as a TU, a qualitative study, employing a multiple case study approach, was employed across three Alliances of Irish IoT’s who are proposing to merge.
The primary methods of data collection consisted of external and internal document collection, in addition to 18 semi-structured interviews, conducted with key members of the Alliances. Data gathered was then thematically analysed, both on a within and cross case basis, in line with the six step approach outlined by Braun and Clarke [12]. This involved searching for themes or patterns across a data set (i.e. documents, reports and interview), rather than within a data item, (e.g. an individual document). Key themes were then identified and categorised, and the findings of the cross case analysis are presented below.

4. Findings and Discussion

The thematic analysis conducted indicates that the merger process in the Irish IoT sector is a highly politicised and emotive process, which is both complex and ambiguous. It suggests that there are a large range of factors which impact upon and shape the merger process, and these have been categorised in the data into a proposed framework outlined in Figure 3 and discussed further below.

![Figure 3: Proposed framework of key factors impacting upon the merger process in higher education](image)

4.1 Political Factors

The data suggests that the merger process in Irish HE is highly political in nature, with both macro and micro political factors having a significant impact on the process. Indeed, political factors were the most prevalent grouping within the data set, which emphasises the critical role politics has played.

At macro-political level, factors identified as impacting upon the process were the Irish political landscape; opposition from traditional universities; a lack of government/Department or HEA commitment, support and clarity; and support and pressure from regional stakeholders. In particular, at a macro level, two key themes emerged. The first concerned the Irish political landscape and identified the important role that political support or ‘push’ has played in the process. Some viewed the TU process itself a political solution to a politically problematic series bids for university status which had been made by a number of IoTs in the recent past. The data identified the critical role that key political actors played in driving forward the merger and TU process, particularly senior politicians who have allegiances to a particular region. The second key factor identified at a macro level was a perceived lack of support, commitment, understanding and clarity from the government, Department of Education and Skills and the HEA, which interviewees across all Alliances felt had hindered their progress. In particular, the failure to enact the necessary legislation to provide certainty and clarity, and to allow the institutions to merge, was a key inhibitory factor, as was the failure to provide the necessary funding at the outset, along with advice and support mechanisms for institutions.

At a micro-political level, a range of themes emerged. These include the key role of power dynamics and negotiations between merging institutions; the importance of strong, credible, charismatic and committed leaders and stability in leadership; the need to develop strong formal and informal relationships between key people in the merging institutions; the need to secure the support of the Senior Executive team, the wider academy and institutional staff; and the need to avoid blocking, delaying tactics, and ‘game playing’ between institutions. In particular, the key role of power dynamics and negotiations between merging institutions featured strongly, with factors such as differences in academic reputation or trajectory or differences in partner size being used to gain bargaining positioning. Smaller partners within the Alliances often expressed concern about losing autonomy or being ‘swallowed up’ by a larger partner, and cited perceived arrogance or superiority on the part of the larger institution. Larger institutions often felt that unnecessary and disproportionate concessions were being made for the smaller partner. At an individual level, interviewees also reported power plays and self-promotion as being an inhibitory feature of the process.

4.2 Strategic Factors

The strategic environment, and in particular the impact of the National Strategy and the difficult economic climate were cited by interviewees as having played a key role in institutional decision making. Interviewees also identified that the drivers for merger and the case for merger were critical. While there were varied strategic drivers for merger, TU designation unified all institutions and Alliances as a key objective, with recognition of the brand value of a university designation. Interviewees also
spoke about the importance of maintaining the regional role and impact of existing IoT’s as a key consideration during the process. Finally, the data suggests that making key strategic choices about who to partner with, the mission and vision of the new institution and the name, governance and management structure of the new institution are critical to the process. Interviewees acknowledged the limitations imposed on institutions in this respect by national policy and political dictat, and suggest that contentious issues in relation to name, governance and management structure of the new institution may often lead to conflict, and should be resolved as early as possible in the process.

4.3 Emotive Factors

There are a large number of findings that suggest emotive factors, which are particularly prevalent in the data set, yet underdeveloped in the literature on mergers in higher education, play a significant role in the merger and re-designation process. Indeed, emotive factors feature higher than strategic factors in terms of number of references in the data. These emotive factors deal with both personal and interpersonal emotions.

In terms of personal emotive factors, interviewees reported that personal commitment, belief and passion were critical to the success of a purported merger project. However, the most prevalent emotive factors in the data set were that of uncertainty, insecurity, fear and frustration as a result of the merger process. There was also a belief amongst some interviewees that there was a level of dishonesty within the process and the data suggests that feelings of uncertainty and fear had, in some cases, given rise to conjecture, rumour and perhaps even feelings of paranoia and conspiracy during the process.

In terms of interpersonal emotions, the data reflects the need to ensure respect, equality and parity of esteem and to develop feelings of trust, honest and understanding between the partner institutions. Feelings of distrust, suspicion, antagonism, hostility and resentment were surprisingly prevalent in the data and, if not acknowledged, addressed and resolved at an early stage, may be fatal to the process.

4.4 Operational Factors

There are a number of key operational factors which the data suggest play a significant role in the merger process. Firstly, the data suggests that key external actors (including consultants, facilitators and mediators) have played an important role in providing knowledge, comfort and confidence internally and confidence and credibility externally.

Secondly, in relation to project structures, resources, project planning and timelines, the data identifies that it is important to have a single decision-making body, and one project office where project managers or coordinators are based. In terms of resources, the data suggests that there has been an underestimation of the work and resources required to effect a successful merger, and a failure to accurately cost the project. It also suggests that both the HEA and institutions themselves have failed to commit the necessary human and financial resources required to effect a merger. The research found that agreeing a memorandum of understanding early in the process, having joint budgets, getting the right project leaders in place and engaging in peer reviews in parallel with the formal re-designation process facilitated the process from a project planning perspective. Issues surrounding due diligence and risk assessments gave rise to differing perspectives from interviewees. Some felt that completing due diligence early in the process was beneficial, but others felt that it was not necessary and that pushing for the completion of due diligence was a sign of distrust.

The findings suggest that it is critically important to build and maintain momentum and stability during the process, to set and adhere to clear dates and timelines and to move quickly to prevent opponents to the merger from gaining traction. Interviewees reported that a lack of momentum due to the stop start nature of the process to date had caused difficulties and reported delays caused both by external (failure to enact legislation, political instability and change, failure to provide funding mechanisms) and internal (IR issues, changes in key personnel, lack of resources, ‘game playing’) factors.

Finally, the data suggests that there is a continued need for communication, engagement and support throughout the process. It is critical that all staff are communicated and engaged with the process, and that this happens from an early stage, via a variety of methods. Throughout the process, training and support for the senior executive and management team on change management, mergers and strategy has been identified as a facilitatory factor, and failure to invest in management training and development, or to address the additional pressure and stress placed on senior managers is a factor which may inhibit the process.

4.5 Historic and Cultural Factors

Finally, the data indicates that culture and history have an important role to play in the merger process. The historic relationship between the partners is of critical importance. The data suggests that while the absence of a history of collaboration may not be fatal, a history of competition or strained relations, or indeed the failure of a previous collaboration between the two, does not bode well. Other factors such as historic positioning and trajectories and a lack of cooperation across the IoT sector generally
emerged as being relevant. In cultural terms, the public sector and rather risk adverse nature of Irish IoT’s, along with relatively inflexible boundary and operating conditions in the sector are cultural factors which the data suggest have acted to inhibit progress. Differences in academic reputation, trajectory and positioning and different values, identities and allegiances between merging organisations have also identified as problematic.

5. Conclusion

The data presented above highlights the complexity of merger processes in higher education, and in particular, details the political, emotive, operational, strategic and historic and cultural factors which are impacting upon the Irish IoT sector as it prepares to undergo a series of mergers and re-designations. Key macro and micro political factors, such as the Irish political landscape and power dynamics and negotiations between institutions emerge from the data as being critical to the process, as do emotive factors such as uncertainty, insecurity, fear and frustration, trust, honesty and understanding, and distrust, suspicion, hostility and resentment. It is evident that the perceived lack of support, clarity and understanding from system level actors in the Irish system has severely delayed and inhibited the process to date. The data emphasises the politics and emotions involved in the merger process in HE and demonstrates the need for leaders of merging institutions to be cognisant of and to operate across all dimensions discussed above, both formally and informally. Institutional leadership is key to the process and leaders need to continuously build support for the merger, being cognisant of the political, cultural and emotive factors outlined above. Leaders must move beyond tribal considerations to focus on the new institution. The data suggests that it is good people management, as opposed to process or project management that will ultimately lead to the merger success or failure, and this should be a critical consideration for all involved in the Irish merger and re-designation processes into the future.

6. References

Teachers’ Broken Relationship with Teacher Education: Living the Reality and Rethinking Practices

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Abstract

This research study was an attempt to identify the reasons for teachers’ minimal engagement in In-service teacher training and education (INSET) and most importantly to bring about change in the local context. A three-cycle action research design was adopted as an investigative methodology to critically explore the effectiveness of INSET practices in the State of Qatar. The first cycle employed a large-scale survey followed by focus groups to identify reasons possible success factors which informed the improved design of an interventionist INSET course in the second cycle. The third cycle focused on trainer role and employed trainee journals to measure the impact on participants.

1. Introduction

In recent years, there has been an increasing focus on teacher education around the world [5], [9], [11]. Although many research studies on teacher education are published every year, most of them have produced a marginal improvement in the quality of professional development in schools [13]. The unclear pathways in the education and licensure of teacher trainers coupled with the limited research on the impact of teacher education have led to a professional development system of teachers that is ‘by all accounts, broken’ in most contexts around the world (Hill, 2009, p. 471). Although research articles ‘trumpeting’ the success of a specific method or programme appear practically monthly, and practitioner magazines are full of accounts of the phenomenal improvements in teacher knowledge and skills, still ‘most teachers engage in only the minimum professional learning required by their institutions’. Day asserted that teachers fail to see the impact of INSET because it fails to “connect with the essential moral purposes that are at the heart of their professionalism” [4]. Further research is needed to identify the reasons for this phenomenon and most importantly to bring about change.

2. Context

Qatar has embarked on an unprecedented national reform of public schools called ‘Education for a New Era’ [3]. This reform was driven by concerns that the Qatari educational system was rigid, outdated and not producing the desired outcomes [1]. The areas of teacher training and English language learning are seen as the best manifestation of this reform. However, since the start of the reform in 2004, minimal academic research has been conducted on the effectiveness of teacher training programmes offered to practitioners in TESOL (Teaching English to speakers of other languages). Ellili-Cherif is among the few studies that investigated teacher education and licensure in Qatari schools; they reported problematic issues in the system and concluded that relevant policies ‘use ambiguous terminology and procedures, ignore local educators’ input, provide unrealistic expectations of society, lack consistency, and created resistance on the part of educators’ [7]. Their study was mainly descriptive, and thus reported concerns remained unanswered.

INSET programmes are one way in which the skills and knowledge of teachers may be revitalised through enhancing their skills and knowledge on specific aspects. In Qatar, there is also an increasing pressure from all parties to for effective INSET.

3. Aims

The purpose of this action research study is to explore critically the effectiveness of INSET practices in Qatar. After that, the findings from the needs analysis stage were used to improve INSET planning, design, and implementation through a three-cycle AR project. Therefore, the main aims of this study are:

- To improve practices in INSET planning, design, and delivery
- To explore the effectiveness of ELT INSET offered to teachers in Qatar.
- To provide a set of clear guidelines and principles for good INSET in a form of a framework informed by teachers’ feedback
- To evaluate the impact of a three-cycle AR INSET project in terms of addressing current challenges and improving training practices
4. Methodology

Action research was chosen as the investigative methodology for this study. This methodology has gained popularity in recent years [12] as a tool for critical investigation [14], which usually results in impact on the area studied [6]. It provides teachers with an opportunity to reflect on their own practice to be the ‘energy force’ for change [8]. Action research is particularly relevant as it provides practitioners with an opportunity to study their own practices in the hope of introducing change [2]. It puts the practitioner at the heart of the research process, enables an insider view of an appropriate methodology, and has a greater potential for a lasting impact. Because of its flexibility, AR can capture better the complexity of teaching and learning compared with positivist approaches [10].

5. References


Antecedent-Based Learning Environments: 
An Exploration of Implementation in the Community for Individuals with Autism Spectrum Disorders  

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Abstract 

Inclusive teaching and learning in respect to the student impacted by Autism Spectrum Disorder (ASD) may only occur successfully when planning extends beyond the academic, social, or behavioral goal and reflects the level and type of environmental support required to maximize learner engagement [11]. Knowing and understanding the complex traits associated with ASD is important; implementing strategies that address learning needs stemming from these traits is essential [9]. The practice of altering learning events and environments that more fully immerse learners requires three things on the part of the teacher: willingness to explore alternative practices, commitment to collaborate with others, and proficiency in observing students and interpreting their needs through behaviors, communication, and other responses [3], [11]. This brief will explore current practices impacting environmental modifications for individuals with Autism Spectrum Disorder. 

1. Introduction 

All children can learn, and students with autism spectrum disorder are no exception; students will need different levels and types of supports to benefit from their learning environment [12]. Inclusive classrooms require teachers who adapt the environment and curriculum to children’s learning styles. Learning environments prepared in ways that specifically address various predisposed traits often associated with autism spectrum disorder will include but are not limited to the following: structure, predictable routine, picture schedule, visual timer, ‘I need a break’ cards with optional quiet space, preferred lighting, low sound levels, optional seating types for independent work, hands-on materials, clearly delineated curriculum and learning spaces, and technology appropriate for the age and grade level of the student [3], [12], [1], [4]. 

2. Literature Review 

According to Quill [6], knowledge about the educational needs for children with ASD may be evident when observation and assessment is paired with the goal of seeking to understand the learner; however, less is known about the design of supportive classroom environments. Antecedent-based interventions (ABI) address those conditions which have been observed to impact a student’s engagement within an environment [2], [5]. Reinforcement and extinction are often paired with these strategies. An analysis of current and potential learning environments is an essential first step in identifying ABI approaches. This careful examination should suggest sensory, organizational, communicative, and language barriers for the learner which could be remedied through universal design. 

Universal Design (UD) is the design and composition of an environment so that it can be accessed, understood and used to the greatest extent possible by all people regardless of their age, size, ability or disability. According to Hall, et.al. (2003), the three core features of UD include multiple means of engagement, representation, and expression. One of the intentions of UD is to create mindfully-designed environments that accommodate those whose needs are not efficiently met in traditional living or learning spaces [7]. Research-based instructional practices and materials that promote the use of classroom-wide instructional methods including ABI can be used within a UD framework and still allow for individualization [10]. 

Related to the concept of universal design are evidence-based practices housed under the approach of Naturalistic Intervention. The key to implementing strategies falling under this category is student and environment centered collaboration. At its core, Naturalistic Intervention offers approaches addressing environmental arrangement (context), interaction techniques specific to learning targets, and strategies based on applied behavior analysis (ABA) methods including targeted intervention that respond to individual strengths, needs, and interests [8].
Naturalistic interventions have been associated with the following outcomes in individuals with ASD: (a) reduced dependence upon prompts, (b) more natural-sounding language, (c) efficiency advantage of teaching language form with meaning, and (d) habituation to everyday distractions present in the real world [5].

3. Contribution to Knowledge

The question ‘What does the ideal teaching and learning environment for people with ASD look like?’ has engaged teachers, community members, and researchers alike. In a midwestern city in the United States, a group of like-minded individuals including university students, professors, parents, and curriculum directors came together to discuss this question. After discussing observations of dozens of students on the spectrum over years of teaching and advocating, a set of variables was agreed upon that was believed to impact learning and engagement. These included the following: experience of the teacher, willingness of the teacher to meet the needs of the student, willingness and eagerness of the teacher to develop a relationship with the learner, environmental supports including frequent and ongoing use of visual supports, adoption of evidence-based interventions integrated into teaching practice, provision and access to a range of sensory materials, alternative seating and work spaces, low level lighting, and open teaching and learning blocks to lessen transitions.

These variables are commonly discussed within the research and are most frequently reflected within evidence-based practice instructional strategies but may not necessarily be assimilated into the classroom design nor into the daily praxis of the teacher. Realizing this, a pilot program was designed encompassing all of the above factors whereby children identified with Autism Spectrum Disorder, mild to moderate to severely impacted, were invited to participate in a two-hour community class at a local art museum. The instruction block included an introductory experience, a small group lesson, time for individual exploration, a break with snack, and a one-hour art lesson. The children’s educational setting in their various schools ranged from partial inclusion to self-contained Level 3 settings. The age range of the participants of the pilot program was 4 to 9. None of the children had previously visited a museum and indeed rarely visited any community site other than school.

The program was infused with Antecedent-Based Interventions: a social story was sent to participants prior to the event along with a picture schedule of the morning, hand-held and lanyard picture schedules were provided to everyone when the children and caregivers arrived, and all spaces were low-light and low-sound. Visual timers were in place, alternative seating was set-up for the small group lesson, and hands-on materials were available to represent abstract concepts. Visual prompts were mindfully integrated into all directions, sensory materials were readily available, and hands-on activities were designed to pair with specific art pieces, available within a marked-off floor area within the gallery for participants to explore. In addition, all art lesson materials for the final project were prepped for individual use within a prepared environment to reduce transitions.

Adults were surveyed following the event along the themes of engagement, appropriateness, support, and safety. Open-ended questions were included as well, allowing for participants to share overall personal impressions. Within the open-ended opportunities for feedback, several communicated that this was the first event they had taken their child to where they as a family felt safe, accepted, and valued. Other notable participant outcomes as reported by parent and caregiver observers included decreased dependence upon prompts paired with extended attention and action within the museum environment, increased non-prompted language and total communication, and lower off-task behaviors stemming from potential distractions. Results communicated exceptionally high levels of agreement as to satisfaction with the event: 100% of each respondent scored each area of the survey at its highest level (see Table 1).

<table>
<thead>
<tr>
<th>Statement</th>
<th>Average Agreement</th>
</tr>
</thead>
<tbody>
<tr>
<td>The program was planned well to meet the needs of my child.</td>
<td>4</td>
</tr>
<tr>
<td>The program materials engaged my child.</td>
<td>4</td>
</tr>
<tr>
<td>The volunteers were respectful and helpful.</td>
<td>4</td>
</tr>
<tr>
<td>The print materials provided were helpful to me.</td>
<td>4</td>
</tr>
<tr>
<td>The use of visual supports helped my child.</td>
<td>4</td>
</tr>
<tr>
<td>The snack time was valuable.</td>
<td>4</td>
</tr>
<tr>
<td>There were enough volunteers to be helpful.</td>
<td>4</td>
</tr>
<tr>
<td>The art project was engaging for my child.</td>
<td>4</td>
</tr>
<tr>
<td>The time of the event and the day of the week worked well for my family.</td>
<td>4</td>
</tr>
<tr>
<td>I would recommend this for other families with children on the spectrum.</td>
<td>4</td>
</tr>
</tbody>
</table>

N = 72

This program has become a grant-sustained regular event offered at the museum three times per year. Currently, this program is in its fifth year and is part of a qualitative study addressing ABI and ASD and the impact of inclusive community experiences.
4. References


Session 6: Learning / Teaching Methodologies and Assessment

Title: Challenging the Orthodoxies: A CoderDojo Perspective
(Authors: Nigel McKelvey, Pamela Cowan)

Title: Talk WITH me, not AT Me: Millennial Learning in the Age of the Shortened Attention Span
(Authors: Ann Powell-Brown, Dawna Lisa Buchanan, Yuankun Yao)

Title: Accomplishment of Multiple Educational Objectives in Class
(Author: Yoshinori Naruse)
Challenging the Orthodoxies: A CoderDojo Perspective

Nigel McKelvey, Pamela Cowan
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Abstract

The purpose of this study was to conduct research within the unorthodox context of a CoderDojo. Since 2011, the CoderDojo movement has been arguably plugging the gap in ICT education for children in Ireland. Ireland is viewed as a hub of activity for major computing companies yet coding or computer science is not taught in any meaningful way in schools. The Minister for Education, Richard Bruton in 2016 outlined a series of amendments to the curriculum at both primary and post-primary level to include coding and computer science. Therefore, this study was timely in that it endeavoured to make educationalists aware of CoderDojos and that it would give a voice to the children participating in these voluntary activities. The data gathered provided insights into the factors that make CoderDojos appealing to young people but also shed light on the issues that might impede learning. With coding to become an integral part of the Irish educational system moving forward, it was important that this study took place so that educationalists and curriculum makers alike could understand how children at CoderDojos were learning how to code. The data gathered showed systems where social constructivism was evident. Children had freedom to move, to engage with peers (not necessarily their own age), to engage with More Knowledgeable Others (MKOs) such as professional computer programmers and to use their imagination by creating projects that were personal to them utilising an array of technologies. Using a combination of data derived from focus group interviews and overt observational data, this paper will present approaches and perspectives on computing education from children attending four CoderDojos in Ireland.

1. Introduction

Usually, a CoderDojo has young people between 7 and 17 years of age participating. This is not a strict rule as such with many other CoderDojos extending the lower limit of 7 to younger children. The CoderDojo Foundation does not stipulate any age, only that participants should have an ability to read basic words and understand how to spell commands. The mix of ages typically enhances the experience of Ninjas (learners) as younger children learn from more experienced and knowledgeable older children while the older children learn how to interact with and mentor their younger counterparts. The typical characteristics of a CoderDojo include an open, friendly and positive environment created where participants are not constrained to the usual rules of a typical classroom. Talking is expected and children are actively encouraged to get up, walk about and impart their knowledge to someone else. This can raise the emotions of children in a positive manner. There is therefore opportunity at a CoderDojo for both learners and mentors to challenge the orthodox approaches of learning.

2. Challenging the Orthodoxies

The term Computational Thinking was first used by [1]. Computational Thinking can be used to algorithmically solve complicated problems often associated with computer programming. The term appears in many computer science curricula throughout the world as it is traditionally associated with being a skill necessary for learners of computer programming. Currently Computational Thinking is generally defined as a set of cognitive skills and problem-solving activities that include (but are not necessarily limited to) the following characteristics:

- Using abstractions and pattern recognition to represent the problem in new and different ways
- Logically organising and analysing data
- Breaking the problem down into smaller parts
- Approaching the problem using programmatic thinking techniques such as iteration, symbolic representation, and logical operations
- Reformulating the problem into a series of ordered steps (algorithmic thinking)
- Identifying, analysing, and implementing possible solutions with the goal of achieving the most efficient and effective combination of steps and resources
- Generalising this problem-solving process to a wide variety of problems
Teachers in STEM-related disciplines that include computational thinking, endeavour to allow students to practice problem-solving skills such as trial and error [5]. The concept of Computational Thinking has been criticised as being too vague, as it is often not distinguished from other forms of thought [6]. Additionally, many computer scientists are concerned about the promotion of Computational Thinking as a substitute for a broader computer science education, as computational thinking represents just one aspect of the field [7].

According to [8] and [9], a core source of engagement in education is knowledge itself which has become ever more fluid. [10] have stated, "what we have here is a transition from a stable, settled world of knowledge produced by authority/authors, to a world of instability, flux, of knowledge produced by the individual" (p. 207). The notion of organised knowledge clearly defined by experts is, in some instances, being sidestepped to give way to continual flux. Many researchers [11] [12] consider this view of knowledge as controversial and also consider it to be challenged by individuals finding the move from expert to amateur knowledge producers unsettling. [13] outlines that the view of experts as sole providers and evaluators of information is one which cannot be sustained in this world of ever advancing technology. Society are persistently exposed to a continual flow of data which enables people to build new concepts and gain new knowledge in new ways.

Research highlights that many are placing importance on the need for differential approaches to both content delivery and learning so that optimum intellectual development can be fostered [14][15][16][17]. Striking a balance between critical thinking and creativity is presented as being essential in the construction of knowledge where a single solution to a problem is not the answer [18].

[19] outlines, that within a constructivist learning environment (such as a CoderDojo), there is a need for:

- Knowledge construction, not reproduction
- Working with real world knowledge
- Realistic and relevant real world environments
- Emphasis on many representations and interpretations that recognise varying perspectives
- Collaboration and social negotiations
- Metacognition and reflection on learning
- Self-regulated learning
- Negotiated goals
- Evaluation as self-analysis

Fluidity as outlined by [20] is one that can help with theorizing the topology of a CoderDojo. Conventional learning spaces tend to involve teacher led instructions, rigid learning outcomes, memorising facts, standardised tests, an isolated classroom dissected from the real world and a focus on individual achievement [21]. The new and unorthodox learning environment offered by CoderDojos are learner centred with hands-on practical experience, problem based and project oriented. The traditional teacher role is also replaced by one where a mentor or computer programming professional leads and guides without a steadfast structure and without facilitating a classroom hierarchy. There is a fluidity present where interconnections and interrelations between learners and any other actor involved are fostered and encouraged when learning occurs [20]. The CoderDojo environment appears to cross the traditional student/teacher boundaries as well as the usual boundaries that exist between an individual and a collective. [21] suggest that fluidity in a learning context can create transformations with discontinuities. Fluidity in this sense helps to articulate new educational environments as active and interactive collectives where collectives are not uniform entities but are rather emerging from the constructive interference of individuals and various collectives.

[22] presented the significance of an adult’s role and indeed the role of capable peers. The research identified that one of the key challenges for adults was defining the limits of the zone. Decisions as to whether the support or scaffolding could take the learning beyond the child’s current capabilities. Bronfenbrenner agrees, and placed a great emphasis on the relationship between adult and child; “Learning and development are facilitated by the participation of the developing person in progressively more complex patterns of reciprocal activity with someone with whom that person has developed a strong and enduring emotional attachment and when the balance of power gradually shifts in favour of the developing person” [23] (p. 60). When considering a learning system, this suggests that the ZPD is enhanced where there is a strong relationship between the subject (child) and the community (MKO). Where the MKOs can relay their approach to resolving a problem in such a way that provides a limited amount of guidance and affords the learner an opportunity to watch and practice skills, then it is possible that the child can remain active within the learning system.

In a traditional educational context, it is arguable that the zone could become contained or even constrained by curriculum (rules) and the pressures facing educationalists to meet assessment goals (division of labour). A less formal context, where the adult is not a trained educationalist striving to meet a set of criteria, has the potential to guide the children further. Therefore the classification of context is important when striving to take children beyond what might be perceived as their academic limit.

The pedagogic principles of the Revised Curriculum which characterise the vision proposed
by the Primary School Curriculum in the Republic of Ireland [24] have the potential to facilitate less formal approaches and utilise skillsets of other MKOs working in professional contexts:

• the child’s sense of wonder and natural curiosity is a primary motivating factor in learning
• the child is an active agent in his or her learning
• learning is developmental in nature
• the child’s existing knowledge and experience form the base for learning
• learning should involve guided activity and discovery methods
• language is central in the learning process
• the child should perceive the aesthetic dimension in learning
• social and emotional dimensions are important factors in learning
• learning is most effective when integrated
• skills that facilitate the transfer of learning should be fostered
• higher-order thinking and problem solving skills should be fostered
• collaborative learning should feature in the learning process
• the range of individual difference should be taken into account in the learning process

While these characteristics pre date CoderDojos, the need and desire to expose children to a new curriculum which embraced critical thinking, problem solving and giving the child agency in their own learning environment, was important. When the INTO’s report was written, CoderDojos did not exist but the movement does appear to align with the aspirations presented in the document. The characteristics combined suggest a learning context with a philosophy that affords learners opportunity to be social and inquisitive. The potential constraints of curriculum assessment on the ZPD [25] could be alleviated via a less formal approach to learning where stress about examinations is not a factor.

A definition of non-formal education as offered by the International Standard Classification of Education (ISCED) [26], outlines that “the defining characteristic of non-formal education is that it is an addition, alternative and/or complement to formal education within the process of the lifelong learning of individuals” (p. 11). [27] noted that in the 1990s, attention given to non-formal education was reluctant and hesitant. As the post-Jomtien (World Conference on Education for All (EFA) in Jomtien (1990)) era focused heavily on formal education, governments and agencies have, as a result, exhibited little interest in non-formal education [28]. The exception, however, to this stance is that of agencies concerned about the social conditions of marginalised children and young people such as the United Nations Children’s Fund (UNICEF) and Save the Children (SCF). In the current post-Dakar (World Education Forum in Dakar (2000)) decade, opinions are evolving again. There are indications that non-formal education, at various levels and for various groups, is gaining in popularity. In recent times, several development agencies, such as the Swedish International Development Cooperation Agency (Sida) and the World Bank, have reassessed their position on adult education in particular [29][30][31][27]. In addition to UNICEF and SCF, other agencies have given their support for the provision of non-formal education to children and young people, such as the United States Agency for International Development (USAID), the Netherlands, Ireland and Switzerland [28].

Controlling one’s own learning aligns with the CoderDojo philosophy. [32] (p. 45) posits that, “Piaget, Freire, Havighurst, Coleman, Brookover and literally hundreds of other psychologists, educators, sociologists and philosophers have indicated clearly where education should be and where, instead it wallows in inefficiency, crust rigidity and stubbornness. Most of those critics advocate changes of the existing educational system and there is ample evidence of the need for dramatic efforts in this area.” Agency in learning via a less formal approach may be the catalyst required. For agency to be achieved, the approach to content delivery must evolve.

### Table 1 Formal, Informal and Unformal Learning [33]

[33] outlines that the success of an unformal learning environment is dependent upon the level of motivation amongst the students and the quality of materials utilised so as to uphold the motivation levels ensuring that the expectations of the individuals are met. Finally, the provision of nonformal institutions with support of a multidisciplinary team is important in enabling the environment to continue with longevity. The nature of the environment is one which also aids a learner in gaining skills for life.

[34] presents ‘Meddler-in-the-Middle’ as an "active interventionist pedagogy in which teachers are mutually involved with students in assembling and/or disassembling knowledge and cultural products. Meddling is a re-positioning of teacher and student as co-directors and co-editors of their social

<table>
<thead>
<tr>
<th>Formal</th>
<th>Informal</th>
<th>Unformal (non-formal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>▪ Visits to museums or science and other places and exhibits with a report required by minimum achievement for an accredited assessment.</td>
<td>▪ visits to museums or science and other places and exhibits</td>
<td>▪ Subject Matter reports present to answer questions but are not trained educators</td>
</tr>
<tr>
<td>▪ reading books, newspapers, magazines on science, technology, etc. as part of homework</td>
<td>▪ reading books, newspapers, magazines on science, technology, etc. as part of homework</td>
<td>▪ Agency – students identify themselves how to solve a problem.</td>
</tr>
<tr>
<td>▪ participating in scientific contests</td>
<td>▪ participating in scientific contests</td>
<td>▪ Understanding of learning, not following a curriculum</td>
</tr>
<tr>
<td>▪ standing in lectures and conferences</td>
<td>▪ standing in lectures and conferences</td>
<td>▫ No assessment</td>
</tr>
</tbody>
</table>
world" (p. 288). In a CoderDojo context, 'meddlers' (mentors) may have influence due to their perceived position by the children and their professional backgrounds (as programmers or student programmers or class teachers). The energy that 'meddlers' bring to the environment does not suggest 'command and control' but rather "support and direction through structure-rich activity in which they themselves are highly involved" [34] (p. 290). This therefore suggests both the potential for a positive as well as a negative 'meddler' in an informal context.

The unformal learning environment offered by a CoderDojo aligns itself with the theory of ‘learning as inquiry’ as outlined by [35]. Learning as inquiry places the question at the foreground rather than the answer and positions learning with the learner as opposed to material as part of a curriculum. It is prudent to note that answers are important, however, learning as inquiry also values the processes associated with inquiry and their impact on knowledge, skills and dispositions toward learning [35]. These impacts could have the potential to positively affect how a learner approaches learning in all walks of life.

As suggested by [36] (p. 5), "the MKO can also be viewed as a learning object or social software which embodies and mediates learning at higher levels of knowledge about the topic being learned than the learner presently possesses". Arguably, the unformal learning space facilitates a transferral of some - or most - of the responsibility of a child's learning path from the mentor (back) to the learner. As a result, it also implies that the child is regaining the control of their own learning path and its design (therefore remaining within the inner triangle of AT; the ZPD). This personal learning space facilitated at a CoderDojo may be more than a "tool to provide access to ‘More Knowledgeable Others’ but as part of a system to allow learners to link learning to performance in practice, though work processes. And taking a wider view of artefacts as including information or knowledge accessed, reflection on action or performance may in turn generate new artefacts for others to use within a ZPD" [36] (p. 5). Thus, it is possible to consider the relationship that exists between the ZPD and unformal learning spaces as an opportunity to construct and seek out the tools and people that will assist a learner through the ZPD [37]. The unformal setting afford opportunities for children to engage with lifelong skills that could help enhance knowledge and skills in multiple ways.

Lifelong learners have many characteristics however some of the more salient attributes include individuals who have an insatiable appetite for knowledge, are social learners, do not merely memorise information and act as educators or teachers themselves [38]. These traits materialise as someone who continually seeks to improve their knowledge and skills by actively seeking out new learning experiences. In a CoderDojo, this may take the form of searching online resources or seeking out expert knowledge from others. Lifelong learners are facilitated in a CoderDojo context due to its social aspect where groups can come together and engage in discussions around their subject or project of interest. CoderDojos are keen to ensure that Ninjas can create a project in an applied way that allows the user to practice skills and create something tangible. The research and development aspect of a Dojo allows a child to go beyond simply absorbing information and enables them to synthesise and apply what has been learned. The unorthodox nature of Dojo delivery ensures that there is no 'teacher' and people can openly share what they know. Children are often encouraged to help each other and relay their findings, thus facilitating them in acting as a MKO.

The field of education is ever changing and the onslaught of technology in the past decade or more has forced a change in attitude among many educational stakeholders. With technology now being used in many aspects of education, it is important to consider if utilising technology has an impact on the dispositions of learners. For knowledge to be truly constructed, an environment should endeavour to invite and stretch the habits of its learners. However, [39] posits that "hard thinking focuses the brain’s attentional field on that which is probable, plausible or ‘sayable’, and thus makes it miss more intricate or unexpected details and patterns in experience” (p. 5). Therefore, it might be considered prudent to foster positive traits and dispositions organically rather than via prescriptive methods.

3. Methodology and Analysis

This study explored the experiences of children (aged 10-13) participating in CoderDojos in one county of Ireland. The research incorporated qualitative (observations and focus groups) and quantitative (survey) methods. Four CoderDojo Locations (A, B, C and D) were identified. These four locations had an existing Dojo (running for more than 12 weeks). They were selected due to their profile diversity and geographic location. The children here were observed, completed a survey and participated in focus group interviews. In this paper, pseudonyms have been used to protect the participant’s identities.
The observational data collected offered an insight into the complex relationships that exist between various elements at a CoderDojo. It demonstrated the importance of where a child might be placed within each learning system if the ZPD is to be maintained or extended. It also served to highlight the factors that may influence agency in learning and thus impacting the ability to learn and grow in a meaningful way. Subtle changes to a mentor’s approach, the layout of a room, the tools made available and the rules applied can have a profound effect on the potential outcome.

The observations also revealed that even in the face of adversity (poor room layout, limited tools, rules, a false sense of the discipline and sometimes a high demand placed on cognitive abilities) the children appeared to have fun and enjoyed being there. The opportunity to engage in limitless problem solving where the learner exhibits determination (tenacity) and recognises that there are more than one way to achieve a result is evidenced by John (B2) when he said:

John: Well coding, ya see, there's loads of ways of doing it. If ya wanna to write a word you could write a small code or a big code, and you could do it many ways, only with school subjects, there's just limits whatever way whatever direction ya go.

John’s response also suggests that his options to learn are limited in a traditional school environment. The notion of a school applying “limits” and being restrictive is a cause for concern for educationalists. Offering learners opportunities to engage with a task in multiple ways is certainly a trait of CoderDojo that could be implemented in a school setting. This of course assumes that there is time and scope within the curriculum to facilitate this.

John’s comments are supported by children at CoderDojo A where they also suggested that there was less opportunity for agency in learning at traditional school.

Sue mentioned being introduced to new people at a CoderDojo. The social aspect of a Dojo is important where children of different ages are learning together in a social context. There is good opportunity for the children to learn how to interact with others in a more productive manner and to learn empathy for others who might be encountering difficulty. These options are often not available in a school setting where, traditionally, a class is comprised of children of a similar age. It is therefore arguable that a CoderDojo is providing its Ninjas with agency in their approach to learning; a potential lifelong skill which supports [22] where an importance is placed on the role of others and capable peers in helping children working in their ZPD.

The fact that children attending CoderDojo B are doing so on a Saturday morning off their own volition demonstrates a certain level of commitment and desire to be there. The freedom to go or not is itself a characteristic of agency as presented by [40].

Emma’s dialogue refers to having an opportunity to practice. This is perhaps further evidence of a learner who is engaged (intent participation) with the material and who is demonstrating tenacity and grit in her approach. It is therefore arguable that tenacity and determination are possible by-products of a learning environment that fosters agency.

Lucy in CoderDojo C also expressed her satisfaction with having choice but used the words “subject” in reference to the CoderDojo and also alluded to situations where they have “instructions”.

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### Table 2. CoderDojo Profiles

<table>
<thead>
<tr>
<th>CoderDojo</th>
<th>Environment</th>
<th>Age Group</th>
<th>Mentor Profile</th>
<th>Technologies Used</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Secondary school computer lab using PCs. Out of school hours. Primary school children in attendance. Tuesdays.</td>
<td>10-13 years</td>
<td>Six computer science degree student volunteers.</td>
<td>Scratch, HTML, Minecraft</td>
</tr>
<tr>
<td>B</td>
<td>Family Resource Centre using PCs. Saturdays.</td>
<td>5-14 years</td>
<td>Computer Programmers.</td>
<td>Scratch, HTML, Java/Swing, Python</td>
</tr>
<tr>
<td>C</td>
<td>Primary School classroom using laptops during school times. Fridays.</td>
<td>10-11 years</td>
<td>Usual class teachers with the addition of two computer science degree students volunteering.</td>
<td>Scratch</td>
</tr>
<tr>
<td>D</td>
<td>Secondary school computer lab using PCs. Out of school hours. Primary school children in attendance. Mondays.</td>
<td>9-14 years</td>
<td>Computer Programmers.</td>
<td>Scratch, HTML, CSS, JavaScript, Python, Machine Learning, 3D Printing</td>
</tr>
</tbody>
</table>

---

*Researcher: Ok. The next question that I’m gonna ask is, is a CoderDojo like other subjects at school?*

*Background noise*

*Paul: I don’t think so because in our school we don’t have like a lot of computers and it’s just not really like a subject in our school.*

*Researcher: What about the rest of you?*

*Background noise*

*Researcher: Is it like school?*

*Sue: I don’t really think it’s like school at all because you get to work with a lot of new people that are introduced to do and there’s different ways of doing stuff.*
CoderDojo C is delivered by the usual class teacher during school hours, therefore Lucy’s point is perhaps a reference to the teacher using a more traditional teaching approach to delivery on occasions (teacher centred). Interestingly, Lucy’s comment doesn’t infer a deeper understanding that agency in learning is beneficial, in that it would help her to gain a better understanding of the problem, but rather that it is less constrained than traditional “subjects”.

The focus group interviews revealed what fun meant to the children and how it influenced and affected their approach.

CoderDojo B (2)

Researcher: Tell me what you think of a CoderDojo?
Billy: Oh, well I think it’s very fun and like your imagination... there’s no limits to it. Like you can, whatever you can think of you can do it.

Billy at CoderDojo (B2) appeared to cite a Dojo as a context that provided him with a world of possibilities. He referred to the fun aspect of using his imagination and that in turn, anything was possible. The confidence building associated with ‘fun’ could arguably act as an intervention to a barrier of the ZPD where children might otherwise experience boredom or encounter resource issues.

CoderDojo D

Emma: Well I would say it’s a class not only to help you learn how to use computers more constructively, more usefully, it’s also a class to find likeminded people.

Researcher: Oh Yeah. Oh. Anything else?
[Short pause]

Nathan: Oh. Yeah. It’s not really all about programming, it’s about seeing what you can design, what you can come up with and it means you think in different ways as well.

The participants at CoderDojo D appear to have been afforded opportunities to understand how to become a MKO (More Knowledgeable Other). Emma seems to understand that there’s more to a Dojo than simply using a computer, she appreciates creativity and the opportunity to interact socially with peers who share a common interest. These ‘softer skills’ are equally as important in allowing her to break down any ZPD barriers and enable her to disregard any false sense of the discipline.

Nathan’s response was quite similar to Emma’s where he also appeared to understand the many different roles that exist within the discipline. The ‘fun’ aspect of the Dojo appears to nurture creativity and encourage it. Nathan’s comment about “thinking in different ways” is maybe evidence that CoderDojo D has managed to dispel another barrier to ZPD: egocentric subjectivism [41]. Nathan appears to understand that there are many solutions and much to be gained by thinking in different ways.

The opinions of the children involved in a CoderDojo about their learning environment are of great interest. Also of interest is the potential cognitive impact of such an environment on learning. CoderDojo A was in a school environment, after hours and delivered by computing students. The children were asked if they liked the room in which their Dojo took place.

CoderDojo A

Pat: I think CoderDojo should take place in a quiet room that has a lot of technical stuff and computers in it.
Paul: I think CoderDojo could kind of be in a big but small room, so kind of a medium one, which the tech that Pat was on about.
Researcher: And is the room that your CoderDojo takes place, is that ok?
Nia: Good
Paul: It’s OK.
Nia: Cos it’s small and compact?
Researcher: It’s compact? OK.
Nia: Because it has computers and because you like go into groups and have teamwork together instead of like struggling with it by yourself.

A CoderDojo usually conjures images of fun and noisy interaction. The dialog above would suggest that the children here prefer a slightly more subdued environment. They liked the social aspect to their Dojo and enjoyed the option of being able to collaborate but they also used words such as “compact”, “small” and “quiet”. These adjectives suggest learners who wish to focus and be studious. The have chosen to go to this Dojo voluntarily and appear to genuinely want to learn. The boys also suggested that the room should have “tech”. The idea that the children wanted to see technology in the room is an indication of a desire for more inspiration. The children are aware that a CoderDojo is dissimilar to their usual learning environments and as a result, they want their CoderDojo context to reflect that disparity. The inclusion of technology in the room is an obvious request.

4. Conclusions

[42] as well as [43] suggest that gaming as a learning tool has the potential to provide learners with contextualised problem solving spaces and helped bridge the in/out-of-school learning gap. There is also scope for social interactions to be improved through gaming where the rules of play are communicated and respected by all participating. Additional evidence was provided by [44] where positive correlations were found between gaming as
a team and learning versus gaming alone. A CoderDojo is an opportunity for children to learn from and with peers.

The data presented in this paper is merely a snapshot of the research conducted, however, it revealed many elements (agency, technology, environment, mentor influence, fun, aspirations, problem-solving, projects and challenges) as being important when creating an unorthodox learning space for children to engage with material such as coding related activities. The data may prove useful to educators hoping to adopt and implement the newly proposed curriculum for Computer Science at Leaving Certificate level in the near future.

5. References


Talk WITH me, not AT Me:  
Millennial Learning in the Age of the Shortened Attention Span

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Abstract

What is the best way to keep undergraduate college students engaged? Although academics have known for some years that the younger generations of millennials and “Z generation” students often prefer fast moving activities, many college professors do not take advantage of that understanding. This paper discusses recent ongoing research in a cultural diversity course. The research compares student learning and cultural sensitivity when information is only read, as opposed to layering the reading with a guest speaker. The data collected appears to indicate that students not only learn more from the addition of a guest speaker, but that they also seem to be more understanding and feel more comfortable with people different from themselves. This work has also encouraged one of the researchers to revamp the course in order to make it more student driven, technological and personally interactive for college students.

1. Introduction

What is the best way to keep college students engaged in class? Unfortunately, the days of college professors reading lectures from yellowed notes is not totally gone. Students simply don’t respond to that method any more. One can see the most technologically skilled students sending messages on their phones under the table, while their eyes remain on the professor. It is time for all of us to re-examine the purpose of teaching at the college level. We want students to become more knowledgeable, but we also want them to be engaged, and to develop a personal interest in new and important topics.

Recently, one of the authors of this ongoing study invited a guest speaker to talk to the students about Islam. The students had read about the tenets of Islam, and they had shared their curiosity and also their fears, many of which came from conversations with parents, or from books or films. They were not sure whether it was the religion that was violent, or whether specific groups twisted the religious principals of Islam in order to justify violent actions. The students wrote some of their thoughts on a survey after they had finished the reading.

When the guest speaker arrived, the students were surprised. They saw a woman who “covered” as her religion indicated that she should do. What they did not expect to see was a native-born American woman who was a teacher, spoke five languages, and who had a crazy, wild sense of humor, and a willingness to answer any questions the students had. When the Moslem teacher left, the students indicated that they liked her as a person, and they now understood that the bombings and violence were not as tied to the religion of Islam as they were tied to specific groups which used Islam as the basis of their hatred and political agendas. Some of the students were amazed to find there are similarities in beliefs that exist among people who are Jewish, Christian and Moslem. At the next class meeting, out of curiosity the professor asked the students to fill out the form once more. She was curious at to whether there would be any changes in student perceptions.

At the time of this information gathering, the professor was only curious. She did not view this as research, but rather as informative for improved teaching. It was only when she noticed that ideas and thoughts seemed to have changed for some students that she realized that this was an important piece of evidence to add to the greater body of knowledge about how college students learn best. After having talked with two colleagues, who recognized the value in this work, the idea for a study was born, and eventually approved as a qualifying research project by the university. Since the parsing of this data is still underway, the project is ongoing. There are several thoughts we had about the possible implications of this work. First, it is a study that applies to the layering of a guest speaker after students have done a traditional reading. Second, it is also about the interactive nature of a good guest speaker, who is willing to clarify and answer questions. After the speaker, the students understood more about the topic, but they also seemed to be more culturally sensitive.

A second idea which emerged from this work is the thought that one reason the students were so receptive to the guest speaker is that they like activity and personal interactions, and they learn
from them. One of the researchers has revamped her
current class this semester to create much more
interaction among students, allow them to use their
cell phones to look up articles to share in class, give
them important duties, and she keeps a tight timeline
on their very interactive classroom work. Students
are allowed the freedom to make suggestions for
further work, and so far, this has been very
successful. One would suspect this freedom to work
well for graduate students, but the students in this
class are only 18-20 years old -many of them right
out of high school. Their interest in learning on their
own has been inspiring.

2. Literature review

A number of research studies have indicated that
guest speakers, and assignments which engage other
people, are conducive to learning. It is clear from the
literature that when effectively used, the inclusion of
guest speakers as one pedagogical tool in an overall
varied educational experience can enrich the learning
experience of the student [2], [6]. In a related field,
it was found that an analysis of 225 studies of under-
graduate STEM teaching methods revealed the
teaching approaches which turned students into
active participants rather than passive listeners
reduced failure rates and boosted scores on exams by
almost one-half a standard deviation [3]. Despite
these findings, many educators continue to use
techniques that often do not engage today’s students.

Like guest speakers, being involved in
collaborative work with one another has been found
to increase students’ problem solving. Recent
findings on student’s collaborative problem-solving
skills were released as part of the Program of
International student Assessment (PISA) conducted
by the OECD - Organization for Economic
Cooperation and Development. The survey assessed
half a million fifteen year olds from a number of
countries relative to academic test scores, problem
solving and scores of social skills. The report is the
first international assessment of students’ social
skills according to Andreas Schleicher, the OECD’s
Director of Education and Skills, who says the report
addresses a growing demand in the workplace for
individuals with strong social skill

A number of articles reinforce the positive aspects
of group interactions and collaborative problem solving.
Group learning is more effective than traditional
methods in improving critical thinking [1]. There are
indications that social interactions also seem to
mediate interactions in neuroplasticity, the brain’s
ability to modify connections between various
groups of brain cells. A good group learning
experience helps build academic self-confidence,
support and encouragement to take risks, and it is
believed that encouraging and engaging others
broadens students’ perspectives to think of the world
in a more diverse way [5].

3. Methodology

This study has been undertaken to better
understand several issues. First, it is designed to
compare the relative effectiveness of two strategies:
the use of a reading passage, and the use of an
interactive speaker following the use of a reading
passage. The comparison involves the promotion of
learning and cultural sensitivity in a course about
diversity and social justice.

In this ongoing study, a mixed method study
design has been adopted, using both qualitative and
quantitative data. Each assignment contains basically
the same questions, although one given after the
speaker contained an additional question to help gain
insight into the answers. While most of the questions
are qualitative, asking students how they felt about
topics after the reading or listening to the speaker,
there also was qualitative data collected. Students
were asked to rate their level of agreement based on
a Likert scale.

The responses of the anonymous students have
been typed by a student worker in the department of
the three researchers. The researchers have built
templates for assessments to independently combine
qualitative results across all participants to see if
there is a general pattern in terms of how the students
responded either differently or similarly to the
assignment of questions. After the preparation of the
qualitative data, the researchers will compare results
to see if there are disagreements. The quantitative
data from the Likert Scale responses will be
summarized to see if there is any difference in the
magnitude of changes in their attitudes.

In addition, there will be qualitative data
available relative to what the students think is the
best way for them to learn about the topics in this course. The students’ responses about whether they enjoyed and or learned from other class assignments that are very interactive in nature will be of interest to the researchers as they consider their responses relative to the readings and the guest speaker. The researchers hope the student responses will add to the body of knowledge about how to best capture the attention, interest and understanding about the topics presented in the course.

4. Conclusion

The authors of this study, which remains in progress, will attempt to determine the efficacy of a guest speaker when added to a traditional reading of information about a topic to be studied. In addition, they will attempt to find out from the students themselves which other assignments they believe made a difference in their learning and their retention of new information. This small study should help us, as professors, determine how these students thought they learned best. It may also add credence to the observations we have had relative to whether students can become more excited about classes when they are involved in active, personal learning.

5. References


Accomplishment of Multiple Educational Objectives in Class

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Abstract

Teachers should consider how to use information and computing technologies (ICT) and teach programmatic approaches efficiently for different subjects. Teachers must especially consider how to teach English comprehensively because English education has been officially adopted in the curriculum in primary schools in Japan. For this study, several activities were conducted to promote students’ multiple abilities. They were created to achieve multiple educational objectives using ICT in class. They helped students to achieve their purposes using ICT with other students. The author described the educational effects of their activities.

1. Introduction

The unified national guideline for K–12 education is defined in Japan. The next guideline, officially scheduled for implementation in 2020, requires that teachers teach subjects using computers, encourage students to use computers individually in their classes, and do programming instruction.

Although the Japanese government promotes the installation of tablet computers at schools, the percentage of teachers who actively use computers in classes is not much greater than the world average. Therefore teachers must take urgent measures. Especially, many teachers have no confidence in manipulating information and computer technologies (ICT) in class sufficiently, although they have computer skills sufficient to complete their routine work. Measures must be taken to apprise teachers of how ICT should be used in class for better learning.

In 2020, English education is scheduled for implementation as a curriculum subject in primary schools in Japan. Adding English and programming instruction into the primary school curriculum simultaneously is expected to be difficult. Teachers must therefore consider how to teach ICT and programming instruction efficiently using activities of different subjects and how to use opportunities during comprehensive learning periods [1] [2] [3].

For example, teachers must use ICT in class, introduce class activities that lead students to use programming techniques, and conduct as many classes as possible to promote students’ communication skills.

This paper reports three key educational activities to illustrate the manner in which several educational activities can be conducted to promote students’ multiple capabilities. First, class activities were done using video conferencing with an overseas educational institution and faculty. Students considered how to promote ICT education in Japan by comparing their ICT education methods with overseas ICT education methods. Students developed their English communication skills by asking questions and discussing matters with overseas teachers after students’ presentations.

Second, the author developed an educational system for students to operate robotic equipment by compiling computer programs while communicating with other students. Based on mutually exchanged information, students created a program to operate the equipment to a given goal. Information that students obtained differed. Therefore students decided the next program for mutual communication.

Third, the author conducted a course for in-service teachers and students wishing to be teachers. They clarified evaluation items and criteria using rubric evaluation. Conducting surveys and developing educational material is popular among teachers in Japan because it enables them to improve their teaching skills by observing other teachers’ classes. Teachers must study how to observe other teachers’ classes and how to evaluate them to raise their teaching skills. Accordingly, the author applied the Rubrics Evaluation method to the class of the course and conducted activities to clarify evaluation items and criteria for classroom activities.

2. Student discussions of ICT in education using video conferencing

The author conducted a course on how teachers should organize lessons using ICT for in-service teachers and students wishing to be teachers.

The students were given a task: their class should be conducted using ICT. Then, after conducting trial lessons, they discussed how to construct effective classes using ICT. However, they had insufficient knowledge about various ICT uses. They only discussed the topic under its limited use. For example, results demonstrated that many in-service teachers did not have sufficient experience with using videoconferences during their class activities,
although they would be able to expand possibilities of learning if they were able to use videoconferencing systems in actual classrooms.

For that reason, the author conducted trial lessons using videoconferencing systems for the course students. The trial lessons have four purposes.

1) To show students ICT effectiveness for education

In several scenes, teachers can use ICT in class. In actuality, ICT is effective for making teachers aware of the possibilities for ICT use in class. Generally speaking, teachers only give lectures with a tablet PC or compel learners use a software application that supports a lesson or teaching point.

However, teachers and learners have few opportunities to organize their thoughts, communicate with other teachers and learners outside their classes, and express their opinions with reference to others’ ideas. Videoconferencing with overseas classes is not always conducted easily, especially because of time difference difficulties. If a class using a videoconferencing system is actually held, then the effects of its use will be beyond teachers’ and learners’ expectations. Therefore, the author led students of the course in experiencing several activities using a videoconferencing system with overseas teachers to confirm the educational effects in class.

2) To ascertain differences and characteristics between Japanese education and foreign countries’ education and to develop abilities to analyze the Japanese education system objectively.

Based on national guidelines, K–12 education in Japan is fundamentally conducted uniformly. Teachers must always think about how to conduct useful lessons to enhance educational effects under the national guidelines. It is meaningful for teachers to consider their education problems compared with other countries. Even teachers who cannot experience real class activities in a foreign country can analyze their educational methods by collecting information from teachers overseas.

3) To make students understand the necessity of English communication

As a subject, English education is to be implemented in primary schools in Japan in 2020. Teachers must use ICT in classes and foster learners’ thinking skills for application to programming techniques. Therefore, both English education and programming education using ICT positively are fundamentally important for teachers.

4) To cultivate students’ motivation to participate in a language study tour

It is important for students to visit a foreign country, to observe classes directly, to compare their education systems with the education system in their visiting country abroad and to deepen their consideration. Video conferencing is a useful tool to carry out advance training program of the language study tour to make the study tour more meaningful and more effective.

Classes using video conferencing were conducted as described below. Four lessons were allotted for video conference preparation. First, the students considered what abilities and skills Japanese learners should develop and how they should learn the abilities and skills. After the students had read the Japanese government guidelines, they discussed the teaching methods they had practiced in actual classes.

Next, the students formed three groups, each with 3–4 people: a group of primary school teachers, a group of junior high school teachers, and a group of high school teachers. They first discussed the Japanese educational system and listed items that they thought differed from the U.K. educational system. Secondly, they compiled questions about differences in English. Thirdly, they asked a teacher in the U.K. questions using video conferencing. Thereby, they confirmed differences between the educational systems in the respective countries. The U.K. teacher gave a lecture about the U.K. educational system to the students of the course.

3. A collaborative experiment requiring communication with others

The author developed an educational experiment system that helps students to achieve a goal using ICT with students at a remote location [4]. Students moved an educational robotic device and developed a program for mutual communication. The educational device had already been developed. The device moves according to some parameters arranged in a program and presents results of its movements to students.

In this experiment, students were required to design a program while communicating with each other. It was conducted as described below.

First, student A was given a task to solve and compile a program. Student A wrote the meaning of the program and recorded the expected result before moving the robotic device. Student A recorded the data of the result after the experiment. Next, student B read the data written by Student A and analyzed it. Student B wrote how the program should be developed and improved. Then the student passed the revised data to Student A. Student A remade the program with reference to the data and comments written by Student B. Created for a collaborative experiment, this system demonstrated that student A can communicate with student B at a remote location to develop a program through mutual collaboration, despite a complete lack of face-to-face communication.

4. Evaluation items created for analysis based on ICT use in class

Evaluation activities are important in classes. Considering how to select evaluation items and
evaluation criteria is also useful for teachers. The author explained several evaluation methods used in class after describing their characteristics to the students in the course.

Rubrics Evaluation is a method supporting objective evaluation using criteria applied mainly to evaluation of student performance and work, teacher performance and various performance activities [5] [6]. Nevertheless, the method is not generally applied to K–12 education because it takes long periods of time to select evaluation items and criteria. Making original evaluation methods is difficult for teachers because of its time-consuming procedure.

The goals of the course were to analyze classes related to ICT, to enhance teachers’ decision-making skills, and to activate communication among students. After the author conducted educational activities for students in groups to assess creation of evaluation items and criteria, the author made students analyze their classes to improve their analytical and communication capabilities. After discussion, students used the following items for class evaluation.

(1) Does a teacher give a learning task to cultivate learners’ motivation to learn?
(2) Does a teacher change the learning mode according to an educational purpose?
(3) Does a teacher encourage individual learners to improve their skills?
(4) Can learners understand the meaning of a given learning task?
(5) Can learners approach a given learning task on their own initiative?

5. Conclusions

The activities reported herein were created to achieve multiple educational objectives using ICT in class. This paper also reported that evaluation activities were important in classes. The author plans to improve the educational activities, revise them, and survey their effects.

6. References


Session 7: Global Issues in Education and Research

Title: Cyberostracism and American Adolescents: The intersection of gender, personality, and rejection on social media
(Author: Erin Castleberry)

Title: Following the Gaze of Learners to Measure Mental Workload: The Index of Cognitive Activity
(Author: Brian D. Beitzel)

Title: An Examination of #DigPed Narratives through the Lens of the Capacities and Signals Framework
(Authors: Suzan Koseoglu, Aras Bozkurt)
Cyberostracism and American Adolescents: The intersection of gender, personality, and rejection on social media

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Abstract

The current generation of adolescents is the first to live their entire lives under the influence of social media. To date, research has primarily focused on the adolescent’s social media use patterns without seeking to identify or mitigate any negative emotional effects of use. A significant issue then is the manner in which shunning or exclusion in an online platform, also known as cyberostracism impacts them. A second and related question involves the relationship among personality traits, gender, age and the experience of cyberostracism. Does cyberostracism differentially impact an adolescent on the basis of these dimensions? Research has suggested that it leads to a sense of feeling out-of-control, isolated, and emotionally down. Beyond this, little is known about the direct effects of this virtual shunning in both the short and long-term. In part, this is due to the fragmented nature of this phenomenon being studied by multiple disciplines without any clear lines of inquiry. This can be remediated by establishing a foundational base of information around what is known so that a more directed effort may be generated that will guide parents, educators and mental health practitioners in recognizing and mitigating the effects of cyberostracism.

1. Scope

As ubiquitous as social media has become, it is still relatively new to the cultural scene. Facebook, for example, was only founded in 2004 and it has changed the way people share information and connect with each other around the globe. The verdict is still out on the impact social media is having on the emotional health of this generation. The study of social media is still relatively new. However, a growing body of research exists on the topic of cyberostracism, yet it is fragmented. Incorporating what is already known about such variables as adolescent gender and personality outside of the social media arena is a reasonable place to begin this line of inquiry. It is clear that mental health practitioners must take into consideration such variables as these in establishing interventions into adolescents experiencing maladaptive emotional states or behavioral reactions to cyberostracism in order to address the holistic needs of the clients most effectively.

As adolescents spend more time interacting with others online, it naturally follows that the normal social human interaction they experience off-line would begin to occur online. Users meet, maintain and end relationships, discuss issues, make jokes, seek answers, and offer support to those with whom they friend, follow, or are connected online [1]. At some point, adolescents, with their limited limbic and prefrontal brain development, may post something that offends their peers or violates a social norm. The reaction of their social media audience can be immediate or met with silence [2]. When the criticism is overtly critical it may come in the form of mocking, teasing, or directly calling the person out for their misdeed. When the reaction is silent, the consequences can be even more insidious because the user is left to imagine what is intended by the silence.

Without direct and clear feedback, the silence of one’s social media audience may be influenced by the negativity bias wherein we weigh more heavily negative information and attribute the worst possible meaning to equivocal information [3]. This sends the mind racing to decide the meaning of the silence and exclusion. Whether the feedback is overt or silent, the experience of rejection or ostracism can be just as acutely felt online as in real life [4]. Moreover, in a large study on perceptions of ostracism in an online environment which consisted of a quarter of the participants falling within the developmental stage of adolescence, it was observed that the more an individual perceived feeling ostracized the more they felt isolated, out of control and experienced a negative mood state [5]. Thus, what we do know about adolescents from this investigation is that online ostracism directly affects self-perceptions and experience of the self.

What is not known is how one’s gender and personality shape this experience. The experience of rejection is subjective and perceptions of it would necessarily be impacted by the innate qualities of the victim. This would be particularly valuable information to support mental health interventions with this population.
2. Objective and Motivation

From a developmental standpoint, it is clear that adolescence is a period where there is a heightened sensitivity to peer acceptance. In the 21st century, this need to experience a sense of belongingness may be salient in both in-person and virtual environments. Over the last 10 years, research has begun to emerge around an individual’s experiences in online communities, yet much of it comes from disparate fields and remains disorganized and little if any of it has been devoted to this developmental segment. Moreover, questions around the influence of personality and gender as mediators of the online experience and its impact remain unanswered.

The current presentation has two purposes of interest to educators, parents and mental health professionals working with adolescent populations. First, it will provide a general overview of what is known about the impact of cyberostracism from a multidisciplinary perspective to attempt to identify general principles associated with online engagement. Second, it will propose a research design and rationale to address the intersection of personality, gender and rejection as they influence an adolescent's perspective deriving from engagement in online communities. Such information would be of benefit to parents, educators and clinicians working with adolescent populations.

3. References


Following the Gaze of Learners to Measure Mental Workload: 
The Index of Cognitive Activity 

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Abstract

One of the most commonly used physiological metrics for measuring cognitive workload is pupil diameter. The Index of Cognitive Activity (ICA) is based on pupilar diameter but was designed to overcome its limitations. The ICA is commercially available yet not well known within the education research community. This investigation explored the relationship between ICA and pupil diameter for a learning task completed by undergraduate students. Results indicate that ICA and pupil size are related but not highly correlated; thus, the adjustments to pupil diameter implemented by the ICA algorithm are nontrivial. This study demonstrates that the ICA should be considered by education researchers as a worthwhile measurement of learners’ cognitive load.

1. Introduction

Instructional designers are trained to be mindful of the cognitive demands they place upon learners. The term cognitive load [1] is familiar to both practitioners and researchers in education; it refers to the mental burden placed upon learners by the structure and content of the learning materials. There are different categories of cognitive load [2], all of which are considered to be “additive” – meaning that incrementally increasing any one type of cognitive load concomitantly increases the overall burden on the learner’s working memory demanded by the task; in other words, the different types of cognitive load do not overlap. Because of this additivity, it is important to minimize all forms of cognitive load by structuring learning materials in an accessible fashion that focuses learners’ attention on the to-be-learned content and avoids complicated instructions or response procedures.

2. Measuring cognitive load

The theory of cognitive load is relatively straightforward – but applying it in practice is by far the more difficult endeavour. In order to apply the theory effectively, one must be able to determine how much cognitive load is experienced by learners while they are completing a given learning task. There have been a number of approaches used to measure cognitive load in research environments; these techniques can be split into two major categories that will briefly be described next: self-ratings and physiological measures.

2.1. Self-ratings

Early approaches focused on asking learners to rate their level of effort or mental demand upon completion of a learning task [3]. Several instruments have been developed for this purpose [3, 4, 5] and are still widely used. These self-reflection ratings are (a) inherently subjective and (b) obtained from inexperienced research participants, yet they have largely been considered valid measures of cognitive load [5, 6].

2.2. Physiological measures

Physiological measures are becoming more commonly utilized to measure cognitive load. The advent of eye-tracking equipment has allowed researchers to employ some of these techniques more widely in recent years. In particular, pupil diameter [7, 8] and eye-fixation durations [9] have been popular metrics. Sudden changes in pupil diameter are broadly believed to signal a change in mental effort [10]. It is also commonly known that as light conditions vary, pupil size automatically adjusts to accommodate for the momentary increase or decrease in ambient lighting. Thus, raw pupil diameter should likely be considered as only an estimate of mental workload due to the “noise” of dilation changes unrelated to cognitive effort. Another limitation is that pupil size varies across individuals and cannot be referenced in a standardized fashion. In addition to pupilar measures, more advanced physiological techniques such as electroencephalography (EEG) [11] have been explored. Overall, one of the clear advantages of physiological measures is that they can
provide real-time data to researchers without querying participants and thus adding to their cognitive load.

Figure 1. Pupil size (top pane) and ICA (bottom pane) for a sample participant on the first practice problem (r = 0.44, p < .01)

2.3. The Index of Cognitive Activity (ICA)

Sandra Marshall [12, 13] developed the Index of Cognitive Activity (ICA) and subsequently received patent approval for it from the United States Patent Office. The ICA is based on pupil dilation but solves the nagging issue of varying pupil size under dynamic light conditions; the ICA’s algorithm is designed to ignore pupilar variations due to changes in light, capturing only changes due to mental workload. ICA data are scaled on a range between 0 and 1 (for each second of observation), with higher numbers representing greater mental workload.

The ICA was not developed as a measure of cognitive load specifically, yet the concept of mental workspace being consumed by the complexity of learning tasks is the same. The ICA metric should be thought of as a measure of the total demand on working memory rather than any one type of cognitive load specifically. Because human cognitive architecture is limited in capacity, what ultimately matters is just that – the overall burden – and not the contribution of a subordinate category of cognitive load. Therefore, the ICA fits well with the goals of both researchers and practitioners working in educational contexts.

The commercial software that currently implements the proprietary ICA algorithm is EyeWorks® [14]. This software provides raw output as well as formatted reports of ICA and other data collected through specialized cameras connected to the software while a participant is completing an assigned task. The principal goal of the present paper is to explore the feasibility of using the ICA metric (with which the author has no affiliation) in the context of a postsecondary learning task, which is described next.

3. Learning task

For the present paper, the learning task under examination was a mathematics learning activity presented to postsecondary students in a laboratory at an Eastern U.S. four-year college. The participants in this activity were undergraduate students who signed up as a course requirement (in courses from various disciplines, none of which was instructed by the author). The topic of the activity was solving total-probability word problems, and participants were randomly assigned to two conditions: the experimental group received instruction on how to solve these problems using a Venn diagram, and the control group received instruction on how to solve the same problems using only equations. All of the activities were delivered via computer.

Phase 1 of the experiment was a pretest with nine probability problems ranging in difficulty from very simple to rather complex. The pretest data were used to assess participants’ background knowledge of probability prior to experiencing the intervention. Phase 2 contained the training. A basic introduction to probability was provided as background information for the more advanced material that was the focus of this study. Then the control group received instruction in how to use an equation to solve total-probability problems; the experimental group received not only equation training but were also instructed how to use a Venn diagram to assist with the construction of the equation. At the conclusion of the tutorial were five worked examples [15]; these were presented using backward
fading [16], such that the first example was fully worked, the second example was missing only the final step, etc., until the fifth example supplied only the labels for each step.

In Phase 3, a posttest was administered. The posttest problems were completely unscaffolded (i.e., there were no solution hints provided), and these word problems were similar in nature to those encountered during the tutorial in Phase 2. The Phase 2 training covered all information necessary to solve the problems in Phase 3.

Table 1. Pearson Correlations Between ICA and Pupil Size, for Selected Screens

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</tbody>
</table>

Note: Because there are individual differences in pupil size, the correlations in this table should be interpreted with caution.

“Tutorial screens 12-14 contained sample problems, along with textual explanations for their solutions. Practice problems 1-5 are the worked examples; the first two practice problems were split onto two screens due to the accompanying textual explanations.

4. Results

The relevant results for the present paper are the pupil-size measurements and the ICA data collected during the above-described learning activity. Other results pertaining to learning and the effectiveness of diagram use in this context have been presented elsewhere and may be obtained from the author.

Figures 1 and 2 display the second-by-second data for a sample participant during the first and second practice problems, respectively. Noteworthy in these figures are the parallel increases and decreases in effort as measured by pupil size (in the upper panels) and ICA (in the lower panels). For example, in Figure 2 at the 25-second mark, there is a precipitous decline in mental effort in both panels, followed by a sharp increase. This positive relationship is underscored by the moderately strong correlation of the two variables for the participant in Figure 1 (r = 0.44, p < .01).

Yet these two metrics do not yield identical agreement, as indicated by the nonparallel portions of Figures 1 and 2. For example, the final seconds of Figure 1 demonstrate an increasing trend in pupil size but a decreasing trend in ICA scores. The inconsistency of these two metrics is also reflected in Table 1 with several of the correlations between ICA and pupil size being nonsignificant at the α = 0.05 level. This inconsistency is well represented by the lack of statistical relationship between the two variables displayed in Figure 2 (r = 0.07, p = .66).
5. Discussion

Considering the data presented here, we can conclude that the ICA algorithm’s adjustments to the “raw” pupil diameter do, in some cases, alter the overall picture of mental effort. This is not surprising, given that the ICA intends to suppress the “noise” of pupilar changes due to sources not affiliated with mental workload. Indeed, one should anticipate varying and perhaps contradictory data from the two different metrics; if they were in agreement, the ICA algorithm would be unnecessary.

Because the alterations to raw pupil diameter provided by the ICA algorithm are nontrivial, the question naturally arises, which of these two metrics represents the more accurate physiological indicator of mental workload? Another form of the question is, how do we know that the ICA’s algorithm provides the correct adjustments? The answer to this set of questions is beyond the scope of this paper, but there have been careful studies conducted [12, 13] that validate the ICA’s ability to distinguish between the pupilar changes due to contemporary variations in light conditions and those due to mental workload.

Pupil-size measurements have always been deemed to be only a proxy for cognitive workload; conversely, the ICA was developed with the goal of measuring it as directly as possible. Considering the evidence documenting the ICA as a valid measure of cognitive workload (including approval by the United States Patent Office), a preference for ICA data over raw pupil-size measurements would surely be a rationally justified position.

The data from the learning task presented in this paper provide evidence of how informative the ICA algorithm can be for researchers and educators seeking to understand how much mental effort learners are experiencing. With data such as these, learning activities can be examined and redesigned as needed to optimize educational experiences – by using techniques that follow the gaze of learners to measure their mental workload.

6. References


An Examination of #DigPed Narratives through the Lens of the Capacities and Signals Framework

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Abstract

“What stories, what names, what struggles, do you wish to add to enable a more democratic education to be built?” asks Apple in his seminal book Official Knowledge [1]. It is this question that drives this research into collective educational narratives and acts of resistance on Twitter. By resistance we mean an attitude that rejects colonial, strictly behaviourist, androcentric, consumerist and industrialist views in education. Using Tufekci’s [2] Capacities and Signals framework, we conceptualise Twitter as a politically charged public space, where educators from all around the world occasionally act against mainstream models and common practices in education through a complex interplay of individual performance, spontaneous interactions with others, and organised structured and semi-structured events.

The context of this mixed methods research is #DigPed activities during three Digital Pedagogy Lab events: Digital Pedagogy Lab Cairo (March 20-22, 2016), Digital Pedagogy Lab PEI (July 13-15, 2016), and Digital Pedagogy Lab 2017 Summer Institute (August 7-11, 2017). We analyse #DigPed through the lens of the Capacities and Signals framework to understand (1) how educational narratives develop and spread on #DigPed, and (2) the nature of their capacities.

Social Networking Analysis (SNA) is used as a starting point in this research to map key people in the network, ties in the network, the hashtags used and moments of intense activity. We then turn our attention to the nature and impact of some narratives that have spread on the network using thematic analysis. We approach the study through an interpretive paradigm; that is, we acknowledge the fact that knowledge is socially constructed through language and interaction and is always partial. Thus, we seek understanding through self-reflexivity and iterative cycles of data collection and analysis.

Findings showed that #DigPed falls into a unified-tight crowd network pattern in which discussions are characterized by highly interconnected people with multiple connections and few isolated participants. SNA also revealed that key influencers (i.e., DPL organizers, keynote speakers) held strategic positions in the network. Three prominent narratives emerged from the thematic analysis: “love in pedagogical work is an orientation,” “every student can have their own domain - to share their work, knowledge, memory” and “most stories about student debts/struggles go untold.” The nature of these narratives led us to consider a capacity different from the ones proposed by Tufekci: pedagogic capacity, which we define as the power to initiate a productive and potentially transformative educational discourse, within one’s self and within communities.

Overall, findings suggest that although a network like #DigPed is open to all, there are hidden power structures that shape the network activity. Findings also align with Stewart’s [3] argument that “hierarchies of influence relate to identity and attention, rather than [institutional] role” (p. 306) on an open platform like Twitter. These hierarchies of influence are not taught through formal practices (such as staff induction events or earned ranks) but learned and earned through ongoing participation in a community, both through professional and personal means. Multiple implications in relation to the pedagogic and narrative capacities of online networks like #DigPed are drawn from this
research: (1) there is a need to strengthen the pedagogic capacity of educational narratives; (2) there is a need to acknowledge the power dynamics in open networks; (3) there is a need to further investigate the complex nuances of gatekeeping.

References


Session 8: Curriculum, Research and Development

Title: Use of a Business Improvement Process to Evaluate a Nursing Curriculum and Develop Improvement Strategies
(Author: Roberta Heale)

Title: Evaluating the Effectiveness of Cognitive Behavioural Therapy for Social Skills and Psychosis by an Interdisciplinary Team of Mental Health Professionals
(Authors: Julia Marinos, Jessie Moorman, Tomas Fogl, Julia Grummisch, Lisa Murata, Jack Chan, Carrie Robertson, Kevin Ritchie, Nicola P. Wright)

Title: Training and Educating Front Line Workers: Identification, Support, and Brief Therapeutic Interventions for Working with Individuals with Psychosis
(Authors: Jessie Moorman, Julia Marinos, Jacky Chan, Nicola P. Wright, Peggy Hickman)
Use of a Business Improvement Process to Evaluate a Nursing Curriculum and Develop Improvement Strategies

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Abstract

The delivery of a nursing program complicated and often includes learning in classrooms, laboratories and in clinical placements in community and hospitals. Evaluation and identification of areas for improvement in curriculum is equally complex. The aim of this contribution is to present how nursing faculty in one program utilized a business improvement process, values stream mapping (VSM) to identify specific issues arising from program evaluation data, to prioritize one of the issues and to make recommendations related to changes in curriculum related to the identified concern. Use of VSM provided a framework for exploration of all factors that impacted the problem and to envision tactics to address it both within and external to the course content.

1. Introduction

The term curriculum refers not only to the content and delivery of individual courses, but also... “typically refers to the knowledge and skills students are expected to learn [1].” Given this, the Evaluation Framework of Laurentian University’s Bachelor of Science in Nursing program outlines a plan of data collection from a wide variety of areas, each contributing to the knowledge and skills of graduates.

The sheer volume of data from these extensive evaluations and data collection strategies is overwhelming. In order to utilize the findings to their optimal level and ensure that we achieve meaningful change, the curriculum committee chose to implement Lean strategies to address problems and achieve goals in the program [2]. Lean is a business change model which is utilized to increase value for customers, while streamlining resources.

The principles of Lean, when applied to a nursing program, can assist the faculty in identifying the program goals, or problems and provide a framework for change of action to better meet the goals.

With the Lean Transformation Model, change can be achieved through addressing the following questions, within the context of nursing education:
1) What is the purpose of the change–what value are we providing, or simply: what problem are we trying to solve?
2) How are we improving the actual work?
3) How are we building capability?
4) What leadership behaviours and management systems are required to support this new way of working?
5) What basic thinking, mindset, or assumptions comprise the existing culture, and are we driving this transformation? [3]

These questions are complex, however, the Lean process is meant to be practical. One strategy in the implementation of Lean that assists in identifying and addressing problems is Value-Stream Mapping (VSM). This process starts with the identification of a goal and/or problem related to a core value. The core value of the nursing education program reflects back to the definition of curriculum in that every nursing student will have the knowledge and skills they require to meet the entry level competencies for registered nurses in Ontario, Canada [4].

2. Program Evaluation

The first step in the curriculum review process was to identify a problem related to the core value of the nursing education program. Data had been collected since 2012 from wide range of areas including student focus groups and exit surveys, stakeholder surveys,
minutes of faculty meetings, outcomes of student RN licensing exams and more. Data were analyzed inductively through the review of each set of data separately, use of coding, grouping, categorization and derivation of themes [5]. Themes from each dataset were collated with the themes from other datasets with the intention of determining commonalities and promoting triangulation. The resulting overarching theme related to gaps in student nurse learning related to medical/surgical nursing care.

3. Implementation of VSM

A VSM process was conducted in December 2017. The session was guided by a facilitator with certification in Lean, specific to healthcare. Efforts were made to include university administration and managers from the local hospital where the majority of medical/surgical clinical placements within the nursing program occur in this VSM session, however, scheduling issues meant that only faculty members from the School of Nursing were able to attend.

The participants used VSM tools and processes to identify specific nursing curriculum issues related to learning gaps in medical/surgical care. They identified the difficulties that had occurred in finding clinical placements for student nurses in medical/surgical settings and concerns that the clinical placements that had been used did not adequately meet students’ learning needs. The group prioritized the issue of the availability and quality of acute care clinical placements.

The next step in the VSM process was to map out the key elements that occur during the academic year and which specifically impact clinical placements. The map provided the faculty with a visual representation of the key players and pressure points [6].

Some significant conclusions arising from this mapping were that student numbers exceeded the cap in each year of the program, communication between the nursing faculty and the clinical placement coordinators at the hospital was fractured and there were potential opportunities to utilization of the practice laboratory at the School of Nursing to augment student clinical learning outside of a formal clinical placement.

From this point, strategies to improve the student’s experience in medical/surgical clinical placements were explored. The participants proposed processes to ensure that the cap of students admitted to the program was respected by the admissions department at the university and that strict limits were placed on student transfers into the program.

There was also a recommendation to strengthen the relationship between the School of Nursing and the managers and clinical educators at the local hospital through securing office space for nursing faculty at the hospital to facilitate meetings related to clinical placement issues. Finally, a recommendation was made to explore the use of simulation to replace clinical time and ease the burden of clinical placements.

4. Conclusions

The VSM process provided this nursing program faculty with a framework for identifying and prioritizing one curriculum issue arising from evaluation data. Strategic mapping of the issue that followed assisted with discernment of specific, practical areas for improvement.

5. References


Evaluating the Effectiveness of Cognitive Behavioural Therapy for Social Skills and Psychosis by an Interdisciplinary Team of Mental Health Professionals

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Abstract

There is a high prevalence of debilitating social anxiety in individuals with schizophrenia. However, individuals with psychotic disorders are often left out of clinical studies, which result in limited research on effective treatments and ways to conduct social skills training. The present study evaluated the effectiveness of a 16-week group protocol for teaching social skills with individuals with psychosis. Patients (n=10) with a diagnosis of schizophrenia spectrum disorders and symptoms of social anxiety completed a group protocol for social skills. The group taught social skills using a combination of in-session activities, role-plays, psychoeducation, and exposure exercises. Pre and post measures include the Inventory of Social Interaction, the Liebowitz Social Anxiety Scale, the Social Phobia Inventory, and other functional measures. Patients are compared to a waitlist control (n=10). Pre and post measures have been completed and data is currently being analyzed. Analysis will also include data from a booster session completed 8 weeks following the end of the group. This study evaluated the effectiveness of a group protocol utilizing quantitative and qualitative information/data from a group focused on teaching social skills for individuals with schizophrenia spectrum disorders and social anxiety symptoms. This study will fill a critical gap in the literature evaluating the effectiveness of teaching social skills for individuals that are often excluded from clinical trials and have co-morbid social anxiety and schizophrenia. Findings also provide evidence for the effectiveness of utilizing in-session training exercises that provided tangible skills to group members.
Training and Educating Front Line Workers: Identification, Support, and Brief Therapeutic Interventions for Working with Individuals with Psychosis

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Abstract

Community capacity building uses education as a tool by which frontline workers can empower themselves, learn key tenets of therapeutic interventions, and practice for working with individuals from intersectional communities. This training was provided by a multidisciplinary clinical team that included a clinical psychologist, PhD students, and an individual with lived experiences of psychosis. The training focused on educating allied health professionals from community housing agencies, health clinics, and educational centres on recognizing as well as supporting the needs of individuals with psychosis from an intersectional lens. A quasi-experimental post-test design was used to measure change in workers’ knowledge of supporting individuals with psychosis. Key findings revealed that workers increased their knowledge around supporting women with psychosis from low socioeconomic status, in-session training exercises provided tangible skills which were relevant to specific worker populations, and the opportunity to receive training by a range of health care professionals spoke to the level of intervention for many workers.
Session 9: Learning / Teaching Methodologies and Assessment

Title: Faculty Orientation for Adjunct Professors: A Just-in-Time Online Delivery Model for Out-of-the-Gate Success
(Authors: Christina Harnett, Chadia Abras)

Title: Booked on Math: Teaching Early Childhood Math Concepts Through Stories
(Authors: Patrick McGuire, Breanna Herron, Kathleen Granaas)

Title: Implementing Hilarity and Creativity in the Human Sexuality Classroom
(Author: Casey T. Tobin)

Title: Pedagogical based Learner Model Characteristics
(Authors: Nour El Mawas, Ioana Ghergulescu, Arghir-Nicolae Moldovan, Cristina Hava Muntean)

Title: The Impact of Computer Assisted Language Learning on ESL Students’ Reading Engagement Skill in the Flipped Classroom
(Authors: Hani Alhasani, Mona Masood, Fauzy Wan)
Faculty Orientation for Adjunct Professors: A Just-in-Time Online Delivery Model for Out-of-the-Gate Success

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Abstract

In an era of heightened accountability, there is simply little luxury afforded new faculty in gradually coming to understand the culture, context and professional expectations of the environment in which they work. External stakeholders have placed universities under increased demands for accountability surrounding program promises, learning outcomes and student dispositions upon graduation. Each university setting is unique requiring an understanding of both implicit and explicit norms and the politics and policies of a particular department. Many new faculty may find themselves teaching in differing pedagogical styles (e.g. distance learning) from those under which they learned and using technological advances heretofore unknown to them. Beyond knowledge and skill needs, faculty have a need to develop professionally and personally.

Faculty development and mentoring becomes more of a challenge when considering faculty who work at a distance in online programs and who are not readily available for in-person enculturation. In addition, adjunct faculty play a pivotal role within larger departments and have the same professional needs. While traditional faculty often have support for enculturation, adjuncts or contingent faculty are often overlooked as “part-timers” paid for piecemeal work despite the fact that they are delivering curricula to support assessment outcomes. How then are their needs and the university’s agenda met? The resolution resides in an online orientation that provides both cultural and academic information and which affords delivery on demand. Using the Just-in-time, Just-for-you, and Just Enough (J3) Model, this presentation will feature a standardized model for online delivery of a program orientation as an exemplar for use with both new regular and adjunct faculty.

1. Scope

Faculty new to the academy both regular and adjunct have little if any opportunity aside from formal faculty development and mentorship initiatives to hone their craft or understand expectations around learning outcomes. While larger universities and schools within them may have some kind of in-person faculty orientation, departments and programs often fail to offer regular or adjunct faculty the benefit of an organized overview of academic life and expectations within higher education. It is expected that the new regular faculty member will learn through exposure to information during meetings, or will educate themselves by independently reading materials, often located by them on the web. Adjunct faculty needs on the other hand are often overlooked because they may be viewed as “less critical” to programmatic outcomes. However, a strong understanding of programmatic structures and outcomes is actually essential for all faculty to know if they are to support scaffolded learning and outcomes mandated by accrediting bodies.

This issue becomes even more critical when considering that courses are linked directly to programmatic outcomes and university missions via assessment practices. Faculty development activities that include an orientation to the university, school and program prepare new faculty to better understand their role in teaching in support of program outcomes. Empirical support exists for the finding that faculty development activities are linked to student learning outcomes [1, 2].

As a field, faculty development has always focused on change in its mission. “Given the centrality of the faculty in the life of colleges and universities and the acceleration of change in higher education, faculty development is more important than ever… In fact, faculty development has emerged as a central player in the transformation of colleges, universities, and higher education today” [3]. Orientation of faculty as a professional development activity is not a luxury; rather, it is a necessity. Today’s enthusiasm for online learning is an example of a shift that is transforming higher education and requires a different screening perspective around what skills, knowledge and expertise is needed in those being hired to teach in brick and mortar as well as in online programs. Couple this movement with the accelerated employment of adjunct faculty in higher education as
those who will transmit institutional/programmatic missions to students [4], and the need for a well-developed and readily delivered orientation becomes clear. However, “Many institution’s practices have not evolved to allow these faculty members to provide the quality of education that meets institution’s goals for student learning and education”. This situation is in stark contrast to the number of contingent faculty instructing in both non-profit colleges and universities within the United States. In 2013, that percentage was estimated to be at 75% of all instructional faculty; however today, that percentage has reached 50% [5,6].

Adjunct faculty, often employed in positions outside of the university, require an orientation that provides a comprehensive overview of the university history, mission, and strategic goals, and university-wide policies. From the program standpoint, faculty need information on program mission, goals and targeted outcomes, teaching responsibilities and expectations, resources, and sources for specialized training (e.g. online teaching training). In addition, this information must be delivered in a “Just-Enough, Just-in-Time and Just for You” format (7). The best way to deliver such information is through an online platform that can be deployed when needed.

Adjunct faculty offer universities a host of benefits to include economic benefits, flexibility, and enhancement of student learning [4]. Ensuring high quality performance then, falls to administration in planning and executing a quality orientation based upon solid pedagogical principles that is capable of being delivered upon demand and based on the adjunct’s schedule. Institutions have a responsibility to provide part-time faculty with training and resources as they are vital to the success of the institution’s mission [8]. Failure to provide an overview of the culture and expectations for part-time faculty jeopardizes the achievement of academic and organizational goals.

2. Objective and Motivation

University adjuncts bring a multitude of benefits to the classroom and are active participants in helping students achieve program learning outcomes and thus supporting the university’s mission. Yet despite their importance, there has not been an adequate emphasis on providing them with the training, knowledge and skills to be effective members of the academy.

To remedy this situation, institutions and programs must consider the needs of contingent faculty in terms of knowledge and skills to adequately prepare them to be effective partners in mission achievement. Moreover, this must be approached in a standardized way and readily available for launch upon demand. Therefore, the most reasonable and efficacious way to approach adjunct faculty needs is to address them in an organized and standardized manner that allows the academy member to retrieve the training just-in-time and at a convenient time within their schedules.

This presentation features an online orientation model as a “best practice” for training and retaining talented adjunct faculty, ensuring student learning outcomes, and meeting the mission of the university or academic setting. It will provide a visual exemplar developed for a counselling program course at the Johns Hopkins University using best instructional design elements and featuring key points of learning to help contingent faculty come-up the learning curve most efficiently. Participants will be able to examine the linkage between learning objectives of the orientation and their linkage to programmatic outcomes and assessments.

3. References


Booked on Math: Teaching Early Childhood Math Concepts Through Stories

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Abstract

In this ongoing research study, we are analyzing and selecting ten story book readings that can be leveraged to teach key mathematics concepts and vocabulary to young children (ages 3-5). In this first phase of our study we are using a research-based framework (Classroom Assessment Scoring System) to conduct the analysis. After books are analyzed and selected, we plan to create developmentally appropriate lesson plans and parent “do-it-at-home” tips to supplement each book reading selected. All associated lesson plans and tips will be posted to a free, public-facing website designed for teachers and parents who wish to use story book readings to teach critical mathematical concepts and develop language skills in young children. To conclude, we discuss the expected outcomes of our study, future research directions, and scale-up opportunities in other subject areas or grade levels.

1. Introduction

Story book readings are commonly used in many early childhood classrooms (ages 3-5) as a teaching and learning tool. Despite the popularity of this instructional resource many early childhood teachers do not fully capitalize on the opportunity to introduce, and subsequently teach, critical early mathematics skills through story book readings.

Figure 1. Booked on Math Implementation Plan

The Booked on Math project is designed to meet this need through three distinct phases (see Figure 1).

2. Research Goals and Objectives

The goal of this study is to analyze a total of ten common book readings across five early childhood mathematical domains: (1) number and operations, (2) patterns and algebra, (3) geometry and spatial relations, (4) measurement, and (5) data analysis and probability. From each book reading we will extract key vocabulary, the underlying mathematical content, and potential discussion questions using a research-based framework. After analyzing each book, developmentally appropriate lesson plans will be created that teachers and parents can use teach early childhood math concepts.

3. Methodology

A total of ten book readings will be selected for the Booked on Math study. Books readings will be selected from several existing libraries including the National Association for the Education of Young Children (NAEYC) recommended early childhood math book list and other research-based early childhood curricula also leveraging common book readings to introduce and teach math (e.g., MyTeachingPartner Mathematics and Science; www.mtpmathscience.net [1] that have demonstrated increases in student learning outcomes in pre-kindergarten mathematics and science contexts through randomized controlled trials [2].

Book readings will be analyzed based on their potential to meet quality dimensions as measured against the research-based Classroom Assessment Scoring System Pre-Kindergarten Framework (CLASS Pre-K) [3]. The CLASS Pre-K framework, predicated upon decades of empirical research into the factors that influence children’s academic and social development, is currently used in thousands of early childhood classrooms in the United States to measure the quality of teaching and learning. The CLASS Pre-K framework includes three broad domains, Emotional Support, Classroom
Organization, and Instructional Support. Book readings with particularly strong connections to the CLASS Pre-K domain of Instructional Support will be selected, as research suggests this domain is most strongly correlated with young children’s development in mathematics [4].

Developmentally appropriate lesson plans will be created for each unique book reading using an inquiry-based “5E” framework popularized by Rodger Bybee and colleagues [5]. This framework has been used by thousands of teachers to create over a million lesson plans. Each lesson plan will include the following core components: learning objectives, key academic vocabulary, materials preparation, engage, explore, explain extend, and evaluate. Lesson plans will also include differentiation elements to support learners with developing skill sets as well as students with advanced capabilities.

4. Expected Outcomes

The expected outcomes of the Booked on Math project are threefold. First, we will identify a subset of ten story book readings with strong connections to the CLASS Pre-K framework that can be used by early childhood teachers and parents to introduce key mathematics concept and vocabulary. We suspect not all story book readings are created equal in terms of their potential to introduce key mathematical concepts, so simply analyzing these books against a research-based framework will be a useful exercise.

Second, the associated 5E lesson plans generated from this study will be shared with both in-service and pre-service teachers for immediate use in classrooms and at home. Moreover, these research-based lesson plans can be used in future studies to measure the effects of the book readings on children’s learning and development in pre-kindergarten mathematics contexts.

Third, we will develop a basic set of “do-it-at-home” resources and tips for parents who wish to leverage book readings to introduce and teach common mathematical concepts to young children. Do-it-at-home resources will be designed to increase parents’ confidence and capacity to maximize the educational potential of math-related story book readings.

5. Conclusion

In conjunction with in-service pre-kindergarten teachers, the materials generated in the Booked on Math research project will be initially piloted in local classrooms in Colorado Springs, Colorado and at the University of Colorado Colorado Springs (UCCS) campus-based Family Development Center. After materials are created and tested on a small scale in local classrooms and at UCCS, larger efforts will be undertaken to test the efficacy of the materials, analyze the effects teachers’ instructional practices, and measure changes in student learning outcomes with larger populations.

We are also considering external funding opportunities to support the scaling up of the Booked on Math framework in other STEM subject areas (e.g., science and engineering) and are in preliminary discussions with elementary teachers to explore the potential of similar work in grades kindergarten through five. External funding would provide opportunities to engage in longitudinal studies over longer periods of time and across multiple classrooms with larger sample sizes.

The Booked on Math project continues to gain momentum and has the potential be a transformative project in the Colorado Springs area and beyond.

6. References


Implementing Hilarity and Creativity in the Human Sexuality Classroom

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Abstract

Humor as an approach in education can be used in a variety of settings and topics, and can be particularly valuable in the human sexuality classroom. Not everyone shares the same sense of hilarity and many times, what one person may find as amusing doesn’t necessarily equate to acceptable humor with another. Hilarity is a valuable teaching tool with many benefits for teachers, as it can enhance learning by promoting comprehension and retention of information. Activity engaging students can include a variety of activities to help students not only understand and recall the information but also to apply and conceptualize various aspects of a subject. This poster presentation will offer an overview of the use of humor and creative activities in a college level Human Sexuality course to further enhance the students' learning. Creative activities, such as 3D models of sexual anatomy and the use of laughter, have been effectively utilized in teaching this undergraduate course. First, the poster will describe examples of how humor can be effectively applied in the human sexuality course, and will include visuals and common questions students may have regarding sexuality issues. Second, the poster will describe creative ways and activities that can be incorporated in order to engage the students and further enhance their understanding of human anatomy and sexuality. Finally, the poster will note examples of the problems and concerns one may encounter when using humor and creative activities when dealing with sensitive topics, noting ways to alter the assignments and interactions.
Pedagogical based Learner Model Characteristics

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Abstract

The personalisation and adaptation of content creation, distribution and presentation aim to increase learner quality of experience, improve the learning process and increase the learning outcomes. This paper introduces a novel Learner Model that is integrated by the NEWTON project into the NEWTELP learning platform in order to support personalisation and adaptation. The NEWTON’s Learner Model includes a multitude of learner characteristics, including pedagogical, disability, affective and multi-sensorial.

1. Introduction

Personalisation is a key factor in modern education, as the differences between learners are now widely recognised by both researchers and educators alike. Personalisation is also one of the biggest current trends in the e-learning industry [1]. There is an increasing need for personalised and intelligent learning environments as learners differ in levels of knowledge, motivation, and have a variety of learning styles and preferences [2]. Personalised learning can support individual learning and further engage learners in their studies. Gaps between slow and fast learners are consistently emerging, and teaching to cater for these differences between students is being noted as one the most challenging aspects by science educators [3], [4].

There is a call for personalisation to be implemented into modern pedagogies, in order to meet the needs and interests of different types of learners [5]. In the Technology Enhanced Learning (TEL) domain, personalisation is one of the key features, and can assist in bringing the focus of the learning experience to the learner instead of the teacher [6]. The personalisation is based on a Learner Model which represents the necessary learner characteristics in the context of a learning system. Various authoring tools that provide support for personalisation rules definition in order to provide personalisation based on the information represented in the Learner Model have been proposed [16].

The HORIZON 2020 NEWTON² project provides an European learning platform (NEWTELP) that delivers personalised and adaptive technology-enhanced educational content and learning activities, addressing the individual learner needs in order to increase the learning outcomes and learner quality of experience. A Learner Model implemented in the NEWTELP platform supports the personalisation and adaptation. The NEWTON Learner Model includes various demographic, pedagogical, disability, affective and multi-sensorial learner characteristics. This paper introduces the NEWTON Learner Model and the learner characteristics modelled by it.

The paper is organised as follows. Section 2 proposes the theoretical background of the study and existing pedagogical and affective based characteristics considered in the Learner Model by different e-learning systems. Section 3 presents the NEWTON Learner Model and its characteristics that support personalisation and adaptation. Section 4 concludes the paper and presents its perspectives.

2. Literature Review on Learner Model Characteristics

2.1. Pedagogical based Characteristics

The Public and Private Information (PAPI) for Learners [7] is a standard that divides the learner information into six categories: (1) contact information (e.g. name, postal address and telephone number), (2) relations information (e.g. classmates, teammates, and mentors), (3) security information (e.g. public keys, private keys and credentials), (4) preference information (useful and unusable I/O devices, learning styles and physical limitations), (5) performance information (e.g. grades, interim reports, and log books), and (6) portfolio information (e.g. accomplishments and works).

¹ http://www.newtonproject.eu/
The Chinese E-Learning Technology Standards (CELTs-11) [8] is a specification for Learner Model that includes seven categories: (1) individual information (e.g. name, gender, date of birth, phone number and e-mail), (2) academic information (e.g. major, grade and learning plan), (3) relationship information (e.g. the relation of the learner with tutors and other learners), (4) safety information (e.g. password), (5) predilection information (e.g. learning resource types such as picture, animation, audio, video, text), (6) performance information (e.g. the learner’s knowledge and mastery of the learned knowledge), and (7) show reel information (e.g. accomplished work and projects of the learner).

Robson and Barr [9] identified five types of learner information to be included in the Learner Model: (1) educational records and high level competencies (e.g. language skills and certifications), (2) competencies (e.g. skills, knowledge, abilities, outcomes, objectives) and level of competence, (3) data in Affective, motivational, and social dimensions, (4) goals (e.g. learning goals and mission/task goals), and (5) physical adaptations (e.g. location, device capabilities, ambient light, and accessibility data).

The Felder-Silverman learning style model (FSLSM) [10] characterises each learner according to four dimensions: (1) sensing (learn facts and concrete learning material) / intuitive (learn abstract learning material), (2) active (learn best by working actively with the learning material) / reflective (think about and reflect on the material), (3) visual (remember best what they have seen) / verbal (get more out of textual representation), and (4) sequential (learn in small incremental steps) / global (learn in large leaps).

According to these main refinement works that provide a general vision of the information considered for user/learner profile/model, one can notice that there are four main types information considered: (1) demographic data such as learner name, his/her postal address, his/her gender, his/her number, etc., (2) grouping data like student mentors, his/her teammates, his/her grades, his/her certifications, (3) student preferences such as media presentation and language skills, and (4) learning activity based information including for example learner’s knowledge level, his/her learning goals, and skills.

### 2.2. Affective based Characteristics

Learner’s affective characteristics, such as motivation, engagement and emotions were also recognised as important aspects to be considered for a successful learning process [11]. Affective characteristics such as motivation, engagement, interest, joy, surprise, boredom and frustration have a huge impact on decision making, managing learning activities, timing, and reflection on learning [12]. A Learner Model should take into consideration these changing learner’s affective characteristics. Current research attempts to address these factors by developing different Learner Models [13].

Learner’s affective characteristics can be grouped into two main dimensions related to: motivation and emotions. These can be measured and assessed using either objective or subjective methods. Objective metrics of motivation can be derived through analyses of data that relates to student’s navigation behaviour such as time on task, number of repeated tasks, and number of help requests [11]. They can also be assessed by using external equipment, such as video camera recordings, heartrate monitor bracelet, Electroencephalography (EEG) headset and following eye-tracker movements. Subjective metrics include scores of questionnaires regarding motivation and engagement, and similar, questionnaires can be used for emotion recognition. Furthermore, an observational assessment can be carried out to evaluate the emotional state of the learner.

A number of adaptive learning systems have incorporated an Affective Learner Model [2], [17], [18]. Cocca and Weibelzahl [14] studied data from a web-based interactive environment, HTML-Tutor, to predict whether a learner is disengaged. They defined interest as being a determinant of engagement, as people tend to be more engaged in activities they are interested in. The study focused on two types of tasks, reading and problem-solving activities, with results pointing out similarities between blind-guessing and uninterested guessing.

Looi [15] based their study on the ARCS Model, inferring three aspects of motivation: confidence, confusion, and effort. This research focused on identifying the learner’s focus of attention and inputs related to learners' actions, such as time spent on task, time spent reading the relevant text, the time for the learner to decide how to perform the task, the time of starting/finishing the task, the number of tasks the learner has finished with respect to the current plan (progress), the number of unexpected tasks performed by the learner (unrelated to the learning plan), and the number of times learners have used the help files.

Rogaten et al. [13] criticised the lack of affective changes (attitude) and behaviour in research, and proposed to breach this gap by studying an Affective-Behaviour-Cognition model of learning gains using longitudinal multilevel modelling, which included data from 80,000 students. Their focus was on finding out whether any specific student or course characteristic can predict learning gains or highlight a potential dropout.

### 3. NEWTELP Platform

NEWTON is a large-scale EU Horizon 2020 project that aims to develop, integrate and disseminate innovative technology-enhanced learning (TEL) methods and tools, and to create new or inter-connect existing state-of-the art teaching labs. Moreover,
NEWTON project aims to build a large Pan-European learning platform that links all stakeholders in education, supports fast dissemination of STEM learning content to a wide audience in a ubiquitous manner, enables content reuse, supports generation of new content, increases content exchange in diverse forms, develops and disseminates new teaching scenarios, and encourages new innovative businesses.

The NEWTON Technology enhanced Learning Platform (NEWTELP) developed as part of the NEWTON project integrates and deploys a multitude of novel and emerging mechanisms and TEL methodologies including: interconnected fab labs and virtual labs, multi-modal and multi-sensorial media distribution, augmented reality, gamification, game-based learning, and self-directed learning pedagogies (e.g., flipped classroom, online problem-based learning, and e-practice testing).

Figure 1 illustrates how the NEWTELP learning system integrates learner modelling, personalisation and adaptation of content creation, distribution and presentation with the aim to improve the learning experience and the learning outcomes.

3.1 NEWTON Learner Model Characteristics

The novelty aspect of the NEWTON Learner Model is that along with demographic and pedagogical characteristics, the model also includes disability, affective and multisensorial characteristics in order to construct a more realistic learner model.

Table 1 summarises the demographic, pedagogical and disability learner characteristics defined by the NEWTON Learner Model. The pedagogical characteristics include demographic data (e.g., student name, gender, age, etc.), grouping data (e.g., college/school name the learner is enrolled, education level such as primary school, secondary school or university), learning preferences (e.g. preferred language, media presentation type, learning style that can be retrieved using questionnaires such as Index of Learning Styles (ILS), etc.), and course or learning activity-based information (e.g. knowledge level, completed tasks, assessments, accessed material, etc.). The learner disability information includes the disability type, the specific disability name, the disability level and any other relevant details.

Table 2 summarises the affective and multisensorial characteristics defined by the NEWTON Learner Model. The learner affective based characteristics include the learner motivation, described as student interest and self-efficacy when conducting the learning activity and his/her emotions that include both learning emotions and a subset from DEQ (Discrete Emotion Questionnaire). The multisensorial characteristics are related to what multisensorial devices are available to the learner, as well as learner preferences regarding multi-sensorial aspects such as visual, olfactive, haptic and air flow.

The information stored in the NEWTON Learner Model is collected explicit from the user (e.g. through forms embedded into the platform), or it is provided by the learning system administrator when a user account is created. Some information is also collected implicit through logging and monitoring of learner’s interaction with the learning platform.
NEWTON Personalisation and Adaptation

The NEWTELP performs personalization and adaptation of content delivery and presentation to address the individual learner needs including their physical disabilities, to improve the learning process, and to increase the learning outcomes and learner quality of experience.

The personalisation aims to improve the learning experience by using the information stored in the Learner Model to provide learners with content that is relevant, suitable and useful (e.g., based on their disability, interaction preferences, multisensorial preferences, affective states, etc.). The NEWTELP learning system also aims to support the students in achieving the learning outcomes by identifying the knowledge gaps (e.g., difference between learning goals and student’s competences for particular topics), and recommending a set of relevant contents to address the gaps.

The NEWTELP complements the content personalisation, with adaptation technology to further support the users and improve the learning experience. The adaptation focuses on overcoming technological limitations, by providing the learners with content adapted to their operational environment/context (e.g., network characteristics, device types, etc.)

<table>
<thead>
<tr>
<th>Category</th>
<th>Sample Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learner demographic data</td>
<td>Student image, name, student ID, email, gender, age</td>
</tr>
<tr>
<td>Learner grouping data</td>
<td>School name, education level, course, study year, working group</td>
</tr>
<tr>
<td>Learning preferences</td>
<td>Language, media presentation, learning style</td>
</tr>
<tr>
<td>Course or learning activity-based information</td>
<td>Knowledge Level, learning goals, skills, interests, learning performance</td>
</tr>
<tr>
<td>Disability information</td>
<td>Type, specific disability, level, details</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Category</th>
<th>Sample Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motivation</td>
<td>Interest, self-efficacy</td>
</tr>
<tr>
<td>Emotion</td>
<td>Engagement, anxiety, boredom, sadness, happiness, anger, enjoyment</td>
</tr>
<tr>
<td>Multisensorial preferences</td>
<td>Device availability, preferences for visual, olfactive, haptic, air flow</td>
</tr>
</tbody>
</table>

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4. Conclusion

The paper introduced the novel NEWTON Learner Model that includes various learner characteristics such as demographic, pedagogical, disability, affective and multisensorial characteristics. A literature review of most common characteristics considered by other learning systems that have built a Learner Model is provided. The learner characteristics modelled in the NEWTON Learner Model are the basis for the personalization and adaptation mechanisms implemented in the NEWTELP. NEWTELP performs both course-level personalisation (e.g., by tailoring and recommending learning contents based on information from the Learner Model), and content-level personalisation (e.g., by having personalised learning loops and feedback inside of an educational content such as virtual labs or educational games).

5. Acknowledgment

This research is supported by the NEWTON project (http://www.newtonproject.eu/) funded under the European Union’s Horizon 2020 Research and Innovation programme, Grant Agreement no. 688503.

6. References


The Impact of Computer Assisted Language Learning on ESL Students’ Reading Engagement Skill in the Flipped Classroom

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Abstract

This study illustrates how to implement the flipped classroom effectively with peer instruction strategy and describes undergraduate students’ engagement during English reading comprehension activities compared to those without peer instruction. We explored the effect of Computer Assisted Language Learning (CALL) on improving ESL learners’ reading comprehension skill in the Flipped learning based on the use of technology inside and outside the classroom. During the CALL based treatment each participant in the experimental group had access to a computer in the language lab. They also received an audio or video recording of the listening lecture taught to prepare for the next lecture activities which include listening comprehension questions. The data analysis of the post-test reading comprehension scores indicated a significant difference between the experimental (Flipped Learning with Peer Instruction, FLWP) and control (Flipped Learning only, FLO) groups; the FLWP outperformed the FLO and obtained a higher average in the listening exam. Thus, the implementation of CALL in the flipped classroom proved to be effective in enhancing the ESL learners’ reading skill. The findings presented positive results for enhancing students’ reading engagement level as it apparently increased by a group of peer instruction intervention.

1. Introduction

Flipped Learning (FL) is an instructional approach that allows students to have more activity in class of which the homework and the lecture have been reversed; alternatively, the lecture that have traditionally taken place inside the classroom and moves to take place outside the classroom and vice versa so that students engage more deeply [1]. Students are provided with online material to gain the necessary knowledge before class, while class time is devoted to active learning [2], and the application of content in the form of peer instruction (henceforth, PI), cooperative learning, small groups, case studies, discussions or simulation experiences clarifications and application of this knowledge. The course content, which is provided for self-study, may be delivered in the form of video casts, PDF, Lecture Maker, PowerPoint slides, recorded audio, or a video before-class reading and exercises, while class time is mainly used for group work activities [3]. In general, student engagement is concerned with interaction between time, energy and other resources, by the students and their institutions for optimizing the student experience and improving learning outcomes, student development, achievement, and the reputation of the institution [4]. To address this gap, professors/instructors require to design and coordinate teaching activities that engage students and require a cultivation of interactive participation, focusing on concepts and insuring that the students understand the material [5].

By implementing the Bloom's taxonomy in the flipped classroom in which "students are doing a lower level of cognitive work (gaining knowledge and comprehension) outside of class, and focusing on higher forms of cognitive work (application, analysis, synthesis and/or evaluation) in class, where they have the support of their peers and instructor" [6]. Replacing direct instruction with recorded lectures or videos that can be observed outside the classroom allows for more class time to be used in active learning. Active learning includes performing activities like reading, writing, analysis, evaluation, discussion and problem solving. This shows that the instructor’s role in the flipped classroom has been radically transformed.

One approach to facilitate lecturers in their teaching is the incorporation of the computer assisted language learning (CALL). CALL has proved its effectiveness through previous studies on English language [7]. Reading is known as a difficult skill to acquire for second-language (L2) learners. Reading is not only challenging for the native speaker, but is even more challenging for the second/foreign language learners. EFL learners face a difficulty in improving their reading skill within the traditional way of learning. They need more practice for developing this skill.

Based on the constructs of student engagement such as “student-faculty interaction” and “active learning”, the same scenario of disengagement can be
observed in Malaysian universities. Moreover, student engagement is a requirement for learning, so schools that want to increase achievement often focus on this foundational need [5]. While students are engaged in the activity, their changing engagement and self-efficacy levels will influence the strategies and tactics they choose to employ during the task [8]. Therefore, the main goal of this study is to investigate the impacts of CALL implemented in the flipped classroom on enhancing English as Foreign Language (EFL) learners' reading engagement skill.

The hypotheses formulated were:

H01 There is no significant difference between flipped learning only (FLO) and flipped learning with peer instruction (FLWP) in students’ reading comprehension.

H02 There is no significant difference between FLO and FLWP in students’ reading comprehension with regards to their English language proficiency.

2. Literature Review

Although the potential application of Flipped Learning (FL) in education has been amplified in recent times, but few studies have been conducted to examine the implementation of FL in English subject class [9]. In particular, in the English subject, the ultimate goal for reading is to make the readers grasp what they have read. When the readers are able to understand them, they are able to comprehend. [10] defined reading in three stages: the ability to recognize the words, the ability to extract meaning and interact with the text, and the ability to pronounce the words. A review of literature on ESL reading emphasizes engagement an important affective variable; hence, ranges of strategies are necessary to develop students’ interest and pleasure in reading as well as improving their deep reading skills to help them overcome their reading problems [11]. Reading strategies are important as they help the ESL students’ reading processes and show them what they understand while reading different materials. Therefore, the students have complications related to academic materials and confusion into choosing the essential reading strategies and skills for effective comprehension [12].

Studies also indicate that the students are not prepared for the reading demands that are imposed on them at university [13]. They also mentioned that students at tertiary education are found to have limited vocabulary knowledge and weak at understanding long sentences or sentences with difficult words. Developing a good reading strategy, the active process should be seen in reading comprehension. [14] posited that some of the reading comprehension strategies that students possibly would employ when doing independent reading were “prior knowledge activation, question generation and construction of mental images during reading”. To improve ESL students’ reading comprehension, they have to do a lot of reading and actively participate in the reading processes.

2.1. Peer instruction

Within the context of this article, PI is a simple way to incorporate some genuine interaction and engagement in lectures. It is cheap, simple to implement, and delivers useful feedback to both students and to the lecturer. All the students in the classroom were grouped into four peers while sharing with others their knowledge; then “vote” on the answer to the question either by flash cards, or by show of hands. If most students have the right answer, the lecturer can confirm it and move on. Then, the lecturer can then confirm the answer and move on, either to another question, or to the next topic in the lecture [8].

2.2. Reading Engagement

Reading engagement is valuable in their own right and are also positively associated with achievement-related outcomes, such as standardized tests and grades [15]. Reference [16] stated that “significant academic achievement is not possible without sustained, substantive engagement”. Reading engagement is so strongly linked to achievement that “engagement in reading may substantially compensate [on measures of reading achievement] for low family income and educational background” [17]. It is essential to develop and refine approaches to classroom discourse that support both engagement and achievement in reading based on active learning. The active learning includes Cooperative Learning engages students to work harder than they do in the conventional classroom [18]. Peer instruction is a subsequent of cooperative learning to engage students [19]. According to self-determination theory, two essential components of intrinsically motivating environments are optimal challenge and autonomy support [20]. Instructors offer learners optimal challenges when they provide tasks that push them toward, but not past, their cognitive limits. Research by [21] found that in the face of such challenges, “people work to conquer them, and do so persistently”. Instruction that supports autonomy provides students with opportunities to do and think for themselves. Such approaches have been highlighted as essential to promoting both general engagement and engaged reading [18, 21]. Thus, Dutton highlighted that participants often rely on ordinary tools, for instance, LMS due to its familiarity and time saving nature; hence, technology can be effectually enabled to instructive objectives as well as increasing student engagement in university-level humanities education [22]. The personal experience frequency increases in flipped classroom...
environments using certain activities such as forming groups of active learners, learning by analysis engagement, and evaluation and synthesis engagement; more than passive learners who learn by collecting information from watching, reading and listening videos [23].

3. Methodology

This quasi experimental research was adopted for this study whereby the research question stated was: What is the effect of Flipped Learning (with or without peer instruction) using computer-assisted language learning on EFL learners’ reading comprehension?

3.1 Participants

The participants consisted of two classes (a total of 170 students) enrolled in level two of the listening course. Their ages ranged from 19 to 21 and both classes underwent the flipped learning approach. The Flipped Learning with Peer Instruction (FLWP) group practiced the listening skills by implementing CALL activities in the flipped classroom and discussed questions with peers. While the Flipped Learning only (FLO) group practiced the reading comprehension skill by listening to a text followed by answering questions based on that text during the class lecture.

3.2 Instrument

The study involved (i) a pre-test and a post-test related to the reading comprehension skill and (ii) video recordings. The tests were designed according to the textbook and the related literature, particularly procedures of similar studies. The reading test examined the following subskills: (1) choosing or writing the correct word/number from a given text, (2) understanding functions: reading comprehension for specific information through multiple choice items to test the students’ understanding of the passage, and (3) vocabulary discrimination by asking the students to circle the synonym or antonym of selected words.

3.3. Procedures

Before conducting the treatment, a pre-test was given to both groups.

3.3.1. Flipped classroom. The lectures that were recorded as video recordings were sent to the students before the next listening class. The students were asked to read or watch the lecture at home more than once according to their abilities. In the following lecture, they had the chance to practice more listening through answering the exercises while listening to recordings, and watching videos and later discussing the main theme and answering questions based on these video or audio recordings. In the FLWP group would discuss the ideas and answer the questions together with their peers. However, the FLO answered the questions during class time without any peer interaction. The remaining time of the lecture was devoted to lab activities, discussions, and presentations. By the end of the fifth week, the post-test was administered.

ANCOVA was conducted to analyze whether there were any significant differences in students’ listening skill while between the groups. An independent samples t-test was used to assess the homogeneity of the two groups in terms of their general proficiency as measured by the Nelson 350 A test.

4. Results

4.1. Students’ Reading Comprehension Scores based on Groups

We compared the FLO and FLWP groups based on the adjusted mean scores of students’ reading comprehension. Table 1 indicates that there were differences between the adjusted mean scores of students’ reading comprehension in FLO and FLWP groups. It is shown that the adjusted mean score of FLWP (16.83) with standard error 0.117 is higher than the adjusted mean score of FLO (15.90) with standard error 0.122. Based on the correlation coefficient between pre-test and students’ reading comprehension scores, the study uses the pre-test as the covariate variable so as to minimize the statistical error.

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Mean</th>
<th>Std Dev.</th>
<th>Adjusted Mean</th>
<th>Std Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>FLO</td>
<td>85</td>
<td>15.79</td>
<td>1.75</td>
<td>15.90</td>
<td>.122</td>
</tr>
<tr>
<td>FLWP</td>
<td>85</td>
<td>16.88</td>
<td>1.62</td>
<td>16.83</td>
<td>.117</td>
</tr>
<tr>
<td>Total</td>
<td>170</td>
<td>16.34</td>
<td>1.77</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

a Covariate appearing in the model are evaluated at the following values: Pre-test=14.79

A two-way ANCOVA was conducted to ascertain the reading comprehension scores based on the two groups in relation to their English proficiency (Table 2). The results revealed that the difference between the adjusted mean scores of FLO and FLWP on reading comprehension is statistically significant at the 0.05 level $F(1,161)= 29.80, \ p=.000$. Since the adjusted mean of FLWP (16.83) is larger than the adjusted mean of FLO (15.90), it could be concluded that FLWP is more effective compared to FLO group. Hence, we reject the hypothesis that ‘there is no significant difference in students’ reading comprehension...
comprehension between FLO and FLWP whereby the
effect size is medium ($\eta^2=0.06$). Accordingly, the size
effect is small with $\eta^2<0.06$, medium with
$0.06\leq\eta^2<0.14$ and large with $\eta^2>0.14$. Finally, the
statistical results support the hypothesis that students
who were in the FLWP had higher reading
comprehension scores compared to students in used
FLO.

| Table 2. Summary of two-way ANCOVA results of
students’ scores on reading comprehension based on
<table>
<thead>
<tr>
<th>groups and proficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Source</td>
</tr>
<tr>
<td>Corrected Model Intercept Pre-test GIP ILo GIP*ILo Error Total Corrected Total</td>
</tr>
<tr>
<td>353.27a</td>
</tr>
<tr>
<td>233.67</td>
</tr>
<tr>
<td>260.91</td>
</tr>
<tr>
<td>32.70</td>
</tr>
<tr>
<td>2.88</td>
</tr>
<tr>
<td>82</td>
</tr>
<tr>
<td>176.62</td>
</tr>
<tr>
<td>529.89</td>
</tr>
</tbody>
</table>

a R Squared = 0.667 (Adjusted R Squared = 0.650)

b $b$ = Computed using alpha = 0.05

4.2 Students’ Reading Comprehension Scores
based on Proficiency

We also investigated whether there is any
significant difference in students’ reading
comprehension between high and low language
proficiency learners in FLO and FLWP groups. The

The adjusted means scores of both low and high
proficiency levels were compared and the result is
shown in Table 3. It shows that the adjusted mean
score of high proficiency (16.51) with standard error
0.127 is larger than the adjusted mean score of low
proficiency (16.22) with standard error 0.116. This
indicates that there is a difference between the
adjusted mean scores of students’ reading
comprehension of low proficiency and high
proficiency in FLO and FLWP groups.

The results of the two-way ANCOVA reported in
Table 2 reveal that the effect of low and high
proficiency on students’ reading comprehension is not
statistically significant at the 0.05 level $F(1, 161) = 2.63$, $p=0.11$. Thus, it cannot be inferred that students

with high proficiency level are more effective relative
to students with low proficiency regarding students’
reading comprehension.

| Table 3. Reading comprehension based on
proficiency |
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Groups</td>
</tr>
<tr>
<td>Lo</td>
</tr>
<tr>
<td>Hi</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

a Covariate appearing in the model are evaluated at the
following values: Pre-test=14.79

Hence, we fail to reject the hypothesis that there is no
significant difference in reading comprehension of
students with low and high proficiency levels. Finally,
the statistical results did not support the hypothesis
that students’ reading comprehension when using
FLO and FLWP are more effective with regards to
their proficiency.

4.3. Students’ Reading Comprehension Scores
based on Groups and Proficiency

This section reports whether there is interaction
effect between groups (FLO and FLWP) and
proficiency (low and high) in students’ reading
comprehension. The corresponding hypothesis is that
there is no interaction effect between groups and
proficiency in students’ reading comprehension.

<table>
<thead>
<tr>
<th>Table 4. Reading comprehension</th>
</tr>
</thead>
<tbody>
<tr>
<td>Groups</td>
</tr>
<tr>
<td>FLO</td>
</tr>
<tr>
<td>High</td>
</tr>
<tr>
<td>Total</td>
</tr>
<tr>
<td>FLPI</td>
</tr>
<tr>
<td>High</td>
</tr>
<tr>
<td>Total</td>
</tr>
</tbody>
</table>

a Covariate appearing in the model are evaluated at the
following values: Pre-test=14.79

Table 4 reports the adjusted mean scores of both
low and high proficiency students in FLO and FLPI
groups in reading comprehension. It reveals that there
is a different between the adjusted mean scores of low
and high proficiency in FLO and FLPI groups in
students reading comprehension. The adjusted mean
score of high proficiency students in FLPI (17.04)
with standard error 0.164 is higher than the adjusted
mean score of low proficiency students in FLPI
(16.61) with standard error 0.170. Similarly, the
adjusted mean score of high proficiency students in
FLO (15.97) with standard error (0.190) is higher than the adjusted mean score of low proficiency students in FLO (15.83) with standard error 0.155.

5. Discussion

The main purpose of this research was to investigate the impact of implementing CALL on improving EFL learners’ listening comprehension skill in the flipped classroom. The findings of the study indicated that the use of CALL in the flipped classroom had a significant role on the improvement of ESL learners’ listening comprehension skill. The findings emerging from the present study are in line with the suggestion of [7] who has claimed that CALL can encourage the development of language learning skills and result in more learning. The findings of this research also suggests that the repetitive nature of input through internet assists learners in understandings linguistics cues. Computers and language learning – as revealed in the present study- are closely inter-related and integration of both in the flipped classroom enabled students to process and to improve their listening skill.

6. Conclusion

Flipped learning contributes computer assisted language learning (CALL) which authorizes students to take responsibility for their learning in English reading comprehension classes, and creates active and engaged learning-centered classrooms through peer instruction. This study proposes future insight into student engagement by using flipped learning in ESL/EFL context, specifically in reading comprehension English course. The findings of this study presented positive results for the engagement level as the flipped classroom lessons follow a smaller time table. Moreover, the instructor might focus the use of developing student background knowledge more effectively during the class time. From this study, it can be inferred that the illustration of FL resulted in a lasting impact on the students’ ESL reading, greater retention of the knowledge and engaged them more in their reading.

This study provides a useful basis for Malaysian higher education institutions and organizations to develop student’s engagement and comprehension level by using flipped learning or combine it with peer instruction strategy. It helps in developing students’ learning for long term performance standards. It promotes for evolving prior knowledge, reflective thinking and long-term memory by flipped learning and peer instruction in the class. We followed these factors in the development of the theoretical framework which the research is based upon. It defines the structures, processes and outcomes of the FL. In other words, the criteria followed to design the FLWP are invaluable to course designers and instructors. They would also help educators and course developers to evaluate the effectiveness on the online courses. Furthermore, online course designers should consider the integration of FL with PI in designing courses for optimum learning since interaction in FL motivates students to learn, reflect, connect and share knowledge. Hence, instructors should be able to design learning environment that is more participatory with a view to maximizing the FL output.

Further work is needed to establish the real connection between the theories of student engagement, student learning and implementation through applicable teaching methods. These connections and enhancements will emerge via continuous teaching, research, and publication.

Acknowledgement: Funding was provided by research grant (1001.PMEDIA.816287) for the doctoral program of higher education from Universiti Sains Malaysia (USM), Centre for Instructional Technology and Multimedia (CITM).

7. References


Workshop Papers

Title: Technical Performance Evaluation of a Technology Enhanced Learning-based Platform for Education
(Authors: Nasim Ferdosian, Diana Bogusevschi, Gabriel-Miro Muntean)

Title: Primary School STEM Education: Using 3D Computer-based Virtual Reality and Experimental Laboratory Simulation in a Physics Case Study
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Title: Gamification elements in STEM subjects – Lessons learned from NEWTON Project
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Abstract

Technical performance evaluation is an important plan of actions for assessing the efficiency of an education system, developed based on Technology Enhanced Learning (TEL) strategies. The problem arises that there is not a single comprehensive framework for evaluating the technical performance of large-scale TEL-based learning platforms such as the European 2020 NEWTON project platform. This paper presents a framework consisting of the explicit metrics and appropriate methods to evaluate the quality of service and technical system performance of a TEL-based learning platform. Evaluation is made under two directions: the educationalists and the software developers. Moreover, some of the required standards and specifications to be used for developing this performance evaluation framework are identified in this paper. Another key contribution of the paper is that it explores the necessity of new related standards, and introduces some novel proposals for standardization in this area.

1. Introduction

Penetration of technology into the educations’ instructional base opens many doors for teachers and students at all academic levels to work virtually anywhere as they teach and study a particular subject. Currently the integration of innovative technologies with educational functions is increasing around the globe [1]. Technical and networked education services have been improving the quality of teaching and learning practices at a fast pace in recent years [2], thanks to the advancements in Technology Enhanced Learning (TEL) strategies and network communication technologies.

The higher adoption of TEL strategies such as Augmented Reality, Virtual Reality and Gamification leads to the higher level of user interaction with the TEL-based learning platform (TEL system) and more quality-aware users. The system’s performance is one of the main factors influencing user experience and consequently the learning outcome. Therefore, it is crucial to evaluate and analyse the technical performance of such a system to enhance learner Quality of Experience (QoE) [3]. However, the technical performance evaluation of the TEL-based learning platforms has become progressively more complex, while the functional sophistication level of them is growing due to the exponentially increasing number of technical aspects involved [4].

A comprehensive survey of the existing quality frameworks (SCORM, IEEE P1484 and IMS Global Learning Consortium) and standards (ISO/IEC 19796, Open ECBCheck and ISO 9126) dedicated to the e-Learning systems can be found in [5]. There are many research studies which have used some of these mentioned standards and frameworks as a tool for evaluating such systems, particularly for teachers and educational administrators [6, 7]. Even though some standardization activities related to general TEL have been defined, there is still a need to fulfill the gap of novel standards to define frameworks and procedures for the technical performance evaluation of these new technology-rich innovative learning systems.

This paper presents a framework consisting of the explicit technical aspects of TEL-based learning platform in the educational environment and their appropriate performance evaluation methods. The set of technical aspects of e-learning service quality proposed in the model is based on a literature study, software quality standards and relevant whitepapers and guidelines. In this regard, the main objectives of this paper are as follows:

- Define technical evaluation criteria
- Define quality standards and evaluation methodologies

This proposed instrumental framework presents a basic structure for evaluating and assessing technical performance of a large-scale TEL system. The proposed structure is a part of the NEWTON project education platform which is a European Horizon 2020 project and will facilitate standardization and evaluation of a TEL system in an educational environment. The rest of the paper is structured as follows. Section 2 presents related work in the area of technical performance assessment and relative issues. Sections 3 presents the proposed technical performance evaluation framework, including a set of technical criteria and respective evaluation methodologies, while Section 4 concludes the paper.
2. TEL Systems Performance Evaluation Aspects

Research into evaluating TEL systems comes from two directions: the technical performance evaluation and the pedagogical evaluation. Technical performance evaluation is what comes apart from the pedagogical evaluation. Technical performance evaluation measures system’s performance from a technical point of view, whereas pedagogical assessment measures students’ performance from an educational point of view where the system is evaluated according to the curriculum standards, practices, and student assessment [15]. In this regard, the strategies for the evaluation of a TEL system can be classified into two types: User-centric evaluation and Developer-centric evaluation through the real-life testing. Each evaluation strategy is suited to evaluate specific goals.

2.1. User-centric evaluation

A User-centric evaluation focuses on the perceptions of users and the performance aspects of the system in application level. User-centric measures, such as end user experience or user satisfaction, are best evaluated by asking users themselves. Therefore, in particular for TEL systems, user-centric evaluations are crucial, but expensive to conduct because the technical teams often only realize that there are delays and performance issues after receiving users complains. It can be conducted as a real-life evaluation, where a large community of users is observed while using and interacting with the system under realistic conditions or as a pilot study where a system is deployed under normal settings. By applying the real-life testing, most user-centric goals, such as measuring user experience or user satisfaction, can be effectively evaluated.

As defined in [8], "End User Experience is essentially a quantification of the entire time it takes a user to perform a specific function, regardless of how many network hops, data calls, applets and other application elements are utilized in the process." Despite the widespread research on user-centric evaluation over a wide variety of applications and services, there is a crucial need to propose solutions to quantify the experience of end users. Authors in [9] proposed standardization approaches for evaluation of users’ QoE in TEL systems. Accordingly in [10], a subjective study is presented on the user QoE when experiencing multimedia as one of innovative TEL strategies applied in education systems.

In the end, User-centric evaluation provides a clear understanding of how well the whole aggregated TEL-based learning system including, network infrastructure, device and application elements are working together to meet end user expectations of how the service should operate. Focusing on the end user experience will ensure that development teams can easily diagnose and fix technical issues.

2.2. Developer-centric evaluation

The main target of Developer-centric evaluation is to evaluate the technical infrastructure of a TEL system which includes all aggregated devices, cloud computing architecture, network elements, and software applications from the viewpoint of developers. Since the end user experience is affected by technical factors, the development team must be able to track all these effective metrics in order to optimize performance and the value of its application investments. The research study in [11] presents an approach to evaluate the quality performance of e-learning systems from the developers’ perspective. The e-Learning Success Model proposed in [12] points out the fact that the overall success of an e-learning system depends on the attainment of success on each of the three stages of systems development including system design, system delivery, and system outcome.

One of the major technical aspects of the Developer-centric evaluation is a network and cloud computing landscape. To keep the pace with the technology, the new TEL systems are switching to cloud computing usage and Internet environments. Therefore, technical evaluation has become more complex and specialized developers move their focus on the overall efficiency of the applied cloud computing services [13].

3. Proposed Performance Evaluation Framework

The most important reason for the technical performance evaluation of a TEL-based learning system, is that the impact of platform on learners’ experience, satisfaction and learning outcomes is dependent upon how successful technology is integrated and how efficiently the services are delivered. The best indicator to measure performance is based on clear and reasonable criteria. Here, two efforts are presented that address, respectively, the criteria to be employed and the measurement approach through the following subsections.

3.1. Criteria

In this section, a criteria model is presented (shown in Figure 1), based on the knowledge of factors, having influence on quality and efficiency of the system outcome. The proposed criteria set is based on the technical quality model proposed in [14], which was used as a useful approach to assess mobile learning services and help learners, instructors,
Criteria, focusing on the infrastructure, performance, experience. There are a big number of influencing factors as follows:

- **Functionality:** The capability of the TEL system to provide the intended functions which meet the specified and implied requirements of users according to the specifications of usage accurately. The application must include all functionalities and features that are necessary to provide an enhanced learning experience. Metrics: response time and bug-feature ratio.

- **Reliability:** The capability of the TEL system to maintain its level of performance and consistency under specified conditions for a defined period. This criterion also characterizes how the system is tolerable to the failures and errors. Metrics: number of impacted users, error rates, recovery time, task success probability, stalling time, fault tolerance.

- **Efficiency:** The capability of the TEL system to provide desired performance, under specified conditions in an efficient manner. The TEL system, while integrating a wide range of technologies, must provide users with fast access to the content and interaction with the components in a good speed. Metrics: throughput, delay and data loss.

- **Connectivity:** The capability of the TEL system to provide seamless delivery of the required services to the users through the specified network connectivity infrastructure and learning settings. Connectivity criteria concerns more about the network and cloud service provider’s ability to handle users and application demands. For example, some of the current innovative learning technologies, such as an HD videoconferencing solution, are effective for on-line learners with fast Internet connections. Metrics: available capacity, link latency, network throughput, data Jitter, and availability of the cloud.

- **Security:** The capability of the TEL system to provide a secure platform while users firmly access resources and services. The new communication technologies come along with increased threats to system and data security and privacy. The TEL system must be equipped with security tools, providing privacy settings and security controls. Metrics: number of denied attacks and data security efficiency (percent).

- **Resource Utilization:** The capability of the TEL system to efficiently manage and control all the resources of the system. Inefficient use of the system resources will lead to service disruptions that ultimately diminish end-user experience. Metrics: bandwidth consumption, CPU, memory usage and power consumption.

### 3.2. Methodologies

The main aim of the TEL system performance evaluation methodologies is to provide solutions to accurately assess actual end user experience and measure effective metrics on what users are really encountering. As it is explained in Section 2, the TEL systems performance evaluation aspects are divided into two directions, user-centric and developer-centric. Accordingly, the corresponding evaluation methodologies are performed in two planes, internal-evaluation and external-evaluation. The external-evaluation plane includes the evaluation methodologies such as: purpose-built surveys, questionnaires, interviews and observational assessment. This part of evaluation is conducted in user side, to test the behavior of the system when the access is granted to a large number of users, in widespread locations and different technical environments, with varied resource needs.

The internal-evaluation plane methodologies are conducted on the developers’ side and includes performance monitoring tools and solutions which evaluate the data automatically gathered through the platform. Currently there are a big number of performance monitoring tools and products, while the TEL platform either is located and performs on enterprise’s own data centre or migrated to a cloud. For example, AppNeta is an Application Performance Monitoring product which provides performance evaluation solutions and data for cloud-derived applications to their development team to discover performance bottlenecks.

The proposed performance evaluation framework is illustrated in Figure 2. As shown in this figure, the outputs from the evaluation planes are gathered and then analyzed in Action Planning step. The required actions for correcting, improving and enhancing the system performance are decided. The decided corrective actions are established and executed to the corresponding parts of the platform through the Performance Improvement step. The improved TEL platform is presented again to the evaluation planes in an iterative manner for achieving high technical performance continuously.

### 4. Conclusion

The learners’ experience, satisfaction and learning outcomes is influenced by the quality of the services and by the way in which they are delivered to learners through the TEL strategies. It is a challenging issue for technology planners and administrators to choose what measures and standards are best to apply for their developed or adopted learning platform.
In this paper we proposed a technical performance evaluation framework for TEL-based learning systems containing the criteria and performance measurement methodologies. This instrumental framework presents a basic structure for evaluating and assessing technical performance of a large-scale TEL-based learning platform. The proposed structure will facilitate standardization and evaluation of e-content. For the future work we plan to investigate the components of the proposed model in different TEL-based learning systems empirically.

5. Acknowledgment

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10. References


Primary School STEM Education: Using 3D Computer-based Virtual Reality and Experimental Laboratory Simulation in a Physics Case Study

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Abstract

An educational application, Water Cycle in Nature, that focuses on physics phenomena such as evaporation and condensation, was employed in a small-scale pilot carried out in a primary school in Ireland, as part of the European Horizon 2020 NEWTON project. 3D immersive computer-based virtual reality and experimental laboratory simulation are part of this application. 58 primary school children took part in this pilot. The goal of the study presented in this paper was to assess the learner experience and usability of the Water Cycle in Nature application. The results analysis shows that most children found the application useful and enjoyable in learning the presented topics.

1. Introduction

It is observed in all levels of education a recent lack of interest in Science, Technology, Engineering, and Mathematics (STEM) subjects, which is mostly due to the perception that these are difficult and demanding subjects. In order to overcome this disengagement from STEM topics, a more interactive and technology-based approach might be the solution, which is also welcomed from a pedagogical point of view. Innovative technology based pedagogies such as gamification and personalised learning path through educational content [1], flipped classroom [2], virtual labs [3], enhanced learning experiences through augmented and virtual reality [4], [5], [6], multiple sensorial media content [7] and interactive educational games [8], have been employed in class or at home as extra-curricular activities. Virtual Reality (VR) and Virtual Labs (VL), provide an immersive experience through graphical simulation while additional features, such as animation, videos and personalization ensure learners’ understanding of complicated theories.

VR and VL also offer an effective way to simplify the understanding and applying STEM complex theory. Various educational studies have been carried out in order to evaluate their benefit on students of various ages in a classroom and informal settings [9].

VR has extremely wide applications across a whole range of disciplines, and the technology has reached a sufficient level of maturity to be applied in education, making VR as an important teaching aid in a wide area of topics, such as medicine in [10], [11] and [12], mathematics and geometry in [13] and [14], and engineering in [15] and [16].

VL, a separate strand of VR, was defined in [17] as a highly interactive multimedia environment that involves users into a computer-generated world. Some of the projects focused on developing online interactive learning environments centred on a functional laboratory that supports collaborative problem solving and enhances students’ practical skills are VESLL (Virtual Engineering Sciences Learning Lab http://myweb.lmu.edu/saugust/VESLL/index.htm), which creates a virtual version of a science museum; Virtlab (http://www.virtlab.com/), which is a platform that provides a series of hands-on experiments to be performed in a virtual chemistry laboratory; DoCircuits (www.docircuits.com), which is an online virtual lab for working with circuits online. Employment of a VL in an educational setting is also presented in [18], paper that demonstrating how VL use significantly enhances the teaching experience. Another use of a VL was also investigated in [19] for analysing “real-world” anomalous data, showing that it assisted students in developing new knowledge and preparing them to real-world investigations.

This paper presents Water Cycle in Nature application that contains a 3D immersive computer-based VR and experimental laboratory simulations in a VL. By making use of the application, physics phenomena that are part of the nature water cycle and precipitation formation, specifically vaporisation, evaporation, boiling and condensation are studied. This application was developed as part of the Horizon 2020 NEWTON project. A research case study involving children from two Irish primary school
classes (one control and one experimental) was carried out. The goal of the research study was to run a small-scale pilot in a primary school in order to evaluate the benefits in learner experience when interacting with the Water Cycle in Nature application, compared with the teacher-based classic approach. Both classes had access to the Water Cycle in Nature application, whereby the control group has also been exposed to the classic teaching approach and they had the opportunity to make a comparison between the classic approach and the technology enhanced learning (TEL) approach lessons. A very high percentage of students in both classes showed high level of enjoyment in using the application, voicing hopes that such lessons will be provided in the future and hoping to take part in such novel-approach lessons more often.

The paper is organized as follows. Section 2 provides a brief description of the NEWTON project and an overview of the Water Cycle in Nature application. Section 3 presents the case study and its evaluation methodology. The usability and learner experience results are discussed in Section 4. Section 5 summarises the paper, and the conclusions of this research study and presents future plans for both the Water Cycle in Nature application and the NEWTON project overall.

2. Water Cycle in Nature Application

The Water Cycle in Nature application and the small-scale primary school pilot described in this paper are part of the NEWTON project funded by the EU Horizon 2020 scheme. The project aims to design, develop and deploy innovative solutions for TEL.

Water Cycle in Nature is only one of a wide variety of applications developed as part of this European project which are planned to be employed internationally in small and large-scale pilots. The applications are available via the NEWTON technology enhance learning platform (NEWTELP). The platform integrates and deploys a multitude of novel and emerging mechanisms and TEL methodologies including: interconnected fab labs and virtual labs, multi-modal and multi-sensorial media distribution, augmented reality, gamification, game-based learning, and self-directed learning pedagogies (e.g., flipped classroom, online problem-based learning, and e-practice testing).

The scope of the Water Cycle in Nature application is to educate children on precipitation formation and the roles that vapourisation and condensation phenomena play in it, as described in [20]. The two phenomena are described in both a nature environment and a VL environment, allowing children to understand better these concepts. The application was developed with advice and input from teachers.

The Water Cycle in Nature application is suitable for both primary and secondary schools, and it has the benefit of being employable in lessons with children with special educational needs, specifically hearing impairments. The children explore the two environments, nature and VL, and they need to follow instruction provided both as a text and as audio track in order to progress through the application. For children with hearing impairments, sign language is used. The audio track, text and, when necessary, sign language provided the educational content as well.

The Water Cycle in Nature application design methodology and its steps, including Specification of the pedagogical objectives, Choice of application model, General description of scenario and virtual laboratory, Choice of software components, Detailed description of scenario and virtual laboratory, Development of educational content description (text and audio-track), Knowledge assessment and Learner Satisfaction evaluation development, Pedagogical quality control and Application dissemination are described in more detail in [20].

3. Case Study Description and Evaluation Methodology

The research case study that involved the Water Cycle in Nature application was carried out in St. Patrick’s Boys National School in Dublin, Ireland, on two classes of 5th class children. Each class had 29 children, and the class was randomly assigned to be either the control or experimental group. The ages of participants ranged from 10 to 11 years old.

Table 1. Water Cycle in Nature: Evaluation Methodology

<table>
<thead>
<tr>
<th>Activity</th>
<th>Control Group</th>
<th>Experimental Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge Pre-test</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>Classic Approach (power point presentation)</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>NEWTON project Approach (Water Cycle in Nature application)</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Learner Satisfaction Questionnaire</td>
<td>-</td>
<td>✓</td>
</tr>
<tr>
<td>Knowledge Post-test</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>NEWTON project Approach (Water Cycle in Nature application)</td>
<td>✓</td>
<td>-</td>
</tr>
<tr>
<td>Learner Satisfaction questionnaire</td>
<td>✓</td>
<td>-</td>
</tr>
</tbody>
</table>

The teachers from the two classes have provided input in the evaluation methodology. The children wishing to take part in this pilot signed Assent Forms, whereas their parents provided signatures on the Consent Form. Table 1 presents the activities defined...
in the evaluation methodology for both control and experimental classes in order of their occurrence.

Two separate strands of assessments were defined in the evaluation methodology. One focused on knowledge gain evaluation and the second one on application usability and learner experience.

Pre and post tests were provided to both classes before and after the lesson in order to assess the knowledge gained. The experimental class interacted with the Water Cycle in Nature application in order to learn about the water cycle in nature, specifically vapourisation and condensation. The control group was presented the same educational content in a classic approach using a power point presentation presented by their teacher. The post-test questions have evaluated the same topics as the pre-test, using questions that were slightly modified and rephrased versions of the pre-test questions. This assessment did present knowledge improvement following each class.

Table 2. Learner Satisfaction Questionnaire

<table>
<thead>
<tr>
<th>No.</th>
<th>Question</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td>The video game and the experiments that I did in the lab from the video (this is called a virtual lab?) helped me to better understand vapourisation and condensation processes.</td>
</tr>
<tr>
<td>Q2</td>
<td>The video game and the experiments that I did in the virtual lab helped me to learn easier about the vapourisation and condensation processes.</td>
</tr>
<tr>
<td>Q3</td>
<td>I enjoyed this lesson that included the video game and the experiments in the virtual lab.</td>
</tr>
<tr>
<td>Q4</td>
<td>The experiments that I did in the virtual lab made the lesson more practical.</td>
</tr>
<tr>
<td>Q5</td>
<td>The video game distracted me from learning.</td>
</tr>
<tr>
<td>Q6</td>
<td>I would like to have more lessons that include video games and doing experiments in virtual labs.</td>
</tr>
<tr>
<td>Q7</td>
<td>Comments/Suggestions</td>
</tr>
</tbody>
</table>

The second part of the case study, and the focus of this paper, was on application usability and learner experience, and were assessed using a Learner Satisfaction Questionnaire (see Table 2). A 5-level Likert scale was used, comprising the following options: Strongly Disagree (SD), Disagree (D), Neutral (N), Agree (A) and Strongly Agree (SA). The questionnaire was provided to the experimental group prior the knowledge post-test. The control class, following their classic teaching approach knowledge assessment, has also interacted with the Water Cycle in Nature application, and after that they have completed the Learner Satisfaction Questionnaire as well.

4. Results

4.1. Learner Experience

The children experience with the Water Cycle in Nature application was assessed for both groups through questions Q1 to Q6 from the Learner Satisfaction Questionnaire. One child from the control class did not provide answers to questions Q4, Q5 and Q6, the remaining students answered all 6 questions. The obtained results for both classes are presented in Table 3.

Table 3. Learner experience results

<table>
<thead>
<tr>
<th>No.</th>
<th>Question</th>
<th>SA (%)</th>
<th>A (%)</th>
<th>N (%)</th>
<th>D (%)</th>
<th>SD (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Q1</td>
<td></td>
<td>31.03</td>
<td>36.21</td>
<td>24.56</td>
<td>6.90</td>
<td>1.72</td>
</tr>
<tr>
<td>Q2</td>
<td></td>
<td>37.93</td>
<td>39.66</td>
<td>19.30</td>
<td>3.45</td>
<td>0.00</td>
</tr>
<tr>
<td>Q3</td>
<td></td>
<td>62.07</td>
<td>27.59</td>
<td>8.77</td>
<td>0.00</td>
<td>1.82</td>
</tr>
<tr>
<td>Q4</td>
<td></td>
<td>29.31</td>
<td>46.55</td>
<td>15.79</td>
<td>6.90</td>
<td>0.00</td>
</tr>
<tr>
<td>Q5</td>
<td></td>
<td>15.52</td>
<td>8.62</td>
<td>24.56</td>
<td>20.69</td>
<td>33.33</td>
</tr>
<tr>
<td>Q6</td>
<td></td>
<td>70.69</td>
<td>24.14</td>
<td>3.51</td>
<td>0.00</td>
<td>0.00</td>
</tr>
</tbody>
</table>

It is observed that over 67% of children thought that the application helped them better understand the presented topics of vapourisation and condensation. 77% of children thought the Water Cycle in Nature application made it easier to learn about the two main topics of the lesson. Almost 90% of children enjoyed the digitised lesson and the presented VL. Over 75% of children did think that the VL made the lesson more practical, showing that when lab facilities are not available, VLs can be used to present similar experiments. A very high percentage of children (94.83%) said that they would like to have more lessons similar to the Water Cycle in Nature application, including the VL. In Q5, a small percentage of children (24%) expressed the opinion that the application distracted them from learning. However, it was observed that some children provided a SA answer to Q5 because of the emoji used, rather than the text of the answer, where the smiley face for the SA option might have confused the participating children, especially when considering the answers provided to the rest of the Learner Satisfaction Questionnaire.

5.2. Application Usability

The Application Usability was assessed based on Comments and Suggestions provided to Q7. 37.9% of children decided to not provide any comments. A few times it was stated that the audio track needed improvement, which was updated for all future use of the application. Otherwise, most of the comments provided by the remaining 62% of children were positive, including statements such as “Good lesson”, “I enjoyed it and I would do it again”, “I would really
like them to do it again” and “I think [it] was so cool. Thank you so much”.

6. Discussion and Conclusion

The small-scale educational research study presented in this paper was carried out in a primary school in Ireland, as part of the European Horizon 2020 NEWTON project. The research study investigated the learner experience benefits of a TEL approach to learning about precipitation formation by employing a digitised application containing VR and VL environments. 58 5th class students from St. Patrick’s Boys National School participated in this study, learning about physics phenomena that are part of the natural water cycle, such as vapourisation, condensation and evaporation. The two classes were randomly assigned as control group and experimental group. The experimental group interacted with the Water Cycle in Nature application and the control group was exposed to classic teaching approach, provided by their usual teacher, and the TEL approach via the application, being able to compare between the two.

A Learner Satisfaction Questionnaire was designed to assess learner experience and application usability. Both classes completed this questionnaire, showing excellent overall learner experience, where over 90% of children would like to take part in more such TEL lessons. More than two thirds of participating children from both classes thought the application eased the understanding of the described concepts. Highly positive comments and feedback was obtained from most children.

The Water Cycle in Nature application will be actualised, according to some of the children’ suggestions and will be part of future international small and large-scale pilots in both primary and secondary schools and in schools for children with hearing impairments. Its effects will also be analysed from a knowledge gain point of view, investigating its benefits on learning improvement and retention.

7. Acknowledgements

This research is supported by the NEWTON project (http://www.newtonproject.eu/) funded under the European Union’s Horizon 2020 Research and Innovation programme, Grant Agreement no. 688503.

8. References


Gamification Elements in STEM Subjects – Lessons Learned from NEWTON Project

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Abstract

Gamification – whereby game mechanics are integrated into a non-game experience, such as a learning experience – has a positive effect on learning, increasing students’ motivation and engagement. STEM education is not currently taking full advantage of the possibilities offered by the implementation of gamification into science lessons. More worryingly, Europe is facing a shortage of scientists in the future, as students are disengaging from STEM subjects, finding them difficult and irrelevant. Science teaching has not caught up with the millennials, who by nature are digital natives, having grown up in an age of technological advancements and video games. While there are many ways to include gamification into education, the implementations made must be genuinely beneficial, and not only changes for the sake of changes. Here, we present the results of a gamification survey, carried out as part of the NEWTON H2020 Project, and discuss the most useful aspects of gamification mechanisms.

1. Introduction

Games are engaging in a way that few other activities are, and this is particularly true for the current learners, millennials, who are digital natives when it comes to technology. They use technology in their everyday lives and have grown up playing video games. Modern video games also include a great deal of social aspect, and online communication via text, chat and email is considered as normal as talking. However, the way in which STEM (Science, Technology, Engineering and Mathematics) subjects are taught has not kept up with the development of technology. Sciences are still primarily taught in a traditional classroom with a teacher-centered set-up, even though this does match the skillset the millennials exhibit. They are used to sharing knowledge and receiving instant feedback, while receiving data from several sources at once.

Technology is their home ground, and these new types of learners require a different approach to education [1]. Pedagogies have not changed but students have. The use of technology such as tablets, laptops and smart phones is becoming more prominent, while video games have conquered an incredibly wide, heterogenous audience. Gamification – whereby game mechanics are integrated into a non-game experience, such as a learning experience – has a recognized positive effect on user enthusiasm and engagement, particularly amongst millennials [2].

The solution to this mismatch of the skills and requirements of millennials, and the status of STEM education, is the implementation of new pedagogies into the learning experiences. These new pedagogies should include components that embrace and enhance the skills the students possess, while considering the requirements that the future technology-orientated job market will demand. However, before this implementation can be done effectively and in a manner that will truly benefit the modern learners, it is important to understand which components of the gamification mechanisms are the most valued and helpful for both educators and learners. These mechanisms must then be implemented into the new pedagogies while utilizing technology in education.

2. NEWTON Project

The NEWTON Project¹ funded by the Horizon 2020 EU Programme – is aiming to change the way we teach STEM subjects and to provide an engaging student-centered approach to learning. The goal is to connect educators and learners through a large-scale European-wide platform NEWTELP and to offer innovative pedagogies in a virtual environment. Gamification will play a key role in the NEWTELP platform enabling a new interaction concept during learning experiences. The gamification component of this platform was introduced to the wider audience in a workshop in Ireland that focused on gamification in

¹http://www.newtonproject.eu/
education [1]. The gamification component is explained in more depth in the next section, followed by details and results of the Gamification Survey, after which conclusions form the final section.

3. NEWTON gamification component

The main idea of the NEWTON gamification component is to combine different concepts and aspects deriving from Adaptation and Personalisation, Gamification, Serious Gaming and Socialization to address the entire learning experience, for both learners and educators [3]. The NEWTON Enhanced Gamification Model, which is the theoretical basis of this component and consists of four layers, is described in more detail in [3]. The Gamification Layer aims to create extrinsic motivations in players; it may contain the main elements used in games such as points, badges, levels, virtual coins or money collected by the term of rewards and leaderboards, progress bar and so on. It also contains the set of rules such as the definition or configuration of conditions and actions, which enable the assignment of rewards to the players. The second layer, Serious Games, through the dynamics and aesthetics of the game (i.e. virtual environment, avatar, animated interaction, etc.), create intrinsic motivation and leverage some psychological factors to increase student engagement.

User profiling is fundamental in addressing aspects such as personalisation and adaptation of game contents and the game experience to match specific students’ requirements. In the NEWTELP platform, this is implemented into the Profiling and Recommendation Layer. Hence, each student can be characterised by personal data, own interests and preferences, implicit behaviour and individual learning progress. By tracking and storing individual actions, the student’s profile will be updated and refined (by using some inference mechanisms to discover new implicit knowledge about him/her) to better inform the system to match personal learning needs, adapt and recommend the single best gamified learning content or pathway, either for the individual or for the team.

Moreover, in line with socialization paradigm, the Social Layer allows students to share their own ideas and ability in order to solve complex problems and stimulate cooperation and team working, by also basing on the use of gamification causing these effects. Finally, in this vision educators still play a fundamental role since they can configure appropriate rules to address more motivation in the learning of specific content, especially those ones considered very difficult by students, to set gamified courses/pathways and they can be active in the social environment to give right suggestions and support to the work of students.

4. Gamification survey

4.1. Methodology

NEWTON Project partners organized a workshop presented at the 7th Irish National Game-Based Learning Conference (iGBL2017), held in Cork, Ireland on June 22nd-23rd 2017, called “Gamifying the Learning Experience: Ideas from the NEWTON Project” [1], which was voted as the best presentation overall. The key goals of the workshop were to explain how the model for gamification connects to the learning experience, and to find out the opinions and thoughts about gamification of the expert audience. In the end of the workshop, the participants, mostly experts from the Education and/or Game-based Learning/Gamification sectors, filled in a survey, which was later distributed to wider gamification expert audiences online.

4.2. Results

The motivation behind the survey was to find out which gamification elements were thought of as the most useful for educators and learners, and how these were aligned with the principles of the NEWTON-Enhanced Gamification Model. In the survey, 54 participants (42% female, 58% male), 52% of whom were aged between 26 and 35, answered questions on their level of familiarity on gamification, where they saw the value of gamification, especially relating to teaching STEM subjects, and what they considered to be the risks of using gamification in education.

The results, which are discussed in more detail below, show that increased engagement and motivation were considered as the most powerful aspects of gamification (see Figure 1). Clear targets and goals were considered the most useful elements of gamified learning experience (see Figure 2).

Figure 1 shows that the most powerful and useful aspects of gamification and of gamifying a learning experience were increased engagement (87%) and increased motivation (80%). As one of the main drivers behind the NEWTON project is the lack of engagement by students in pursuing STEM subjects, this is encouraging for the implementation of different gamification mechanisms into the platform.

Other studies have shown similar results and proven how gamifying a learning experience does make it more engaging for learners. Hamari [4] carried out a study where students were awarded badges for their work, while the non-gamified control group did not receive badges. Students who received badges reportedly had a significantly higher level of engagement. Similar results were reported by Domínguez et al. [5], with gamification increasing motivation in students. Rocha Seixas et al. [6] found that students who received more rewards and badges also had significantly better average performances in
their coursework and tests. Teachers taking part in this gamification study also noticed how interested and engaged the students were to learn using the online system and reflected on how the awarded badges sometimes did not reflect their expectations for a specific student. This allowed the teachers to look closely at the progress of a specific student and offer more in-depth teaching to an individual. In the NEWTELP platform, the Profiling and Recommendation Layer serves a similar purpose, allowing for both the learner and the educator to track the student’s progress and provide insight into the individual learning journey.

Gamifying a learning experience encourages students to communicate with other learners, as the level of activity in forums and projects has been found to increase when gamification has been implemented into the experience [7]. In the NEWTELP platform, the Social Layer encourages students to share their own ideas and allows for cooperation and team work. Other signs of increased motivation and engagement are improved percentage of students passing the coursework, and participation in voluntary activities [8]. In the survey, the third most powerful and useful aspect was instant feedback (40%), which is also something NEWTON virtual labs offer. Furthermore, 89% of the participants agreed that gamification could enhance the learning of STEM subjects.

The participants of the Gamification Survey answered what were, in their opinion, the most useful gamification mechanisms (see Figure 2). For learners to have targets and clear goals were considered as the most useful aspects of gamification. Ideally, goals should be specific, clear, moderately difficult and immediately achievable. Instant feedback was the second most valued gamification mechanism. Immediate rewards are considered more appropriate for learners, especially millennials, than potentially vague long-term benefits [9]. Optimal level of challenge, which is related to personalisation, was considered as the third most useful gamification mechanism. Challenges should be clear, concrete, and actionable learning tasks that increase in complexity as the learner progresses. In the NEWTELP platform, the Profiling and Recommendation Layer enables each student to work at their own level, as the system records their previous work, updates the user profile as the student progresses and tracks individual preferences. The participants of the survey considered team challenges to be important, as these assist students in building their team work and communication skills, while enhancing social engagement loops [9]. Teamwork also gives learners visibility, reputation and recognition, which are important in increasing motivation.

Personalisation was also considered as very useful. Types of personalisation include personalised experiences, adaptive level of difficulty, challenges tailored to the players’ level of skill, and scaffolding, i.e. increasing the difficulty as the player’s growing skills. Themes, points and prizes (including badges) were also appreciated as gamification mechanisms. Themes as well as storylines have been found to make the learning experience more enjoyable and engaging to learners [10]. Point systems manage the acquisition and spending of points that quantify user performance, while badges reflecting the prestige within players’ community are given for special achievements, or for effort of the learner [9]. Avatars and narrative also scored high. Avatars can function as so-called pedagogical agents, who help guide the learning journey [11]. In some learning exercises, students can also create their own avatars, hence adding another touch of personalisation to the learning experience.
5. Conclusion

Research has shown that gamification mechanisms offer ways to make the teaching of STEM subjects more engaging for students, increasing their motivation and bringing relevance to the subjects. Disengagement from science is a serious issue amongst millennials, and by utilizing technology and gamification, we can bring familiarity and increase interest of the learners. The results of this survey emphasize this fact, as they show that the increased engagement and motivation were considered the most powerful and useful aspects gamification has to offer to STEM education. Out of the gamification mechanisms, targets and clear goals, instant feedback and optimal level of challenge were ranked as the most useful ones for learners. In the NEWTON H2020 Project, which aims to motivate and engage students to study STEM subjects, gamification mechanisms play a key role, as we recognize the value and opportunities these provide, and the results of this survey will be used to refine the gamification mechanisms within the system.

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7. References


