# FACULTY USE OF THE ACTIVE LEARNING CLASSROOM: BARRIERS AND FACILITATORS

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## ABSTRACT

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| Aim/Purpose | The study aimed to examine teacher educators' perceptions regarding their ability to implement innovative pedagogies following a year during which they used a newly equipped Active Learning Classroom (ALC), designed for teacher training |
| Background | To this end, we asked how participants perceived the effective use of the ALC and how they were able to leverage the use of the ALC to implement innovative pedagogies. |
| Methodology | Using the grounded theory method, we conducted qualitative analysis of data collected from semi-structured in-depth personal interviews. The sample included 22 randomly-selected teacher educators in a single teacher-education college, who had used the ALC over the last year. Average teaching tenure was 22 years. |
| Contribution | As part of the transition to using innovative pedagogies in an ICT (Information Communication Technology) enhanced teaching environment, our proposed model can be used to map teachers' perceptions and proficiencies, so as to address the specific needs of each group. |
| Findings | Analysis revealed four pedagogic teaching patterns. Based on the TPACK (Technology, Pedagogy, and Content, Knowledge) model as a |

theoretical framework, we were able to relate these patterns to partici-pants' strengths and weaknesses in technological and pedagogic knowledge and the ways in which they used the ALC. These patterns testify that there are different levels of use and integration of technolo-gy and pedagogy by teacher educators.

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| Recommendations for Practitioners | Enhancing teachers' knowledge, promoting innovative concepts and removing barriers for ICT usage require integrated technological-pedagogic guidance, which should be provided to the teachers by in-structors with integrated TPK (Technology Pedagogy Knowledge). |
| Recommendations for Researchers | The ability to map technological and pedagogic strengths in accord with teaching patterns and styles provides an advantageous and applicable foundation that can be used by any future studies that wish to pursue this line of investigation. |
| Impact on Society | Formulating new strategies in teacher education would effectively make teacher educators the leading force driving the desired transformation, whereby teachers have the skills and knowledge to prepare students to become productive members of society in the 21st century. |
| Future Research | Future studies are encouraged to use our proposed model (which maps technological and pedagogic strengths in accord with teaching patterns) to examine additional questions, for example, what is the relationship between teaching style and teaching effectiveness and can it provide the impetus to attempt to shift teachers' attitudes and styles? |
| Keywords | TPACK, teacher educators, teaching style, teacher perceptions, techno-logical classroom, pedagogy |

# INTRODUCTION

The technological and pedagogic changes that occurred in the 21st century initiated a paradigm shift in the perception of teaching towards the constructivist teaching approach that places the learner at the center (Barak, Ben-Chaim, & Zoller, 2007). A teacher is expected to create learning environments that present assignments, challenges, and content relevant for the learners (National Research Coun-cil [NRC], 1996), and teachers who place the student at the focus of the teaching-learning process are expected to "successfully assimilate and integrate technology into their teaching" practices (Ertmer & Ottenbreit-Leftwich, 2010). There are clear expectations that the teachers should be active partners in the construction and design of learning tasks that utilize the technology-enhanced environment (Barak, Carson, & Zoller, 2007). Yet studies have shown that although teacher educators are aware of the pedagogic potential afforded by teaching technologies, many continue to use technology in tradi-tional ways, with no fundamental change in the related teaching or learning patterns (Bransford, Brown, & Cocking, 2000).

This study offers a test case regarding the introduction of technology in a classroom for active learn-ing, with the purpose of encouraging pedagogic change in teacher training processes. The process of assimilation of technology in teaching is complex and multi-dimensional (Englund, Olofsson & Price, 2017). For this reason, a qualitative research approach was chosen. This approach enabled us to elicit attitudes and insights from teacher educators teaching in an Active Learning Classroom, out of consideration for their subjective viewpoint.

To enhance both faculty and student knowledge and provide them with the optimal environment for collaborative digital teaching and learning and for the implementation of new pedagogy, the teacher-education college where this study took place constructed an ALC. This environment was specially designed for teaching and learning with state-of-the-art technological and pedagogic models.

The purpose of this classroom was to reinforce collaborative teaching and learning methods that enable the learners to construct knowledge by themselves, according to the model of constructivist learning. These processes would also be supported by technological tools that facilitate collaborative knowledge construction with teacher educators' guidance (Margaliot, Gorev, & Vaisman, 2018). The ALC includes various fixed and mobile modern technological tools that can assist interactive and collaborative teaching and learning, with special utilities to enable testing, feedback, documentation and review. As previously suggested (Mitchell, Wohleb, & Skinner, 2016), although one of the pre-conditions for novel pedagogic thinking is the provision of a suitably constructed physical and technological infrastructure, the first usage of such a classroom demonstrated that the availability of digital technology alone was not sufficient to produce the necessary innovation. The same trend was noted in the ALC in the present study: at first, most members of the teaching faculty did not maximize their use of its technological advantages. In order to encourage the teacher educators to use the facilities, the college offered the lecturers professional, technical, and pedagogic assistance throughout the academic year, encouraging informed use of the ALC. During that year, the lecturers were able to use the ALC as an experimental laboratory for staff and students, where they learned to use the new technologies and implement innovative pedagogies. The study used the ALC environment as a test case, to examine the ways teacher educators integrated technology use into the pedagogic process, to test the relationships between teachers' attitudes, knowledge, and teaching patterns and to identify facilitators and barriers to technology usage (Avidov Ungar, Leshem, Margaliot, & Grobgeld, 2015).

The goal of this study was, therefore, to examine how teacher educators perceived the use of the ALC as a teaching instrument based on innovative technologies. More specifically, we sought to learn from the experiences of teacher educators about the barriers to and the facilitators of effective usage of the ALC in their attempt to make the learning active and meaningful. We also wanted to understand whether and how the teacher educators were able to leverage the use of the ALC to create opportunities for innovative pedagogies.

## THEORETICAL BACKGROUND

### Innovative pedagogies

The US Department of Education (2016) states that: "Across the board, teacher preparation and professional development programs fail to prepare teachers to use technology in effective ways" (p. 5). In order to train teachers effectively, teacher educators need to change their methods. This change could be realized through the integration of innovative pedagogic approaches that employ collaborative technological tools together with teaching processes (Margaliot et al., 2018).

New pedagogies constitute an important part in the process of assimilating the use of digital technologies in teaching-learning processes (Jung & Latchem, 2011). In order for the learning to be significant for the learners, it should be perceived as being valuable and meaningful to the learners and relevant to their daily assignments and challenges, their perceptions, thoughts and emotions (Pellegrino & Hilton, 2013). Meaningful learning can only be achieved with the assistance of digital learning when it is used as an innovative pedagogic infrastructure and applies a broad spectrum of pedagogic methods. This learning employs information and communication technology that empowers the learners' learning (Avidov-Ungar & Eshet-Alkakay, 2011; Rogers, 2003). Various technological tools are employed in digital learning to allow learners to access online and offline knowledge. This type of learning is enhanced by well-organized yet flexible pedagogic progressions. For this purpose, it is important to provide a purpose-built space with appropriate technological equipment. This space enables cooperative learning and can support most types of pedagogic requirements.

The integration of technological infrastructure not only advances the use of technology; more importantly, it promotes the incorporation of innovative pedagogy (Kolloffel, Eysink, & de Jong, 2011). Given that effective usage of the modern tools requires knowledge, Koehler and Mishra (2009) sug-

gested the Technological, Pedagogic, and Content Knowledge (TPACK) framework. The TPACK framework consists of three main types of knowledge: content (knowledge of the subject learned or taught), pedagogy (knowledge about the processes and practices or methods of teaching and learning), and technology (knowledge about the ways of thinking about and working with technological tools and resources). At the intersections between these three main forms of knowledge, integrated knowledge skills can be identified. TPACK mastery enables teachers to use the most appropriate pedagogic principles to design effective learning activities, so that they can convey and illustrate the content in a manner attractive and clear for learners. In this manner, by integrating the three primary forms of knowledge into the teaching process, teachers can provide an optimal learning experience that helps students gain a comprehensive understanding of the learned content (Avidov & Eshet-Alkalay, 2017; Shamir-Inbal, Dayan, & Kali, 2009).Teacher attitudes towards the introduction of Information and Communication Technology (ICT) in the teaching process have a major effect on their TPACK-related self-efficacy beliefs (Yerdelen-Damar, Boz, & Aydın-Günbatar, 2017); hence, fostering a positive attitude in this regard could improve teachers' ICT usage and the outcomes of the teaching process (Lee, & Lee, 2014). Attitudes towards technology affect the degree to which teachers accept the use of ICT, and hence the frequency and level at which they integrate ICT in their teaching process (van Braak, Tondeur, & Valcke, 2004); therefore, teachers' attitudes should be considered an important component when examining factors that facilitate or impede technology-enhanced teaching.

Harris and Hofer (2009) found that optimal integration of ICT in teaching requires teachers to have positive attitudes towards the use of technology. Positive attitudes are based on teachers' understanding that the technology contributes to and enhances teaching and learning processes (Kay, 2006). Typically, teachers who demonstrate positive attitudes concerning the use of ICT in their teaching work tend to favor a learner-focused pedagogy (Drent & Meelissen, 2008). Sang, Valcke, Van Braak and Tondeur (2010) validated an integrated model that showed the impact of attitudes and efficacy on classroom ICT usage, whereby teachers' attitudes towards educational ICT significantly predicted prospective ICT usage. Changing teachers' attitudes is not easy. A 10-year longitudinal study found that younger teachers' attitudes change slowly from a negative to a positive approach towards adapting technology usage in classroom, whereas negative attitudes of senior teachers are more difficult to change (Englund et al., 2017; Mitchell et al., 2016; Postareff, Lindblom-Ylänne, & Nevgi, 2007). Furthermore, initiating attitude changes among teachers may require powerful external influences (Barnett, 2014).

Research has shown that teachers' positive attitudes towards the inclusion of technology in the classroom influences the effectiveness of the assimilation of technological tools in teaching (Ertmer & Ottenbreit-Leftwich, 2010). To date, various studies have discussed the role of teacher attitudes towards the integration of ICT in elementary and high schools (Bingimlas, 2009; Siemens & Tittenberger, 2009). Recent studies have tested teacher educators' attitudes towards ICT integration (Instefjord & Munthe, 2017). Innovative tools have been constructed in order to measure the perceptions of pre-service teachers regarding their readiness to integrate technology in the classroom (Tondeur, van Braak, Siddiq, & Scherer, 2016). However, we believe that there is still insufficient knowledge about the perceptions of teacher educators regarding ICT integration and the effects it may have on their pedagogic practices. Consequently, this study aimed primarily to identify and characterize the perceptions of teacher educators concerning the ALC environment, its use, and its impact on pedagogy and the teaching-learning process. To this end, we asked the study population, experienced teacher educators who are members of the faculty of a teacher-education college, to address their own process of ICT integration, taking into account their pedagogic needs and their perceptions of ALC-related teaching.

## BARRIERS TO AND FACILITATORS OF CLASSROOM ICT INTEGRATION

Previous studies have reported a variety of facilitators and barriers to classroom ICT integration, including – but not transactional to – pedagogic beliefs and perceptions, time management, teachers' knowledge of and skills in selecting and using the various technological tools, the suitability of ICT tools for teaching-learning purposes, and the effectiveness of the technical and pedagogic support system (Brzycki & Dudt, 2005; Goktas, Yildirim & Yildirim, 2009; Gomez, Sherin, Griesdorn, & Finn, 2008; Maltz & DeBlois, 2005; Moser, 2007). The contributing factors can be divided into two groups – personal factors and environmental factors.

### Personal factors

Recent studies have found correlations of teachers' usage of ICT with personal factors, including the teacher's age, personal computer knowledge and skills, perceptions of self-esteem and self-efficacy, and beliefs regarding the impact of technology use on students' learning and achievements and on the efficacy of classroom teaching-and-learning activities (Levin & Wadmany, 2008). Personal factors are not easily changed; thus, more experienced teachers tend to use older teaching strategies whereas novice teachers tend to change strategies and adopt new methods of ICT integration in their classrooms (Englund et al., 2017).

### Environmental factors

The main environmental factors in the school, which are determined by the particular education system, include the availability of ICT infrastructure, systems, and equipment, as well as the availability and quality of both technical and cognitive support for teachers who use these facilities. Other environmental factors include the school's educational vision, school management policy, school's past attempts to introduce and use educational innovation, students' parents support of the ICT integration process, social support and/or pressure from colleagues, financial incentives offered to ICT integration teachers, and the presence and usage of an intra-school ICT system (Inan & Lowther).

## ICT INTEGRATION IN THE CONTEXT OF TEACHER TRAINING

Studies that examined ICT integration among teacher educators discovered a lack of knowledge regarding possible means and ways to effectively create ICT educational tools for their own classes (Surry, Ensminger, & Jones, 2003). As a result, researchers suggested the need to develop new teacher-training strategies intended to emphasize the link between the pedagogic aspects of teacher training and ICT-enhanced teaching-and-learning methods (Instefjord, & Munthe, 2016; Tondeur, Pareja Roblin, van Braak, Voogt, & Prestridge, 2017). Such new strategies would further serve to expand and strengthen pre-service teachers' TPACK-related skills (Baran & Uygun, 2016). Formulating such new strategies in teacher education would effectively make teacher educators the leading force driving the desired transformation – a transformation which would include the mastery of 21st century teaching skills and the implementation of ICT-based pedagogy in the teacher-training process (Brenner, & Brill, 2016).

## GOALS AND OBJECTIVES

The overall goal of the current study was to collect information that would help us understand how to help teachers take full advantage of the ALC setting. The findings could then be used to design an effective teacher-training module on ICT integration in teaching and education. Working with a sample of teacher educators meant that we could assume participants' high-level proficiency and mastery of all of the components that comprise the teaching-and-learning process in terms of pedagogy, content, and the ability to apply theoretical knowledge in their teaching practices. In a different sample of teachers, lack of such proficiency might interfere with our observations of the challenges of adapting to and maximizing the use of the ALC.

Hence, the study was conducted among teacher educators in a teacher-education college. The focus of the study was on their perceptions regarding the use of innovative teaching pedagogy. To this end, we collected data on their experiences and impressions regarding the use of the ALC. It should be noted that all of the study participants work in a climate that affords them full academic freedom in choosing teaching environments and teaching methods.

It is important to note that the teacher educators, who participated in the research, chose to teach in the ALC. Just as there was a possibility to choose to teach in the classroom, so the teacher educators were also able to choose the manner in which the technological means would be used in accord with their needs and preferences.

To this end, the following research questions (RQs) were posed.

1. Based on teacher educators' experience, what were the barriers to and the facilitators of effective usage of the ALC?

2. How do the teacher educators describe the overall experience of using the technologies available in the ALC?

3. Given participants' pedagogic and technological knowledge, what kind of teaching patterns can be discerned in teacher educators' use of the ALC?

# METHODS

## THE SAMPLE

The Active Learning Classroom was first available for use at the beginning of the 2014-2015 academic year and the data was collected at the end of the year during October and November 2015. Of 160 faculty members, 30 teachers used the ALC during its first year of operation. The sample included 22 teacher educators ($N = 22$), which was equivalent to about 14% of all the teacher educators in the college and about 75% of the teacher educators who used the ALC in their teaching. All participants volunteered to take part in the survey and they were promised full anonymity. Participants' ages ranged between 40 and 60 years, and their average teaching tenure was 22 years. The participants were randomly selected from a list of ALC users. Approximately 20% of the participants had a Masters' degree and about 80% had a PhD degree. Twenty of the participants were women, and two were men.

## THE TOOLS

Our research was based on a qualitative construct. The data were gathered through semi-structured in-depth interviews that examined teachers' perceptions of the implementation of new pedagogies in the ALC. The interviews used the narrative method, which views the conversation as an evolving process until the preferred story is revealed (Creswell, 1998; Maykut, & Morehouse, 1994). Every interview lasted about 75 minutes. Most of the interviews were performed face-to-face (n=16), where a single researcher interviewed a single participant, either at the college or at the participant's home, while a few interviews were conducted over the phone (n=6). To understand teacher educators' perceptions after they had used the ALC over a period of a year, we asked them the following questions.

- How do you perceive the process of teaching and learning in the ICT-based ALC?

- How do you perceive the roles of the teacher, the students, and the technology in an ICT-integrated teaching/ALC environment?

- What facilitates and what impedes effective use of the ALC?

- What constitutes successful ICT-integrated learning?

The questions were composed in such a way as to enable the respondents to describe their experiences while teaching in the ALC and to examine the characteristics of their use of the classroom, whether there were any impediments hindering their work and the factors that facilitated successful use of the classroom and the technological tools that it contained. At the first stage, two of the researchers conducted four pilot interviews in order to test the suitability of the questions for the research goals. After the pilot, the questions were composed in their final form as detailed above, and then an expert interviewer performed the research interviews.

It is important to note that the research respondents received an explanation of the goals of the research: to learn from their experience and to share their insights with other teacher educators in the college. This led to a high level of involvement by the research respondents. As noted the interviews were relatively long, lasting about 75 minutes even when some interviews were conducted by telephone.

The interviewer posed these questions with the intent to examine the ways in which the interviewees used the ALC, factors that could promote or might prevent ALC usage, participants' perceptions of ALC teaching as a teaching-learning enhancing agent, participants' perceptions of innovative pedagogy, and participants' perceptions of the teacher's role in the 21st century. During the interview, the participants were required to think reflectively about the technological and pedagogic characteristics of innovative teaching, in the context of the 21st century demands regarding teaching and learning.

The questions were devised according to the "scaffolding" approach (White, 2007). The notion underlying the scaffolding approach is to enable interviewees to move between "floors," i.e., central themes, whereby each *floor* is divided into rooms, which constitute subthemes. The researchers provide the *scaffolding* and the *stairs* between floors by asking assistive questions, clarifying, mapping, dismantling, undermining, and connecting to new meanings, according to the content of the conversation. In the current study, the first *floor* referred to the interviewees' use of ALC characteristics, specifically frequency of use, types of activities, teaching methods, and the use of ICT-enhanced pedagogies. We documented their initial attitudes towards ICT-based teaching, the ways they implemented their own technological and pedagogic knowledge in the ALC, and their ALC teaching-and-learning experience.

Then, using the virtual scaffolding, the interviewees were able to "climb to the next floors" and to achieve deeper observations of their perceptions. At this floor we could document participants' thoughts, beliefs, attitudes and perceptions about the advantages and disadvantages of teaching in the ALC. We also examined the contribution of the ALC to the implementation of innovative pedagogies. On the third floor, the participants examined their perceptions of teacher training in the 21st century, focusing on ICT integration in teaching, the teacher's roles, and the expected teaching products. The demographic data collected included gender, age, academic degree, and teaching tenure. The research was approved by the Ethics Committee of the college's Research Authority. The research was performed after receiving permission to conduct the interviews while maintaining the privacy and anonymity of the interviewees at all stages of the research and in any publication of the results.

## DATA ANALYSIS

Data analysis began during the interviews and the data collection process, in order to improve and focus the follow-up questions. Further analysis of the interviews was based on the "grounded theory method" (Glaser & Strauss, 1967), composed of building blocks taken from the field of the investigated subject. The grounded theory approach makes it possible to develop and validate theories using information gathered from the various viewpoints of the participants. This research method promotes theory development, by placing greater emphasis on listening to the participants' own explanations (Pigeon, 1996).

The data received from participants about their actions and the explanations they provided for their actions (including thoughts, evaluations, and considerations after the fact) constitute the "building

blocks" for constructing the theory. The underlying assumption for the process is that the interviewees hold theoretical structures that form the base for their words and actions. These theories do not necessarily have cohesion or internal continuity; they probably do not contain all of the components of a "good theory," and in many cases the interviewees are not aware of their theories (Glaser, 1978). Such theories are frequently based on interviewees' hidden knowledge more than on their explicit knowledge (Polanyi, 1967). During the interview, the researchers tried to help the interviewees become conscious of their unconscious knowledge. The process of transforming latent knowledge into open knowledge is essential in order to build a theory based on the information collected by the researchers (Glaser & Strauss, 1967).

Consequently, our description of the findings, i.e., participants' perceptions regarding ALC teaching, new pedagogies, and new technological tools, was constructed with the help of the "floors and scaffolding" method (White, 2007), based on content analysis of the interviews, the interviewer's interpretation of the interviewees' remarks, and the interviewees' own insights. Common themes that emerged from the interviews were considered in relation to the research objectives. The theme discovery process was based on the interview findings, combined with literature-based theoretical knowledge (Guba & Lincoln, 1981). The analysis was carried out in accordance with the principles of qualitative research, including inductive and holistic coding and analysis, and relied on theory development through the known theoretical knowledge of the examined phenomenon and the data collected in the study.

# RESULTS

The order in which the results are presented corresponds to the research questions we posed. The research questions are:

1. Based on their experience, what were the facilitators of and the barriers to effective usage of the ALC?
2. How do the teacher educators describe the overall experience of using the technologies available in the ALC?
3. Given participants' pedagogic and technological knowledge, what kind of teaching patterns can be discerned in teacher educators' use of the ALC?

## RQ1. FACILITATORS AND BARRIERS TO THE EFFECTIVE USE OF ACL

Analysis of the findings revealed a total of 91 statements describing facilitating factors for effective use of the ALC, from which three types of themes were derived, namely, pedagogic factors (47 statements, 52%), technological factors (24 statements, 26%), and factors related to the learning environment (20 statements, 22%). The following excerpts are presented according to these three themes.

### Pedagogic facilitating factors

Teacher educators referred to several technological facilitating factors, among them, the availability of technical support: "As soon as I knew I could rely on support from the technical department, lessons were fluent, I was not anxious and was able to proceed calmly." Others mentioned the availability of new and advanced equipment: "The new equipment made me feel that I was working at the forefront of the field of education, which made me want to use it so as to serve as a useful model to the teacher trainees;" "The fact that I'm familiar with equipment combined with the fact that it is now available in the college, encouraged me to use it in my teaching, as it made my teaching experience more interesting and varied."

Teacher educators referred also to the learning environment as enabling collaborative learning and affording the teacher direct contact with each student individually: "This is the first time in years that I've been able to see how to create opportunities for collaborative learning, due to the physical struc-

ture of the classroom and the technologies it affords;" "My teaching method allows me to walk among the students, make personal contact and observe their work and their progress within the lesson's framework."

## Pedagogic barriers factors

Analysis of the barriers to effective ALC usage, as found in participants' descriptions, revealed 77 statements conveying three different themes: technological barriers (28 statements, 37%), barriers related to the learning environment (27 statements, 35%) and pedagogic barriers (22 statements, 28%).

The technological barriers mentioned by participants included lack of technological knowledge, "I can't manage teaching in an innovative manner because I don't have the technological know-how, I don't know how to operate all of the equipment in the classroom;" as well as lack of experience in informed usage, as expressed in the following excerpt:

> *I don't know how to choose the right tool for the tasks I've prepared in my lesson. It appears I don't have the necessary technological knowledge to know how or how much to use the technology, or even which particular tool corresponds to my lesson.*

Other participants mentioned that using the technology interrupted the lesson flow: "Dealing with the technology takes up a lot of time;" and "Technological failures interrupt the lesson flow." Another aspect raised by interviewees was technology-related insecurity: "My lack of confidence during the lesson is noticeable and it comes from the fact that my students are much more knowledgeable and proficient in the use of technologies compared to my own experience."

The learning environment-related barriers mentioned by the teacher educators referred to aspects such as classroom size, "I can't manage to teach more than 30 students at a time – there weren't enough work stations to accommodate everyone, so I couldn't use the technologies as I had planned." Others claimed that they could not combine both direct presentation of materials with collaborative learning due to the physical layout of the classroom: "The classroom is large and wide and students have to contend with a great deal of stimuli; thus, when I want to present new information, it is technically impossible to get students to concentrate their attention on the presentation." Another technical aspect is the fact that there is only one ALC in the entire college:

> *I had planned to conduct three lessons in the ALC, but I was given access to only two periods, because the room had already been booked. As a result, I was not able to attain the collaborative outcomes that I had planned for these lessons.*

The following excerpts represent the pedagogic barriers that the teacher educators raised in the course of the interviews.

> *I had to devote much more time to prepare a lesson for the ALC than for a regular class – I can't spend that much time preparing every lesson, which means I won't get a lot of experience using the ALC.*

Similarly, another interviewee noted the time factor regarding a different aspect of the lesson, namely, the increased amount of time dedicated to collaborative learning compared to non-collaborative learning: "I need to allocate more time to teach each topic when applying the collaborative learning approach using the technological tools and I simply can't afford it, because it would mean dropping other topics from the syllabus." Other teachers expressed their hesitance to cede control of the lesson to the students: "At some point during the lesson I got lost; students brought up things I hadn't intended to address and hadn't included in the lesson plan;" "Sometimes I selected appropriate technological tools and was unable to attain the goals I had set out in my lesson plan."

## RQ 2. OVERALL EXPERIENCE OF USING THE TECHNOLOGY AVAILABLE IN THE ALC

Three themes emerged from the descriptions provided by the interviewees: (a) features of the teaching process when taking advantage of ICT-enhanced environment in the ALC, (b) ways of using the technology in the lesson, and (c) the degree to which the teacher is in control of the process (ranging from teacher-centered to student-centered learning).

### Features of the teaching process when taking advantage of the ICT-enhanced environment in the ALC

"For me this [teaching process] is characterized by maximum student participation in the lesson and evidence that the students are enjoying the lesson." Also, another participant chose to emphasize the enhanced value of the learning process: "In the ALC environment, I [can tell that] my students understand the value of what they're learning and [they tell me that] they apply it to their own teaching in the schools." "It [i.e., teaching in the ALC] presents numerous opportunities, first among them, a way for students to collaborate and share information in a different way." Another advantage that was noted: "Students learn to study independently and develop critical-thinking skills." "It helps students gain a better understanding of the content," and in the same vein, one interviewee said: "Context-based learning enables students to construct new knowledge," and another added: "The outcome was much better than what I had planned for." "You can expect the outcome of the lesson (conducted in the ALC) to be relevant to and shared by all of the students."

### Ways of using the technology in the lesson

The following excerpts convey participants' perceptions regarding the role of the technology in an ALC environment.

> *First of all, I believe that technology should be integrated in all teaching processes at the college – it is inseparable from the process of teaching and learning, just like pen and paper were in the past. It has to be a basic and inherent part [of the process].*

"The technological tools are only a means that enhance the experience and the outcome of the learning process." Another participant stated: "I think of the innovative pedagogy as a means that makes the technological tools more accessible."

The participants also mentioned another effective use of technology, indicating that they used the technological tools available in the ALC as a platform that enables novel didactic work. Thus, for example: "Look, today the classroom is a platform, the question is: what do you do with this platform and how you use it? I mean – didactically. The pedagogy needs to change and we need to use the platform correctly. It's a means." We also found that several teachers noted the effective use of collaborative technological tools available in the classroom that facilitated the performance of workshops while also enabling group work for the sharing and creation of new knowledge. Thus, for example, one of the teachers said: "there is a dynamic dictated by the pedagogy, sharing within groups, a lot of group work, there are collaborations and people exchange positions in the group. At each and every stage, the students worked in groups and were assisted by the technology, which is the motto."

As part of the transition to using innovative pedagogies in an ICT-enhanced teaching environment, our proposed model can be used to map teachers' perceptions and proficiencies, so as to address the specific needs of each group.

### The degree to which the teacher in an ALC is in control of the learning process

Participants raised the aspect of classroom control, addressing the issue of teacher-centered vs. student-centered learning. Several of the interviewed teacher educators sought to define and control the

learning process to varying degrees: "The learning process should be flexible and oriented towards relevant outcomes, yet guided by the teacher," "[the process should be] active, aimed at the outcome defined by the teacher," and "the teacher's role is to convey the material in a manner that will be comprehensible to the student, while providing access to technological means."

The following view was less common:

> The *teacher's* role is to prepare the materials and the lesson, but during the lesson, the reins should be in the hands of the students. I know what my goal is, but the students might lead us to places that I hadn't considered.

Others broached this aspect by referring to the role of the student in the ALC setting: "The student does what the teacher planned; although the process is creative, the class is directed by the teacher." "The student takes an active part in learning, both in the classroom and in the schoolwide context." "Teacher trainees are active throughout the learning process; as a result of this type of learning, they will become innovative leaders at the cutting edge of the field of education."

## RQ 3. TEACHING PATTERNS USED IN THE ALC

In light of what the data revealed regarding participants' pedagogic and technological knowledge, we attempted to discern the different types of teaching patterns manifested in the teacher educators' descriptions of their experiences in the ALC. We identified four different pedagogic patterns in the data and gave these patterns the following names: traditional pedagogy, transactional innovative pedagogy, rewarding innovative pedagogy, and enhancing innovative pedagogy. The patterns and their distinctive characteristics as pertaining to pedagogy for the use of technology in teaching are described in Table 1.

**Table 1. The four patterns of teacher educators' ALC experiences: Pedagogic principles**

| Teaching Patterns<br><br>Components | Traditional Teaching | Limited Innovation | Incentivized Innovation | Innovation for Enrichment |
|---|---|---|---|---|
| Perceptions regarding the Teaching-Learning Process | Traditional, presentation-style teaching | Traditional, presentation-style teaching | Flexible teaching style, made relevant to student contexts | Context-based teaching that enables students' independent construction of new and relevant knowledge |
| The Role of Technology | Traditional use of technology (e.g., slide presentations using computer software). | Informed use of technological means and belief in the significance of such use. | Using technology to link to knowledge sources during the lesson. | Technology is used to create an empowering learning experience that has relevance beyond the classroom... |
| Teacher's Control of the Lesson | Teacher follows a predefined, close-ended lesson plan. Transmits knowledge according to a prescriptive set of goals. | Teacher follows a predefined, close-ended lesson plan. Transmits knowledge according to the evolving learning process. | Flexible, yet controls the process. Aims to foster independent learning and empowers students to acquire new knowledge. | Enables a flexible learning process that exceeds official curricular boundaries. Mediates the learning process, by creating opportunities for independent learning. |

The following is an elaborate description of each of the four patterns of ALC usage, characterized according to three pedagogic principles (perceptions regarding the teaching/learning process; the role of technology; and teacher's control of the lesson).

The pattern of traditional pedagogy places the entire responsibility for the learning process with the teacher. The lesson is presented and controlled by the teacher, who conveys the information to the student through presentations or lectures, the content of which has been determined in advance. One of the participants stated it thus: "I still teach using direct presentation of information – I don't know any other way." Another interviewee noted: "I am committed to adhering to the syllabus, which is constraining;" and yet another commented: "teaching is our task – I conduct the lesson and I do not lose control."

The pattern of transactional pedagogic innovation still involves conveying the information through direct presentations, and although the lecturer believes that it is important to integrate technology in the teaching process, this is not practically implemented in the lesson plan or in the form of active learning. One of the interviewees described it thus: "I wanted them to use my tools, the tools I had planned for…."

The pattern of incentivized innovation reveals a more flexible rule of the teacher, who allows the students to work freely within the technological environment, but attempts to choose the technological task to match the content studied. "Technologies should be integrated in all teaching processes at the college – it [replaces the use of] pen and paper.... It has to be a basic and inherent part [of the process]." Another participant stated: "Technology is a means and not an end; you set the task and then choose the tool."

The pattern of innovation for enrichment involves giving the students a free rein so that they are active as equal partners in choosing the content and the way they learn. The technology provides an environment in which they collaborate to construct knowledge, so that in many cases, the content derived from the learning process differs from the targets that the lecturer or teacher had in mind. In this case the teacher's role is not to be the information source, but rather to help guide and navigate the learning process within the technological environment. Given that students are exposed to an information-rich environment even when exploring a narrow content field, it is the role of the teacher to guide the learning while allowing the students to navigate and construct their knowledge on their own. This was expressed by one of the participants in the following manner:

> *I think that if the teacher chooses a pedagogic approach that is more about demonstrating ways that students can self-monitor their learning process and less about control, then the pedagogy is innovative, and then neither the kind of classroom in which the lesson is conducted nor the technological means selected makes a difference.*

Another participant said: "A teacher who prepares the lesson and then gives free rein is aware of the goals, but is still willing to let the students explore and consider aspects that he or she has not planned for." "The teacher is not necessarily the source of all knowledge and the students do not necessarily learn only through the lesson and its tasks." "[The teacher's role is] to help the students navigate towards an awareness and an understanding that technological tools can be used to improve the teaching process and lead students to experience independent learning."

## DISCUSSION

Adapting schools to the 21st century requires changes in the perception of teaching, such that the student takes center stage during the process of teaching and learning at school (Barak, Ben-Chaim, et al., 2007). In other words, the teacher aims to place the student at the focus of the learning process, while effectively integrating and assimilating technology in the teaching process (Ertmer & Ottenbreit-Leftwich, 2010).

## TEACHING STYLES

The TPACK framework (Mishra & Koehler, 2006) enables integrative observation and examination of teaching in an ICT-enhanced environment. The intention of the current research was to focus on a specific aspect of the TPACK model – the interface between technological knowledge (TK) and pedagogic knowledge (PK) – and the implications of this interface on ICT-integrated teaching patterns. The model shown in Figure 1 demonstrates the way in which the four pedagogic patterns identified in this study can be understood within the broader framework of the TPACK model. We plotted teachers' usage of student-centered vs. teacher-centered pedagogies to the vertical axis and teachers' degree of technological knowledge to the horizontal axis. This meta-analysis of the findings yielded four pedagogic patterns discerned in this study and exposes four teaching styles.

|  |  | Traditional (Low TK) | Innovative (High TK) |
|---|---|---|---|
| **Innovative Pedagogy (High PK)** | | Transactional Innovation | Innovation for Enrichment |
| **Traditional Pedagogy (Low PK)** | | Traditional teaching | Incentivized Innovation |

Pedagogy (vertical axis label) — Technology Usage (horizontal axis label)

**Figure 1. Pedagogic patterns mapped onto PK-TK matrix – a meta-analysis of the findings**

Each of the four teaching patterns we found corresponds to a specific area in the model. The four regions vary in the ways the teachers integrate technology and pedagogy in the ALC.

### The traditional teacher and innovation for enrichment

At the basic level of the model (low TK and low PK) we find the traditional teacher, who uses the ALC as a traditional classroom, mainly for teacher-centered frontal instruction, whereby the role allotted to the technology usage is mostly passive. The traditional teacher presents the content (using slide-presentation software) and the students listen to the teacher while reading the media. In the traditional teaching style ICT is used in many cases to present the main content and display examples from within the classroom.

At the most advanced level (high TK and high PK), we find a teaching style that uses innovation for enrichment, where the *teacher* serves as a learning facilitator while the students use the technology for active learning. The lessons are based on tasks, requiring students to use technological tools to find information and to use technological tools throughout the process, to produce their own learning products. This teaching pattern requires the teacher to prepare and adapt each lesson plan accordingly. The teacher who uses Innovation for Enrichment prepares all ICT-based assignments in advance, recognizing that collaborative tasks provide the most effective learning experience.

We view these two opposite styles as located at the extreme ends of a continuum that represents instructional effectiveness. Given that a comparison of the effectiveness of the different teaching styles gleaned in this research is beyond the scope of our study, we present this view as an intuitive assumption. We believe that the effectiveness of traditional teaching is a very obvious-basic level while the

Innovation for Enrichment teaching style including technological tools, may enrich the process of teaching and learning towards a more elaborative teaching style. Further studies are required to examine these assumptions.

## Transactional innovation and incentivized innovation

The two other areas in the model (high TK and low PK, as well as its opposite -- low TK and high PK – are characterized by intermediate skill and knowledge levels. Presumably, these styles are used by teachers who are in the process of transitioning from traditional teaching to teaching that is more student-centered and involves the use of innovative ICT-enhanced pedagogies. Such a transition requires teachers to change their pedagogic perceptions and to acquire the technological knowledge and tools that would enable them to realize and apply the new pedagogic concepts. In addition, this shift requires teachers to understand and internalize the notion that implementing new pedagogies in an ICT-enhanced environment creates learning opportunities that did not exist in the past.

The teachers who use the transactional innovation teaching style (low TK and high PK) lack confidence in the technological environment and in the ability of ICT tools to provide the required pedagogic products. Therefore, they continue to rely on the traditional and more familiar approach to lead and control the building and presentation of content in the classroom. As to teachers who use the incentivized innovation style of teaching (high TK and low PK), they possess the necessary technological knowledge; however, they do not perceive it as serving a pedagogic goal. These teachers seek an incentive for using innovative ICT-based pedagogies, because they view the technology merely as a means to an end, whereby the "end" is a product which they consider equivalent to the product of traditional teaching. Hence, although they may use innovative technological tools, they maintain full control of the lesson, the content, and its products. The teachers in the two intermediate regions do not allow the learners to take responsibility for learning and, therefore, the effectiveness of their teaching style is more transactional than the effectiveness of the style that uses Innovation for Enrichment. The teaching process reaches maximal effectiveness only when the teacher is knowledgeable about the technology and trusts it to provide the students with the ability to achieve the knowledge by themselves. Such trust entails an understanding and acceptance of an underlying premise, namely, that students' independent knowledge construction is the pedagogic approach that yields the best results for the students.

More specifically, the working assumption of innovative pedagogy is that appropriate teaching and task construction, which takes into account the existing inventory, enables learners, whether individually or in a group setting, to find, formulate, and organize the appropriate content into knowledge, while maintaining full control of the learning process. Control of the learning process is transferred to the students only by teachers who are confident in the ability of their students to learn and to perform the required tasks on their own. Hence, we expected teachers with higher pedagogic knowledge (high PK with either low or high TK) to apply innovative pedagogies; however, the experiences of teachers who exhibited high PK but low TK revealed a gap between their conceptual approach and their ability to implement this approach. We found that teachers with higher pedagogic knowledge who lacked technological skills did not allow students to control the learning. They were unable to implement their advanced pedagogic knowledge or their conceptual understandings, as expressed in the interviews. This finding demonstrates how important it is to master technological knowledge as a tool to promote pedagogy among teacher educators, regardless of the desired teaching style. This finding also demonstrates that pedagogic knowledge alone is not sufficient for achieving optimal teaching and learning in the ICT environment. Only teachers with both high PK and high TK were able to apply innovative pedagogy in the ICT-enhanced classroom in a manner that implements Innovation for Enrichment.

## THE FACTORS THAT FACILITATE OR IMPEDE TEACHING IN THE ALC

Examining the factors that facilitate or impede teaching in the ALC revealed that high pedagogic knowledge and the teacher's desire to improve the pedagogic aptitudes of the students promoted effective ALC usage, whereas the key barriers were related to the teacher's technological knowledge and the teaching environment. Our findings support those of a previous study on teacher educators' ICT integration, which found that participants lacked knowledge of the ways to effectively combine ICT tools for their lessons (Surry et al., 2003).

In conclusion, our findings suggest that effective teaching depends on teachers' theoretical and practical perceptions, acceptance, and control of the technological space, on the one hand, and their ability to implement new pedagogies suitable for ICT-integrated teaching and learning, on the other hand. Hence, to facilitate and promote teachers' effective use of pedagogies that employ advanced ICT technologies, we should guide them to adopt the pattern of *Innovation for Enrichment*. A teacher's willingness to forgo traditional teaching patterns requires a high level of both pedagogic and technological knowledge. Possession of such proficiencies affords the teacher the freedom to choose both the learning content and the appropriate technological tools to support student-centered learning. Ensuring that teachers have both access to this knowledge and opportunities to practice its implementation will mitigate the barriers and pave the way to effective use of innovations for the purpose of enrichment.

Teacher educators are expected to model the use of innovative pedagogies for their students, who are tomorrow's teachers. Based on the study findings, we suggest that although the teacher educators have a strong and comprehensive theoretical and practical foundation, their perceptions of the innovative pedagogy are scaled in correlation with their teaching style in the ICT environment, and in turn, their teaching style can be mapped to their levels of technological-pedagogic knowledge. Furthermore, findings of the current study indicate that these teaching styles have a significant and important effect on teachers' ability to employ innovative ICT-enhanced pedagogies for the purpose of enriching the learning experience.

As part of the transition to using innovative pedagogies in an ICT-enhanced teaching environment, we recommend conducting a preliminary survey of teachers' perceptions and proficiencies, and then allocating teachers to groups, mapped to the model proposed herein. In this manner, specific objectives and training modules can be assigned to each group according to the teachers' TPK mapping, which take into account the group members' teaching styles and attitudes. There are numerous ways to conduct the professional enhancement for each group, whether by means of specially dedicated workshops that cater to the particular needs of each group, or by means of a more gradual process, which would involve teaming- (or pairing-) up individuals from complementary groups (an individual with high TK and low PK with an individual with high PK and low TK) for the purpose of mutual and supportive collaboration. Shagrir (2017) found that teacher educators "prefer to collaborate...to advance new initiatives and ideas that they are interested in leading in their place of work [as well as to] advance teaching abilities" (p. 9).

As previously noted, the findings suggest that only teachers with both high TK and PK, who use Innovation for Enrichment, considered the ALC environment beneficial for the teaching process, whereas teacher educators with conservative pedagogic perceptions (low PK) perceived the ALC as a barrier to teaching (e.g., "The ALC was not suitable for frontal instruction", "I need a microphone to teach in the ALC"). These teacher educators need reinforcement of their pedagogic knowledge, through professional guidance that will teach them the teaching-and-learning methods of innovative pedagogy, teacher role, and the significance of environmental factors to the pedagogic principles promoted in this environment. Teachers lacking in technological knowledge also considered the ALC as a barrier for teaching (e.g., "I don't know how to use the system", "I don't know how to share information"). The technological knowledge of these teacher educators should be increased via professional guidance. The findings denote that the technological and pedagogic implications of ALC

teaching cannot be separated. Enhancing teachers' knowledge, promoting innovative concepts and removing barriers for ICT usage require integrated technological-pedagogic guidance, which should be provided to the teachers by instructors with integrated TPK knowledge.

The research's contribution stems from the identification of four main patterns used by the teacher educators in their integration of digital tools in the ALC. This model enables us to see that at the high (enhancing) level of implementation that was identified, technology contributes to the enrichment of teaching and learning. Thus, for example, according to one of the interviewees:

> In the past we also gave tasks to individuals or groups in which in the end shared knowledge was created, however, assisted by technology, for example the use of collaborative documents, the students were exposed to knowledge acquired by others already during the work and so in the end the final product/knowledge that was created was broad and rich.

It is clear from these words that a pedagogic work model (PK) had been formed including the use of technology (TK), so that learning occurs through a learning assignment that is performed in small learning groups. Later, each group shares its knowledge with other groups. Then a collaborative document is drawn up containing the knowledge from all the groups. This exemplifies the effective use of technology to support and advance the construction of knowledge through the effective exploitation of technological resources.

## CONCLUSION

The research findings show that there were differences in the ways in which the teacher educators integrated technology in teaching and adapted it to their pedagogic needs. As shown above, there were different patterns expressing different types of teachers and teaching approaches. Analysis of the spectrum of types in the model which was proposed, suggests different levels of assimilation of the technological tools in teaching. Since both the students and also the teachers live in the technological world and use it intensively, it is necessary to make teaching more relevant and meaningful for them. They need to be constantly updated about new teaching approaches, so that the integration of innovative technologies is carried out in a relevant and significant manner. The teachers can choose the pedagogic and technological tools appropriate for them, adapting them for their student population in accord with the tools available to them.

The practical implementation of the research findings and conclusions can be derived from the differences in the ways in which the teacher educators integrated technology in teaching and adapted it to their pedagogic needs. As shown above, there were different patterns expressing different types of teacher educators and teaching approaches. Analysis of the spectrum of types in the model which was proposed, suggests different levels of assimilation of the technological tools in teaching.

The Active Learning Classroom provided us with the opportunity to observe the dynamics of the transition from traditional pedagogy to ICT-enhanced innovative pedagogy. However, although the participants were asked to describe their experiences using ALC throughout an entire academic year, the interviews were conducted at a single point in time, at the end of the academic year. We did not examine the process of transitioning from one approach to the other and, therefore, our analysis could not provide causal insights.

The sample was very small (N = 22) and, as a convenience sample, it included teacher educators affiliated with one particular college; therefore, the findings cannot be generalized. The qualitative study methodology makes the generalization of the findings even more difficult. It is recommended that future research include longitudinal studies, focusing on diverse teacher-educator populations from a number of teacher-education colleges, in order to achieve generalizable and causal findings.

Future studies are encouraged to use our proposed model, to examine additional questions, including the following: Are teaching styles static or dynamic (do teachers alternate between several teaching styles)? What are the factors involved in changing teaching styles? What factors support or restrict

the shift in teaching styles? Regardless of supportive or restrictive surrounding factors, can a shift in teaching styles be achieved by conducting refresher workshops focusing on TK and PK without a parallel change in attitudes? What are the indications for investing in such a shift, especially in the case of teachers with high PK who need to improve their technological knowledge and skills? What is the relationship between teaching style and teaching effectiveness and can it provide the impetus to attempt to shift teachers' attitudes and styles?

As noted, this study did not attempt to examine either the effectiveness of ALC teaching styles or the relationships between teaching styles and teaching effectiveness. However, we believe that the proposed mapping of technological and pedagogic strengths to teaching patterns and styles provides an advantageous and applicable foundation that can be used by any future studies that wish to pursue this line of investigation.

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