

## **Potentials and barriers for implementation of learning technologies to support problem-based learning inspired methods in higher education in Jordan**

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**Abstract:** This paper presents results from a case study of ICT integration in higher education at universities in Jordan and Palestine. The study was conducted as part of the Erasmus+ project, Modernization of Teaching Methodologies in Higher Education: EU Experience for Jordan And Palestinian Territory (METHODS). The main purpose of the project is to modernize teaching forms at universities in Jordan and Palestine to raise the competencies of individual learners to become active members of the knowledge society by enhancing the learning process of students acquiring 21<sup>st</sup> century competencies to become autonomous and active learners. Traditional instructive methods are still widely applied in higher education in many Arab countries. The approach has been criticised for being teacher-centred rather than student-centred, and faces problems with the integration of learning technologies in educational programs. Teaching methods need to be improved at universities in Jordan and Palestine, so some universities have been experimenting with problem-based learning (PBL) methods in their courses for creating student-centred, ICT-supported higher education.

This paper presents results from a background study conducted to understand possibilities of and barriers to developing and implementing new types of teaching forms with elements of problem-based learning. The current interview studies were conducted with a class of 30 engineering students and one faculty member at a university in Jordan. The interviews specifically focused on understanding how participants perceived the existing educational practice and system, what problems they identified in their classrooms, and what teaching methods they hoped to see developed further in their classrooms. The results show that participants experience problems with group work, teaching that has little focus on applying theory to practice, open problem solving, and implementation of technology in courses. The results indicate that it is central to both look at pedagogical approaches such as application of theory on practice and support of group work as well facilities for group work and ICT infra structure, when establishing new ICT efforts at Middle Eastern universities.

**Keywords:** Higher education in Middle Eastern countries, ICT and learning.

### **1. Introduction**

Developing new educational approaches and practices has been a central focus at universities in Middle Eastern countries in recent years. Middle Eastern education has been criticized for rewarding passive consumption of knowledge and failing to engage students in applying skills and knowledge to situations outside the educational institution (Mahrous & Ahmed, 2010; Britz & Richard, 1992). In the majority of Arabic-speaking countries, traditional instructive educational methods are still influencing higher education, and teaching methods in higher education are teacher-centred rather than student-centred (Saleh, Al-Tawil & Hadithi, 2012).

Problem-based learning (PBL) is an educational method that could be used to change traditional educational approaches in higher education in Middle Eastern countries (Sungur & Tekkaya, 2006). Problem-based learning has been defined as both an educational strategy or philosophy and a teaching form (Baden & Major, 2004). As a result, there are various PBL guidelines and models developed for specific disciplinary, cultural or instructional contexts. These varied guidelines include principles such as perception of knowledge building, learning, teacher roles, student roles and problems that must be considered when implementing PBL (Graff & Cosmos, 2003). It is central to understand what possibilities and barriers exist for implementing new teaching forms in higher education in a Middle Eastern context. This paper presents results from the project Modernization of Teaching Methodologies in Higher Education: EU Experience for Jordan And Palestinian Territory (METHODS). The study is an interview study involving students and a faculty member at a Jordanian university. The central goal of the study is to understand what possibilities or barriers exist for implementing new PBL-inspired, ICT teaching forms in higher education in a Middle Eastern context.

### **2. Background**

Pedagogy in educational institutions in many Middle Eastern countries has been criticised for depending solely on lectures, rote learning and dictation through teaching that consists of illustrating concepts and reading from textbooks (Mahrous & Ahmed, 2010; Chadraba & O'Keefe, 2007; Tubaishat, Bhatti, & El-Qawasmeh, 2006). The Middle Eastern education system has been criticised for being an examination-oriented system dependent on memorizing facts rather than applying theoretical concepts to situations outside the classroom (Mahrous, 2010; Britz & Richard, 1992; Russell, 2004). Instead of continuing to follow a system focussed on rote learning, new educational tools and models are needed in Middle Eastern higher education.

Alkoudmani and Elkalimi (2015) reported on pharmacy schools in several Arabic-speaking countries experimenting with blended learning methods and e-learning. In contrast to traditional educational approaches in Middle Eastern countries, new methods of instruction have been introduced in these pharmacy schools to provide interactive, problem-based learning, as well as computer-assisted learning in several countries such as Kuwait, Jordan, Saudi Arabia, Egypt, UAE and Qatar (Alkoudmani & Elkalimi, 2015). Implementing these new educational approaches can be difficult because of major barriers, including ICT problems, higher connectivity, cost, unequal income distribution and low public esteem of online learning as a credible way to learn (Alkoudmani & Elkalimi, 2015).

Implementing PBL has shown to have several positive effects on students' motivation and learning. Sungur and Tekkaya (2006) reported a study that focussed on investigating the effectiveness of PBL and traditional self-regulated learning on tenth-grade students' motivation and learning strategies. Results showed that PBL students had high levels of intrinsic goal orientation, critical thinking and peer learning compared to students following classes with traditional instructional approaches (Sungur & Tekkaya, 2006).

It is important to understand the differences in applying educational models and tools in both a Middle Eastern and Western educational context. In a cross-cultural study of business students' perceptions of the effectiveness of pedagogical tools, Mahrous & Ahmed (2010) show that students in Middle Eastern countries, the U.S. and Great Britain all perceive lectures, group projects, multiple choice questions and essay questions as pedagogically effective tools. Contrary to this, methods that simulate authentic work life situations were rated significantly lower as an effective pedagogical tool by Middle Eastern students than by American and British students. Case studies that introduce students to the conditions of decision-making in an authentic professional context is a widely used tool in business studies and has been shown to provide students with a more practical experience than other pedagogical tools (Burns, 1992). Mahrous and Ahmed suggest that above the results stem from students being accustomed to passive learning systems, so students lack the practical experience to analyse a problem with open-ended multiple answers and experience confusion on what is expected of them (Mahrous & Ahmed, 2010).

The current study presents data from a qualitative interview study with students and a faculty member at a Jordanian university. The focus of the study is to understand possibilities and barriers in the existing educational culture to develop PBL-inspired educational models and tools for higher education in a Middle Eastern context.

### **3. The METHODS**

Project Modernization of Teaching Methodologies in Higher Education: EU Experience for Jordan and Palestinian Territory (METHODS) is a three-year project, which began in 2016. The main purpose for this project is to modernize teaching forms in higher education at two Middle Eastern universities. The establishment of the international technology learning centre is to utilize ICT's best practices at the level of higher education. The project was created in collaboration with EU-partners and partners from the Middle East from universities in the Palestinian and Jordanian territory. The project activities includes pre-studies of the challenges of integrating new types of ICT learning forms at Middle Eastern universities, development of ICT learning centres and teaching forms to develop a design course prototype and development of new ICT learning pilot courses. The current study is specifically aimed at uncovering possibilities for and barriers to integrating teaching forms with a PBL approach in existing courses in the engineering program in Jordan.

#### **3.1 Data collection and analyses**

To understand the potential of and barriers to the development and implementation of PBL at the Jordanian university, qualitative research methods have been conducted. The data consists of qualitative unstructured interviews (Kvale & Brinkmann, 2009). In total, eight interviews have been conducted before and after students experienced courses with elements of PBL. Students and one faculty member were interviewed about teaching methods used, and how traditional methods differ from PBL, their experiences with PBL, which ICT tools are used in a teaching context and the challenges that accompany ICT.

The collection of the qualitative data took place at University of Jordan and via Skype in October and December 2017, and a total of 17 students and one faculty member participated in eight focus group interviews. The qualitative unstructured interview method allowed an in-depth understanding of the participants' perceptions and meaning creation (Kvale & Brinkmann, 2009). The interviews were conducted with a focus on PBL elements such as group work, standard education and use of ITC in education. These topics contribute to understanding any issues that could arise when implementing elements of problem-based learning.

The data analysis of the interviews with the faculty member and the students has been analysed with an inductive thematic analysis (Braun & Clark, 2006). The purpose of this method is to discover patterns and themes across the data sets. This method allows the researcher to review every statement in the data set and to organize and describe the data set in rich detail (Braun & Clark, 2006). The data set was analysed with a semantic approach. This means that the process involves progression from description, where the patterns and themes are identified through the statements from the students and faculty member and their explicit meanings then summarized to interpretation (Braun & Clark, 2006). In the thematic analysis process, the thematic analysis phases were followed, step-by-step, from viewing statements to coding to patterns and themes, which resulted in the following findings below (Braun & Clark, 2006).

#### 4. Findings

In this section the findings of the interview study are presented. The following table lists the themes and sub-themes identified through the thematic analysis.

**Table 1:** Themes generated in thematic analysis of interview data from interviews with students (S) and a faculty member (FM) at Jordan University. Data collected September–December 2017.

THEMES AND SUB-THEMES	EXAMPLES OF FROM DATA
<p><b>Conventional way/standard teaching method</b></p> <ul style="list-style-type: none"> <li>● Students passive</li> <li>● Not reaching own results</li> <li>● Theoretical not practical</li> </ul>	<p>S1: '... the method doesn't allow you to <b>search for information [author emphasis added]</b> on your own, you get <b>explained/described</b> and <b>displayed everything</b> in advance, which means that you have <b>not really reached a result yourself...</b>'</p>
<p><b>Group work, relations and facilities</b></p> <ul style="list-style-type: none"> <li>● Group-work facilities, do not know where to sit</li> <li>● Mixed-gender group work at home are not socially acceptable</li> </ul>	<p>S2: 'The problem is when we work in a group of projects, we do not know where to sit. Sometimes it can be <b>difficult to work together</b> at the university library.'</p> <p>FM: '...it's not popular that a group of <b>mixed-gender work together at home</b>. To go home to a group member's home and work together there, it's <b>socially not acceptable.</b>'</p>
<p><b>University and skills for labour market</b></p> <ul style="list-style-type: none"> <li>● University learning not useful on the labour market</li> <li>● Relations and network, not skills</li> </ul>	<p>S3: '...when you graduate, you meet <b>challenges</b> in terms of <b>society</b> looking at your <b>relations/networks, rather than your skills.</b>'</p>
<p><b>Limiting infrastructure</b></p> <ul style="list-style-type: none"> <li>● Slow internet connection, web sites blocked</li> <li>● Outdated laboratories</li> </ul>	<p>FM: '...the <b>infrastructure can either help or prevent</b>, it can make things easier or worse...the <b>infrastructure is unfortunately what limits us.</b>'</p>

##### 4.1 The conventional way/standard teaching method and skills for labour market

The interviewed students expressed that the existing teaching method – what they define as ‘the conventional way’ – is characterized by passivity and the storage of information that is quickly forgotten at the end of the semester. They criticised traditional methods for not teaching them to be critical thinkers and for not giving them the opportunity to develop communication skills, as the learning situation is characterised by the teacher-centred teaching method (Hmelo-Silver & Barrows, 2006). One student commented:

If you are asked about detailed information in the later semesters in specific subjects that you have learned through the conventional method, you...forget about these things and you will not develop real life skills. There are also things that do not focus on communication, interaction skills. They focus only on the material, the academic building skills. Other skills like communication...you teach them outside of the curriculum, but not at university.

It appears that the students’ active involvement in their education is relatively limited. Furthermore, they state that the teaching method does not encourage them to do further research on their own and that they lack experience in taking responsibility for their own learning. The students also expressed that they felt teaching should focus on building competencies such as Critical thinking, communication and interaction, which are some of the basic principles of PBL (Graff & Kolmos, 2003). How this relates to exams and teaching materials was expressed by a student during an interview:

It is the same conventional method you study; you are taking an exam and then you will be done. In many subjects, you do not get the important things because you have not experienced or gained experience of something yourself; you have only studied the content and materials you have received.

Through PBL, students can acquire knowledge based on their own experiences with the content, as well as through research, problem solving and discussion. The faculty member from the university expressed that the existing teaching form also proves to be challenging from the teacher’s perspective:

The main problem with standard teaching methods is that the students are passive, [and] they do not do much in class unless the teacher asks them. They do not study regularly; they only study just before the exam, so that’s a problem. So, it’s a conventional way to study: they read and solve tasks. They do not do research; this is the problem of the conventional way of studying.

The data from interviews with both students and teacher indicates that the existing course assessment forms pose a challenge when implementing PBL processes, as exams focuses solely on course content from the syllabus. Within the teacher-centred paradigm, students’ focus is on learning strictly the course curricula, motivated by exam results and the teacher’s delivery of the subject-specific “true knowledge” (Hmelo-Silver & Barrows, 2006). Several students also expressed doubt of whether the skills they acquire at university are sufficient for their careers after graduation. One student said,

We have heard from other students, who have graduated and come to work, that what is working here at university has nothing [to do] with what we will work with when we get a job. Therefore, the university is not useful when entering the labour market.

Part of the goal of PBL is to prepare students for the labour market, including through work on real-life issues from the surrounding community. In the case of student-centred learning environments, it is important for teachers to clarify the educational objectives behind activities the students are involved in, such as why they would need to complete problem-solving activities (Hmelo-Silver & Barrows, 2006).

#### **4.2 Group work, student relations and limiting facilities**

The finding in this section includes several aspects related to group work in a Middle Eastern context, such as gender issues, facility issues and new types of e-learning platforms.

One of the major challenges of group work is that there are very limited physical facilities available at the Jordanian university. The vast majority of students mentioned that they do not have spaces for group work at the university. One student explains:

We do not have rooms available where we can sit in groups and work. The engineering library closes at 16:00 and it can therefore be difficult to find a suitable place to sit and work. They [the university] have not secured us facilities for group work.

Students do not have meeting rooms or group rooms to do group and project work, making group work nearly impossible. Because of this, students are not able to learn negotiation, planning or co-work in solving of tasks. Another challenge that arises from a lack of group work is related to gender issues and elements of gender-mixed groups. This central aspect is highlighted by the faculty member:

If we have a group of three students, and the max must be three in one group, and there is one female student, I usually allow her to join the group [of other female students] as it will not work if she is to be alone. The reason is that they sometimes have to work from home, and...if they go it's no good that the mixed groups work together at home, they go home to one of the group members' homes and work together there, socially it's not acceptable.

Here, there are also personal and interpersonal aspects that arise. Students expressed that they do not have the opportunity to work at home together if they work in mixed groups. As the teacher has pointed out, home work in mixed groups, is in general, not culturally accepted. This is a factor that may influence the negotiation process and can eventually challenge the mutual responsibility in the form of the negotiation process among the group members and hence the community of practice (Wenger, et al., 2009). Lack of facilities can thus be challenging for group work processes in general and specifically for group work in gender mixed groups. E-learning technologies have been tested by the participating faculty member, who sees these technologies as a way to change the classroom from traditional teacher-centred activities to activities characterized by PBL's student-centred paradigm (Garett, 2008; Plush, 2014). Technology-based environments help promote the active involvement of students in the form of discussion, group work and responsibility for self-learning. In the interview, the faculty member mentions how he has applied e-learning as a teaching tool for several years as a supplement:

I've been trying online for the past 2–3 years, [to use] YouTube videos. So, I make videos and upload them on YouTube, and the students find it very useful. They can actually go to YouTube and see the teaching; even if they have not been to the classroom, they can see [the videos]...They have the opportunity to see and understand them and refresh their memory. The YouTube videos help the students a lot; they help them understand the concept and read up to the exam, etc.

The YouTube videos allow students to follow up on some of his classes. It also helps the students to clarify some of the things they may not understand from the reading material. As one student notes, "We really like XX's videos on YouTube. [They] are excellent and we do not experience any problems with his teaching." The faculty member has experimented with other types of online forums to support PBL elements in his courses to allow students to exchange ideas and support the anchoring of the habitat in the specific requirements of the student community (Wenger et al., 2009):

We have to use e-learning as a testing tool, as a forum, [and] I have planned to do more...[to use] a forum where students can exchange ideas with each other and ask questions to be answered there. We created a Facebook page for this, where students can post questions to the teaching content. I can answer it, or another student can answer. Other students may also have the same question.

Activities like knowledge exchange between the students and the teacher will create learning environments that are characterized by dialogue that supports knowledge building of a specific subject. The aim is that the students will be able to negotiate digitally. Students are able to utilize their own competencies and have the opportunity to foster new skills with their own by drawing on the other fellow students and the teacher. The forum can complement the community of learning in the form of group and project work, especially with the lack of facilities for group work at the Jordanian university (Wenger et al., 2009). It can help strengthen the negotiation process in group work and the course itself. The use of the forum will, however, need to be supplemented by the other aspects of PBL, such as real-world problem-solving.

However, many students in the study note that their access to technology is limited. The university has limited computers, software and labs, and the internet connection is poor. It is difficult to make best use of technology in the classroom when students and teachers cannot use it as they intend to. One of the students complained:

For example, when you need to work with something specific here at university, the computers are very old; we cannot use them. And, the internet network is very bad. Sometimes you can spend one and a half hours accessing the internet...to search for something that [should] not take that long.

The limitations of technology in Middle Eastern universities will limit the acquisition of new tools and the use of existing ones, such as Facebook forums and YouTube videos, as old technology is too frustrating for students and teachers to use. The unstable internet connection will affect whether IT-based workflows will reduce complexity and increase group and project work from a PBL perspective. This will also complicate student practices by not allowing them to make use of online resources. To technically secure and a solid ICT infrastructure is thus an extremely central element when building new ICT learning centres at Middle Eastern universities.

## 5. Conclusion

Teaching in Middle Eastern universities is characterised by passive learning and storage of information that is quickly lost at the end of the semester, which does not encourage independent learning processes. This can pose challenges to implementing the PBL method. In the study it became evident that there are challenges with both group work and facilities but also exciting possibilities in applying new online teaching forums. The lack of facilities for group and project work at the university can prevent students – especially in mixed-gender groups – from negotiating, delegating and planning jointly. The responding faculty member in this study, however, is experimenting with using a variety of platforms for e-learning as teaching tools. He attempts to actively engage the students by establishing a Facebook forum where the students can exchange knowledge. The online forum can complement the community of practice in the form of group and project work, thus opening online facilities as students meet challenges with physical facilities. In addition, there are some challenges with access to equipment and infrastructure, including an unstable network connection. This can immediately lead to challenges associated with the inclusion of digital habitats that must be considered if the IT-based working methods will optimize group and project work, which is part of PBL's goals.

The above study indicate that it is central to both look at pedagogical approaches such as application of theory on practice and support of group work as well facilities for group work and ICT infra structure, when establishing new ICT efforts at Middle Eastern universities.

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