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Research Article

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Lecturers' Pedagogical Beliefs and Their Technology Integration Practices in an Engineering HEI

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Abstract

The aim of the study was to find out to what extent lecturers' pedagogical beliefs and their technology integration practices align in the Omani HE context and the potential factors that may influence their efforts to practice what they believe regarding technology integration. I used methodological triangulation in which questionnaire was used to examine lecturers' pedagogical beliefs regarding technology use, observation to examine lecturers' technology practices in reality and interview to explore in depth what have been found in the questionnaire. The participants were lecturers from an engineering higher education institution in Oman. The findings revealed a misalignment between lecturers' pedagogical beliefs and their practices due to factors such as lecturers' training, technical issues with WIFI and software installation and students' IT skills and abilities. Recommendations were provided in terms of providing lecturers with more technology integration training, raising the level of technical support and increasing the students' IT awareness.

Keywords: Lecturers' Pedagogical Beliefs, Technology Integration, Higher Education

1. Introduction

This study explores the relationship between lecturers' pedagogical beliefs and their technology integration practices in the Omani HE context. I want to find out to what extent lecturers' pedagogical beliefs and their technology integration practices align and what potential factors that may influence their efforts to practice what they believe regarding technology integration. The word 'align' in this context refers to whether what lecturers are saying is what they are doing or not. Higher education institutions are increasingly focusing on more student-centered practices with technology integration to enable more interactive and collaborative learning with engagement and autonomy [1]. Technology is seen as an important factor in supporting and achieving student-centered teaching and learning, and that is why educational institutions have been investing a great amount of resources in order to provide educational places with computers, software and new technology artefacts [2].

Besides, in some HE institutions there is a significant investment in lecturers' training and professional development to enable lecturers to use technology effectively aiming at more collaboration, engagement, interaction and autonomy in the learning processes [3-5]. This is exactly what is happening in Oman as educational policy makers are spending a huge amount of money for technology provision and lecturers' training in the HE institutions in order to increase the quality of HE. This, it is felt, will enhance the teaching and learning process and enable more student-centered approaches characterized by collaboration, engagement and interaction. However, is this investment enough to achieve effective teaching and learning processes with technology?

In fact, many researchers explored how lecturers' use of technology is affected by their pedagogical beliefs [6-8]. lecturers tend to base their technology integration practices on their pedagogical beliefs [9,10]. For example, technology such as IWB, mobile devices and computers do not determine what effective pedagogical strategies should be applied to them though their uses may suggest the applicability of some strategies [11]. Thus, lecturers' pedagogical beliefs will play an important role in determining how to effectively use technology [12]. In this respect, many studies concluded that taking into consideration lecturers' beliefs is the best way to fully understand effective technology integration in teaching and learning [13-16]. It has been recommended that further exploration about the relationship between lecturers' beliefs and their technology integration practices is necessary. The reason is that although there are many studies which have studied the relationship between lecturers' beliefs and their technology integration practices the relationship is not fully understood and

explained yet [9,17-19].

Therefore, it would be useful to explore the relationship between lecturers' beliefs and their real technology integration practices in the Omani HE context. That will provide insights for the educators and the educational policy makers in my country to find out possible ways to effectively integrate technology with its full potentials which, in turn, might enhance and develop the quality and the efficacy of the teaching and learning processes. Not only that, but also it might help them to justify the huge amount of money spent on technology resources provision and professional development training in the HE contexts in Oman.

The research study attempts to explore the relationship between lecturers' pedagogical espoused beliefs and their pedagogical enacted beliefs in terms of technology integration practices in teaching and learning process. First, it identifies the technology integration practices that lecturers have in the teaching and learning processes. Second, it finds out the pedagogical beliefs that lecturers hold regarding technology integration. Third, it explores to what extent lecturers' pedagogical beliefs and their technology integration practices align. Finally, it investigates the potential factors that may influence their efforts to practice what they believe regarding technology integration.

The research study attempts to answer the following questions:

- What pedagogical beliefs do lecturers hold regarding technology integration?
- What technology integration practices do lecturers have in the teaching and learning processes?
- To what extent lecturers' pedagogical beliefs and their technology integration practices align?
- What are the potential factors that may influence lecturers' efforts to practice what they believe regarding technology integration?

2. Literature Review

2.1. Lecturers' Pedagogical Beliefs and Their Technology Integration Practices

Many scholars and researchers have considered lecturers as an important and essential factor for achieving effective and efficient technology integration in teaching and learning [20,21]. The reason is the fact that lecturer is the one who makes direct and spontaneous decisions and judgements over technology integration practices in teaching and learning inside the classroom [22,23]. Thus, exploring the relationship between lecturers' pedagogical beliefs and their technology integration practices can help to find out how and why lecturers make such decisions and judgements with technology integration which, in turn, may contribute to enhance and develop more effective teaching and learning process [24].

Researchers mention that understanding lecturers' beliefs is important in order to understand their behaviours or practices [7,25]. Regarding the relationship between lecturers' pedagogical beliefs and their use of technology, concluded that lecturers' pedagogical beliefs 'influence their perceptions and judgments, which in turn, affect their behaviour in the classroom' [7].

2.2. Alignment Between Beliefs and Practices

Lecturers' pedagogical beliefs are considered as a filtration tool by which new experiences with technology integration in teaching are evaluated and then decisions of implementation strategies are determined [6]. Researchers have indicated that lecturers' pedagogical beliefs play a crucial role in changing technology integration practices into more constructivist view [26-28]. Further, lecturers tend to change their teaching practices and gain more student-centered beliefs when they use technology consciously over time [29]. Nevertheless, this cannot be generalized for all lecturers as lecturers' pedagogical beliefs might not align with their practices, and that can be influenced by contextual factors which hinder lecturers' efforts to put their beliefs in practice consistently such as pre-determined practices and time constraints [30-32].

It has been reported that those lecturers who have student-centered and constructivist pedagogical beliefs are using technology in a way that is more teacher-centered that is more into developing the learners' technical skills [33,34]. For example, asking the students to search the Web to find information and resources about a particular topic or using PowerPoint to display and teach a lesson in a traditional way. This is exactly what has been referred to as "inconsistencies" between lecturers' pedagogical beliefs and their teaching practices [25,31,35]. In their study of technology-using, Ertmer, concluded that lecturers' pedagogical beliefs about technology integration in the classroom did not usually align with their teaching practices [31].

In their studies on the relationship between lecturers' pedagogical beliefs and technology integration practices, found out that there is an existence of inconsistency between lecturers' pedagogical beliefs and their technology integration practices [36,37]. As it has been illustrated by that teaching and learning environment contains a variety of complicated procedures and activities which may occur at the same time and randomly [38]. To control such complexity, lecturers might come up with techniques and strategies which might be inconsistent with their own pedagogical beliefs [39]. However, it has been found that some lecturers have managed to translate their pedagogical beliefs regarding effective technology integration into practices whereas many or even most of them have not [13,36]. found that those lecturers with constructivist or student-centered beliefs started to use "blended pedagogical strategy" (applying both behaviourism and constructivism practices in their teaching and learning process), which enabled them to reconcile or reduce the inconsistencies between their student-centered pedagogical beliefs and their teacher-centered technology integration practices [31].

2.3. Influential Factors Leading to Possible Misalignment

Points out that many lecturers who hold student-centered pedagogical belief integrate technology in a way that can represent both student-centered approach as well as teacher-centered approach [13]. When they have been asked about the reasons

behind this inconsistency, they referred to contextual factors such as " curricular requirements and social pressure exerted by parents or administrators" as well as training and availability of resources [20,40]. In fact, the barriers that can affect technology integration in teaching can be classified into two categories; the internal or second-order barriers (e.g. lecturers' beliefs, and personal attitudes confidence, resistance to change and technology advantages) and the external or first-order barriers - e.g. lack of time, lack of training, limited resources and lack of administrative and or peers support [41,42].

Indicates that barriers to technology integration have a strong relationship with each other in a way that one barrier can be influenced by the other barriers at the same time [43]. For example, lecturers' belief in terms of pedagogical confidence in using technology can be influenced by training and administrative or peers support. point out that for lecturers to integrate technology effectively, they should believe that technology can assist them to reach teaching and learning objectives successfully and efficiently, using technology will not cause any constraints that may hinder the achievement of teaching and learning objectives and lecturers should have sufficient competence and capability as well as enough resources to be able to integrate technology effectively [44]. Moreover, training and professional development events for lecturers on how to integrate technology effectively in teaching and learning have been significantly emphasized since using technology is becoming more and more important in the educational field [11].

It is considered as an effective factor that can affect lecturers' pedagogical beliefs which, in turn, influence the technology integration in teaching contexts. In his study of 17 lecturers doing training technology integration in teaching, found that most lecturers gained positive beliefs that represent their willingness to integrate technology in teaching in a more creative and effective way. However, have argued that lecturers have not been given enough training and professional development support to qualify them in specific technology integration techniques and practices such as applying certain applications and tools [45,46].

3. Methodology

Mentions that to fully understand the lecturers' pedagogical beliefs, it is significant to know ‘what lecturers say, intend and do’. As a means of doing this, I used methodological triangulation to explore the research topic from the three multi-dimensional perspectives mentioned above [13]. First, what lecturers say (to find out their pedagogical beliefs)? Second, what lecturers do (to find out their technology integration practices)? Third, how lecturers explain and justify what they say and do (to find out if lecturers' beliefs and practices align or not and why)? In other words, first, I used a questionnaire to obtain statistical descriptions of lecturers' pedagogical beliefs about effective technology integration in their teaching practices [47,48]. The questionnaire was followed by observation to check in reality those statistical descriptions obtained from the questionnaire and finally, the interview was used in conjunction with questionnaire and observation for in-depth exploration and understanding of the topic being investigated [49,50].

Furthermore, I have taken into consideration that triangulation can take different types: data sources triangulation, investigators triangulation, methodological triangulation, theoretical triangulation and data analysis triangulation [51,52]. To be specific, what I am using in this research study is the methodological triangulation which can be classified into two different types as it has been informed ‘withinmethod triangulation’ (using different data collection tools from one method only-either quantitative or qualitative) and ‘across-method triangulation’ (using different data collection tools from both methods- quantitative and qualitative) [53]. I have used across-method triangulation, in this research study, as I am using a combination of both quantitative and qualitative data collection methods which are a questionnaire, observation and interview [51,52,54].

Enumerated around forty methodological triangulation or mixed methods research designs found in the literature, and six of the most frequently used designs have been described [55,56]. The sequential explanatory design is one of the six designs and the most straightforward in which quantitative data is collected and analysed first and then qualitative data in two phases within the same study, and they are mixed in the interpretation phase of the study. Moreover, as it has been identified that the main aim of the sequential explanatory design is to use the qualitative findings to gain better understanding, explanation and interpretation of the quantitative results [56]. Therefore, I used the sequential explanatory design in this research study.

4. Findings and Discussion

The overall findings of the research study show that lecturers' pedagogical beliefs mostly support using technology for learning (collaboration/ interaction/engagement), learning autonomy or After class activities (e.g. reflection) rather than drills/practices, assessment, administration or displaying content. Whereas lecturers' technology integration practices, in reality, were between student-centered practices that support using technology for learning collaboration, interaction, engagement and autonomy, and teacher-centered practices that support using technology for drills and practices, displaying content, assessment and administrative purposes. It can be concluded that there was an alignment as well as a clear inconsistency or misalignment between lecturers' pedagogical beliefs and their technology integration practices. As it has been revealed from the interview findings that the reasons behind such inconsistency probably refer to the following factors which influenced lecturers' efforts to integrate technology effectively in a similar way to their pedagogical beliefs:

1. Training
2. Technical issues with WIFI and software installation
3. Students’ IT skills and abilities

4.1. Lecturers' Pedagogical Beliefs Regarding Effective Technology Use

As it has been informed by researchers that lecturers' pedagogical beliefs can be categorized into two main beliefs which are; student-centered beliefs and teacher-centered beliefs [27,57]. However, indicate that lecturers can hold both pedagogical beliefs; teacher-centered and student-cantered. Regarding the pedagogical beliefs that lecturers held in this study, it can be seen from the results of both the questionnaire and the interview that learning (collaboration/ interaction/engagement) and learning autonomy were the most reported pedagogical purposes among the others for achieving effective technology integration [58]. Not only that, but also most lecturers believed that technology integration supports student-centered approach in which lecturers' role is facilitating rather than dominating.

On the other hand, most lecturers' pedagogical beliefs didn't support the idea that technologies can be used effectively for drills/ practices, assessment and administration/management except for specific technologies like using emails mostly for administration and management which is obvious and expected. This indicates that lecturers' pedagogical beliefs are more into student-centered which is commonly related to the constructivist view of learning in which students are the central focus and the lecturer plays a more facilitating role by supporting collaboration, interaction, autonomy and engagement. This is exactly what researchers have been referring to by saying that teachers' Studentcentered beliefs are commonly related to constructivist approaches in which the lecturer is playing a facilitator role and focuses on students' collaboration, interaction, engagement and autonomy [58,59].

4.2. Lecturers' Technology Integration Practices

Lecturers' technology integration practices that have been found in some studies indicated that lecturers are using technology for administrative purposes, communicating with peers and colleagues-Teachers Talk Tech survey drill and practice activities and assessment [60,61]. In other words, it has been found that those lecturers who hold student-centered and constructivist pedagogical beliefs are integrating technology in a teacher centered way [33,34]. Further, teacher-centered beliefs are commonly related to behaviourism in which the lecturers plays an expert role and focuses more on content [57,59]. For example, some lecturers may utilize the IWB to project content rather than using it in an interactive, collaborative and engaging way [62].

Nevertheless, what I can see from the observation and the interview results regarding lecturers' technology integration practices that lecturers' (A and B) practices were a mix of both student-centered practices in which they use technology for learning collaboration, interaction, engagement and autonomy and teacher-centered practices in which they use technology for drills and practices, displaying content, assessment and administrative purposes. This goes in line with what have found that lecturers with student-centered beliefs started to use "blended pedagogical strategy" (applying both behaviourism and constructivism practices in their teaching and learning process), which enabled them to reconcile the misalignment between their student-centered pedagogical beliefs and their teachercentered technology integration practices [31].

4.3 Alignment and Misalignment Between Lecturers' Pedagogical Beliefs and their Practices

In this study, I examined to what extent lecturers' pedagogical beliefs and their technology integration practices align. My findings suggest that, in general, lecturers were able to practise what they believe regarding technology integration in some cases, whereas there were some other cases in which they were unsuccessful to translate their beliefs into practices. This can be possibly interpreted in a way that at least two lecturers (A and B) in this study are in transition, moving from teachercentered technology integration practices to student-centered technology integration practices. Although there are some cases of alignment reported between lecturers' pedagogical beliefs and their practices, it still needs several years to reach a complete alignment [63].

Moreover, indicated that teaching and learning environment includes many complicated procedures and tasks which might happen at the same time and randomly [38]. To manage such complexity, lecturers might apply teaching practices which might be inconsistent with their own pedagogical beliefs [39]. In their study of technology-using, found that lecturers' pedagogical beliefs regarding technology use did not usually align with their practices [31]. Not only that, but also in their studies of the relationship between lecturers' pedagogical beliefs and technology integration practices concluded that there was an inconsistency between lecturers' pedagogical beliefs and their technology integration practices [36,37].

Regarding such misalignment between lecturers' pedagogical beliefs and their practices, found that contextual factors such as " curricular requirements and social pressure exerted by parents or administrators" as well as training and availability of resources are the reasons behind the inconsistency between lecturers' pedagogical beliefs and their practices [13,20,40].

4.4 Potential Factors that may Influence Lecturers' Efforts to Practice what they Believe Regarding Technology Integration

Based on this research study findings, misalignment was found between lecturers' pedagogical beliefs and their practices, and the reasons behind such inconsistency can be referred to the following four factors which influenced lecturers' efforts to practice what they believe regarding technology integration.

4.4.1. Factor one: Lecturers' Training

Training is considered as a major factor that can influence lecturers' pedagogical beliefs which, in turn, influence their technology integration practices [45]. In this study, lecturers have reported that they need technology integration training "even in simple things", as they stated since that will help them to integrate technology effectively and successfully. However, in his study of 17 lecturers

who did technology integration training, found that most of the lecturers' pedagogical beliefs have changed positively in a way that indicates willingness and enthusiasm to use technology in a more creative and effective way [45]. It indicated that providing lecturers with technology integration training can influence the lecturers' pedagogical beliefs which, in turn, will lead to effective use of technology in the teaching and learning process. However, it is not only a matter of IT training but more than that. It is what referred to as 'TPACK' (technological pedagogical content knowledge) which enables lecturers to understand the skills, knowledge and pedagogical practices needed for successful and effective technology integration [64].

4.4.2. Factor Two: Technical Issues with WIFI and Software Installation

Technical problems that are occurring during the technology integration practices play an important role in constraining lecturers' efforts to integrate technology effectively and successfully in a way that may influence their technology integration beliefs negatively unless technical support or IT training is provided. Rogers pointed out that, implementing technology competencies may be a catalyst, but effective use of technology in the classroom will require a paradigm shift from teaching to learning, which will require adequate training in technology and learning styles, as well as adequate technical support [65].

4.4.3. Factor Three: Students' IT Skills and Abilities

In their study, found that students' IT skills and abilities can constrain studentcantered technology integration, and this is exactly what I found in this study as one of the lecturers have said that he sometimes he doesn't use the technology because students vary in their skills to operate that technology; some are fast and some are slow [66]. Therefore, raising the students' IT awareness might support lecturers' efforts to integrate technology in a student-centered way.

4.5. Recommendation

The findings in this study revealed some cases of misalignment between lecturers' pedagogical beliefs and their practices. Three factors have been found to influence lecturers' efforts to integrate technology in the way they believe which possibly, in turn, led to misalignment between their pedagogical beliefs and their practices. Moreover, the factors which have been found are considered to be 'contextual factors' as it has been described [13]. Therefore, I suggest that to achieve more effective technology integration, the educational policy makers in the HE institution need to take into consideration the following recommendations and deal with them from different perspectives as it is not enough to pay attention only to one aspect of the improvement [67]:

- Provide lecturers with more technology integration training.
- Raise the level of on-site technical support.
- Increase students' IT awareness.

5. Conclusion

To conclude this research study, this chapter will revisit the research question as well as discuss the limitations of the study in a way that may lead to further implications for future studies.

5.1. Revisiting Research Question

The research study attempts to answer the following questions:

- What pedagogical beliefs do lecturers hold regarding technology integration?
- What technology integration practices do lecturers have in the teaching and learning processes?
- To what extent lecturers' pedagogical beliefs and their technology integration practices align?
- What are the potential factors that may influence lecturers' efforts to practice what they believe regarding technology integration?

It can be concluded that lecturers' pedagogical beliefs found to be more into student-centered approach which is commonly related to the constructivist view of learning in which students are the central focus in which lecturer is playing a more facilitating role by encouraging collaboration, interaction, autonomy and engagement practices [58,59]. On the other hand, lecturers' technology integration practices were between student-centered practices that support using technology for learning collaboration, interaction, engagement and autonomy, and teacher-centered practices that support using technology for drills and practices, displaying content, assessment and administrative purposes [59]. Furthermore, there was a misalignment between lecturers' pedagogical beliefs regarding technology use and their practices. Such inconsistency can be related to the following factors

- Lecturers' Training
- Technical issues with WIFI and software installation
- Students' IT skills and abilities

5.2. Limitations and Future Studies

In this research study, there are some limitations that are worth considering. First, there were 60 participants selected to do the questionnaire from which 30 respondents (response rate of 50%). Not only that, but also the number of observation and interview participants were two only. Such number of participants is not sufficient to generalise the findings of this study to all HE contexts in Oman, and thus the findings in the study can be considered as an additional or suggestive rather than representative.

Second, in this study, there were only two observations conducted once to examine lecturers' technology integration practices for only 45 minutes per lesson which, unfortunately, was not enough. It indicates that several observations are recommended to gain a better understanding regarding lecturers' technology integration practices. Not only that, but also it would be better to have a longitudinal study in which the change of lecturers' pedagogical beliefs as well as their technology integration practices can be explored over time which, in turn, may lead to more reliable, representative and effective findings.

Finally, in this research, I was not able to explore the relationship

between lecturers' pedagogical beliefs and their technology integration practices in terms of their experience, gender or age due to the limit of participants' number as well as the time constraint. It indicates that it would be more useful and may lead to better results if lecturers' pedagogical beliefs and their technology integration practices have been examined in relation to lecturers' experience, gender or age , and this is exactly what have referred to when they stated that 'a study with many more participants might well investigate this possibility, which is likely to have implications for lecturer training and constructing supports to change lecturers beliefs to be more educationally effective with the in-depth knowledge of lecturers' dispositions' [69].

Declarations

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Conflict of Interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Ethical Approval

The participants were protected by anonymizing their personal information during the research process. They knew that the participation was voluntary, and they could retreat at any time.

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