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Teachers' and Students' perceptions of Autonomy using Inquiry-Based Learning in Initial the Teacher Education

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In higher education, assessments play an important role in improving students' learning. However, the students, lack in autonomy in their assessment practices, are deprived in their independent learning. Learner autonomy is defined as learners' ability to take charge or control of their own learning. However, it is little known about the degree to which inquiry-based learning make the teachers and students autonomous in their assessment methods through which they are assessed in relation to the defined learning goals. Thus, this research work carried out on the teachers and students' perceptions of using inquiry-based methods in developing them autonomous teachers. Semi-structured interviews with the 20 teacher-educators and 4 focus group interviews were conducted. The findings show that the teachers and students appreciate the value of autonomy in developing their learning through using inquiry based methods in their continuous assessment. The teachers and students reflected their positive views about the independent learning through assignment methods, classroom discussions and projects that make them critical thinker and autonomous learner. The results showed the proper orientation should be given to the teachers' and students' on the importance of autonomy regarding development of the learning. The recommendations are made to the relevant authorities, explanations are discussed and suggestions for additional research are offered.

Key words: *teacher-educators, student-teachers, inquiry-based pedagogy, initial teacher education, science literate thinking*

Introduction

In higher education, it is often thought that teachers have considerable freedom: autonomy on what they teach and how they teach it. If teacher wishes to change the way teaching and learning are to take place, they need the autonomy, along with support, to make the necessary adjustments. Indeed, it is assumed that student centered approaches, like inquiry-based methods, help in developing teacher and student autonomy in their learning in the classroom. However, in Pakistan, curricula and assessment systems are heavily prescribed in higher education and teacher autonomy may be limited. At the same time, learner autonomy can be defined as the ability of learners to take charge or control of their own learning. However, assessment system may curtail that autonomy considerably.

In Pakistan, the typical way of teaching at all levels is lecturing, with a passive audience of learners whose task is to record and then memorise as much as possible. This dominant style of teaching results in rote learning to pass the examination and with little learner autonomy (Ali, 2008; Akhter, 2009*)*. In a degree course leading to a teacher qualification (Initial Teacher Education), an added complication is that numbers tend to be large, making lecturing an even more attractive option. Yet, in such a course, the quality of teaching is of paramount importance for it offers models for the prospective teachers to copy. In Pakistan, the

evidence reveals poor quality (Khan, 2012; Mohammed, 2008). The goal is possession of the degree, the degree awards are based on examinations that reward accurate recall, and the award of the degree opens the door to teaching (Mohammed, 2008; Ahmed, 2011; Khan, 2012; Memon, 2010). There are very few opportunities for training programmes or professional development programmes for teacher-trainers.

In such a context, the development of the skills to introduce an approach like inquiry-based learning with students and teachers is not going to be easy. This study considers such an approach and looks at the kinds of issues related to teacher autonomy that can help or hinder the development. It is always a goal of education to generate learners who can manage their own learning and continue to develop their understandings and skills long after the period of formal education. Freedom to manage learning, freedom to develop the appropriate skills, and freedom to search out new understandings - all these are important - and they may well be stifled where there is little autonomy for teacher or learner.

Review of the Related Literature

Teacher autonomy has been seen in three interrelated ways (as shown in the figure 1):

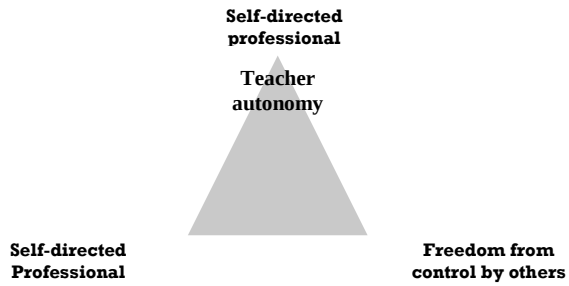

Figure 1 Teacher Autonomy

In thinking of self-directed professional action, Little (1995) emphasis capacity on the part of teachers in stating that teachers may be, '*autonomous in the sense of having a strong sense of personal responsibility for their teaching, exercising via continuous reflection and analysis . . . affective and cognitive control of the teaching process'.* Tort-Moloney (1997) considers that teachers need to be autonomous in their professional development in the way they are aware of '*why, when, where and how pedagogical skills can be acquired in the self-conscious awareness of teaching practice it*'. In a fundamental sense, much depends on how teachers are seen in wider society. Teacher autonomy in many countries has been eroded and teachers are seen almost as technicians delivering what society (usually politicians) mandates. The teacher is an independent trusted professional has too often been lost (Nichols and Berliner, 2007).

There is a considerable literature relating to inquiry-based learning but, at the same time, a diversity of views of what constitutes this approach (Abell *et al.,* 2001; Newman *et al.,* 2004). Thus Kuhn (2011) notes that the diversity tends to reflect what different promoters of the idea think. According to Colburn (2000) and Aaronson (2007), the most confusing thing about inquiry is its definition. In the context of science education in the United States, the National Research Council has promoted inquiry as an activity learning using the following model: "*Inquiry is a multifaceted activity that involves making observations; posing questions; examining books and other sources of information to see what is already known; planning investigations... using tools to gather, analyse, and interpret data; proposing answers, explanations, and predictions; and communicating the results"* (NRC, 2000: 12).

The view is that the way science works should be reflected in how it is taught (NRC, 2000; Bybee, 2000). However, this is careless thinking for there is no reason in the world to think that the way any subject undertakes its research should necessarily underpin the way that subject is taught to non-specialists. At school level, the majority will never become research scientists. Understanding how research is conducted may be important. Trying to teach science using such research approaches may

or may not be appropriate. Nonetheless, the general picture presented is that inquiry involves hands-on experiences, identifying and collecting appropriate evidence, presenting results systematically, analyzing and interpreting results, formulating conclusions, and evaluating the worth and importance of those conclusions where the learners are central to the learning process. All of that may be desirable. Much is practised by research scientists. It is not fundamental to successful understanding and whether research in the sciences is described completely by this is another matter.

In the context of science education, the diversity of view is even greater. For example, Aaronson (2007) defines inquiry as a teaching strategy to motivate learners, in both hands-on and minds-on sense, manipulating materials to study particular phenomena and stimulate student-teachers by questioning. However, neither of these approaches really encapsulates the essential of inquiry-based learning. Lee (2004) argues for a description with distinct features. This leads to seeing enquiry-based learning as reflecting a way of teaching that helps students achieve understanding in science by combining scientific knowledge with reasoning and thinking skills. The role of the teacher is to act more as a facilitator of learning than as an instructor. However, even this is far too all-embracing, more or less gathering every desirable aim for science education into its ambit. In their careful study of the actual practice of enquiry-based learning, Lucas and Rowley (2011: 478) adopt the key ideas first out forward by Kahn and O'Rourke (2005) who state that inquiry-based learning is:

> "… *A broad umbrella term used to describe approaches to learning that are driven by a process of enquiry which actively involves students in discussion, questioning, and investigation"*.

The key phrase is '*driven by a process of enquiry*' and this captures the essential essence of the pedagogy. This can be teacher-led, working by mans of discussion and sharing, or it can be where students work in groups or even individually. The key point is that the learners have some issue to address and they have to carry out enquiry in order to understand the issue, find answers, generates the next stage of questions. This may involve practical work; it may not. With this broad picture in mind, there is need to see how teacher autonomy and inquiry-based learning might relate to each other. In essence, is the teacher free to use such a leaning strategy? I the teacher free to build the curriculum around scenarios which generate the questions to be explored (Lucas and Rowley, 2011). In the specific context of teacher education, do the teacher educators have the freedom to adopt this approach and do the learners have the freedom in terms of opportunities, time and resources, to pursue enquiries. This involves consideration of how, in practice, teacher autonomy - in the sense of potential for self-directed teacher-learning – can develop *in symbiosis with* engagement in pedagogy for autonomy. Thus, learner autonomy is also to be seen as the right of teachers to develop as human beings so they have this right in the classroom.

Finally, it is hard to establish an agreed definition of inquiry after looking at various definitions of inquiry from different perspectives. However, looking at the literature, resources and research, we took inquiry-based learning as not perfectly identical with the other approaches to learning, because inquiry has distinct features and have its own core ingredients (e.g. Lee, 2004). Therefore, the definition, in the particular context, informed to our study is as: *A way of teaching that helps students achieving understanding in science by combining scientific knowledge with reasoning*

and thinking skills. The role of the teacher is to act more as a facilitator of learning than as a sole instructor.

In engaging with inquiry-based pedagogies, the teacher role changes quite markedly. They have a task in generating questions; they also have a role in encouraging the learners to generate questions. Teachers and learners can *learn together* become more empowered in the course of pedagogy for autonomy combined with reflective teaching (Smith 2001: 43). However, it goes further than that. It might be most appropriate for teacher educators to focus directly on developing willingness and a *capacity* for self-directed teaching and teacher-learning, linked to induction into pedagogy for learner autonomy, while acknowledging and as far as possible preparing teachers to address the constraints which might operate in practice on their *actual* freedom in these areas. Thus, Moreira *et al.* (1999: 18) considered that their "*own professional empowerment makes greater sense when it builds on the empowerment of student-teachers, just as theirs gains meaning from a focus on pupils' empowerment"*. However, in order to gain and impart these benefits we may need to acknowledge, and as far as possible address, constraints on our own '*teacher educator autonomy*'.

The literature suggests a link between teacher and learner autonomy as educational goals, Flävia Vieira (quoted in Barfield *et al.,* 2001). Teacher autonomy can "*accommodate transmissive, authoritarian or even oppressive purposes*" (Aoki 2000). In this connection, the particular value of teacher-learner autonomy may deserve a special emphasis. The importance of reflective teaching (reflection on and learning from the experience of teaching) has been recognised for some time now, and corresponds well with an overall focus within teacher education on developing a '*capacity for self-directed professional action*'. There is still need to explore that is the importance of reflective or inquiry-based learning, in other words reflection by teachers on when, where, how and from what sources they should be autonomous, including but not confined to any learning they can achieve via teaching. In order for teachers to gain better abilities, confidence, competency and a greater willingness to learn for themselves in developing 'an appropriate expertise of their own, thus, there is a need to explore that how teachers and learners perceive the role and value of autonomy using inquiry-based methods in ITE.

Aims of the Study

Looking at teacher-educators and learners, this study aims to explore their perceptions of autonomy using inquiry-based pedagogy in their professional learning experiences in a Pakistani educational context. The research also examines the challenges faced by teachers and learners which arise from their existing culture and teaching situations at the university. The focus of this study is not to attempt to justify inquiry-based pedagogy. However, this study focuses specifically on exploring the teacher-educator and learners' perceptions of the role and importance of inquiry-based pedagogy in Initial Teacher Education and how the autonomy and freedoms open to them relate to its introduction

Research Questions

The following research questions are addressed:

(1) How do the teachers perceive their autonomy in using inquiry-based strategies in Teacher Education Programs (BEd honors)?

(2) How do the student-teachers perceive their autonomy in using inquiry-based strategies in Teacher Education Program (BEd honors)?

Research Approach

In considering education in the sciences and related areas, one key aspect is how the teacher-

educators and their students perceive the nature of the sciences: a body of findings to be mastered or more a way of enquiry to be employed. In exploring perceptions, Ahmed (2012) notes the tendency on Pakistan to depend on quantitative approaches based on questionnaires. The uses of the qualitative approaches, like interviews, focus groups and observations are less common (Akhter, 2013). This study is centered on the use of inquiry-based pedagogy. The aim is to explore how teacher-educators and their students perceive autonomy when such approaches are employed.

The approach adopted is to employ interviews and focus groups. Compared to questionnaires, they offer opportunities to probe areas in depth, allowing participants opportunities to focus on issues of importance for them as well as express ideas in their own words. Compared to the use of questionnaires, interviews and focus groups are time-consuming and it can be difficult to summarize the data to give precise conclusions (Bell, 2005). With questionnaires, usually responses are fixed, allowing easier data analyses and drawing conclusions on clear statistical evidence. However, in an interview, it is possible for the interviewer to gain rapport and establish a friendly and secure relationship with the interviewee, often opening opportunities to gain detailed and more personal insights (Rodrigues, 2010; Smith *et al.*, 1998: 218).

The interviews and focus groups here fulfilled two roles. The aim is to explore the perceptions of respondents,

- In how they understand inquiry and inquiry-based pedagogy.
- In their grasp of the way inquiry-based pedagogy works, specifically in the context of learner autonomy.

A focus group allows respondents the opportunity to express their own ideas in their own words (Cohen *et al.*, 2007) while interviews can express their opinions freely and openly when considering the nature of inquiry-based pedagogy and the way it might affect teacher and leaner autonomy. With students, four focus groups were conducted. Each focus group had 5-6 post graduates students of almost same ages. Moreover there were interviews with 20 science teacher-educators teaching various courses of teacher education at post graduate level. The participants involved were chosen simply on grounds of being easily accessible but they involved typical students and their teachers.

Findings

The interview and focus groups generated the following themes.

- Perceptions of Inquiry-based Learning
- The perceptions of the teachers' autonomy
- Examination in relation to the teachers' and the students' autonomy
- Teacher Autonomy in adopting Inquiry-based Pedagogy

The response were noted and analyzed. The key points are summarised here, with typical verbatim quotations given.

The Perceptions of Inquiry-based Learning

This study captures teacher' and student-teachers' perceptions regarding their understanding of inquiry and inquiry-based science pedagogy through interviews. Although the teacher-educators' exposure to inquiry and inquiry-based pedagogical strategies differed, they shared common ideas, as demonstrated by their perceptions of inquiry-based pedagogical approaches, the practicalities of teaching using inquiry, and the factors contributing to the understanding of inquiry-based pedagogy. In the

context of inquiry, teacher-educators and student-teachers reported their perceptions in relation to various inquiry-based activities. Most of the teacher-educators indicated that they had little exposure of inquiry-based instruction or used it less as reported: *I had a little idea about inquiry-based learning (T2). Another said: I had done inquiry till this class, sometimes* (T3). Thus, teacher-educators reported that they had a limited use of inquiry taught in the science classes regarding their previous experience.

Besides, the student-teachers' perceptions in focus groups regarding their understanding of the importance of inquiry and inquiry-based pedagogies in learning science were examined, to see how they understood the benefits of teaching and learning science through inquiry based pedagogy. It was found that student-teachers' reflections on the focus groups indicate that they understood how inquiry-based instructions involve student-teachers' learning. Moreover, most teacher-educators' responses indicated that they understand that student-teachers must be exposed to activities that engage them to answer scientifically-oriented questions and participate in other science-exploring activities. Also, teachers' responses indicated that student-teachers were able to do open inquiries when they understand the process of inquiry-based pedagogy. Moreover, some of the teacher-educators' responses indicate that they often question as reported: *I cannot teach the entire curriculum using inquiry. I could only engage student-teachers in questions and demonstrations (*T18). Likewise, student-teachers reported their apprehensions that they were less involved using inquiry according to their learning experiences as reported: *We are only exposed to questions; some components of inquiry such as open-ended investigations are less used because of shortage of time and resources* (G2-S4). Thus, the above response indicates that teacher more likely having a little understanding of inquiry-based learning and still provide question and guided procedure using inquiry. However, student-teachers could generate an explanation supported by the evidence they collect.

The Perceptions of the teachers' autonomy

The interview data provide a rich picture of the key issues on lack of professional development on inquiry-based approaches. Thus, teachers reflected their apprehensions on being untrained how to conduct an inquiry-based lesson: *Training and refreshing courses are mandatory in implementing inquiry-based methods. It is very important to have trained teachers and specialist lab instructors in inquiry-based sessions* (T15). Similarly, student-teachers reported that teachers are insufficiently trained to handle inquiry-based lessons because they lack training: *Our teachers are not skilled in using inquiry-based methods; they do not seem equipped with the knowledge how to conduct inquiry-based methods. Therefore, they should be trained enough in using inquiry-based methods* (G1-S2).

It is interesting to note that some responses of teachers are contradictory to each other such as the teachers think that they are untrained in IBL; simultaneously they realised the importance of inquiry-based learning approaches. Also, they said that training and refreshing courses are mandatory in implementing inquiry-based methods. Interview data indicated that the majority of teacher-educator responses indicated that teacher-educators tend to avoid using inquiry-based pedagogy, lacking confidence. On the contrary, they saw lack of training being behind this:

Teachers are neither prepared nor trained to use inquiry. It is still a concern that our teacher-educators seem not willing to use it (T10). In addition, T2 reported: *I think the lack of training is also a cause of lack of motivation for teachers who actually want to use inquiry-based strategies* (T2). Their responses indicate that one reason for the lack of using inquiry is insufficient training but they can use inquiry-based methods if they are properly trained.

Overall, their views can be summarised (figure 2):

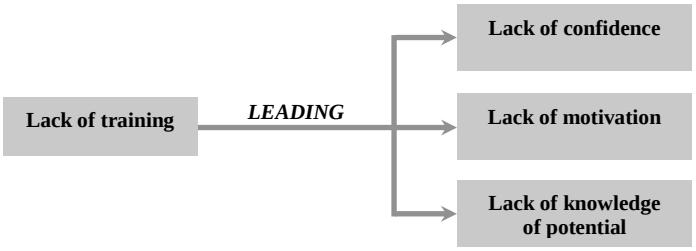

Figure 2

However, it was recognised that the development of inquiry-based learning depended on teacher-educator willingness and motivation: *It is up to teacher how they use inquiry-based pedagogy.* (T15)

Similarly, there was a general view among student teachers that they did not really grasp what was involved and they needed to depend on exploring the skill on their own, gaining little guidance from their teachers: *Unfortunately, student-teachers are unaware the process of inquiry. We are not guided by our teachers so we feel nervous how to participate when inquiry is used* (G2-S3). Moreover, the majority of teacher-educators feel that could reduce their apprehensions if they have proper knowledge about the process of inquiry-based pedagogy: *Teachers should understand inquiry-based process and how inquiry improves student-teachers' learning with effective trainings.* (T10)

Student-teachers also reported similar apprehensions. They lacked initiative on how to participate in inquiry-based activities. They realised that there are other issues that might arise because student-teachers do not understand the process of inquiry. This apprehension was voiced by the student-teachers in their 1st year of their studies: *Teachers should clarify what approach she is using in class so that student-teachers get ready for that. Especially, student-teachers at their first year are not confident in using inquiry-based strategies. Student-teachers should be enough prepared to understand the process of inquiry to attain learning outcome.* (G1-S1) Moreover, the majority of student-teachers went further when they reported that, *Teachers do seem willing to use lecture only not inquiry-based activities. They want their student-teachers to listen them* (G1-S4). Unsurprisingly, the student teachers recalled their own school days as not helping either: *I think we were not prepared using inquiry-based teaching from our school education. Though, inquiry-based teaching seems impracticable currently.* (G1-S4)

For these student-teachers, the anxiety was caused by the realization that teaching science through inquiry might raise questions from student-teachers which they might not be able to answer. Although the teacher-educators claimed they encouraged the use of questions with their students, in practice they tended to discourage too many questions because of this anxiety. Moreover, the student-teachers were insecure by the practices of their teacher in teaching science. Though inquiry-based methods present several challenges to student-teachers, student-teachers realised that is most important method to meet standards of science education. Teacher-educators also responded that student-teachers are not prepared enough to use inquiry-based instructional strategies: *Most student-teachers do not participate in activities. They seem afraid of initiating in participation in inquiry-based activities* (T15).

Overall, the views of student teachers can be summarised (figure 3):

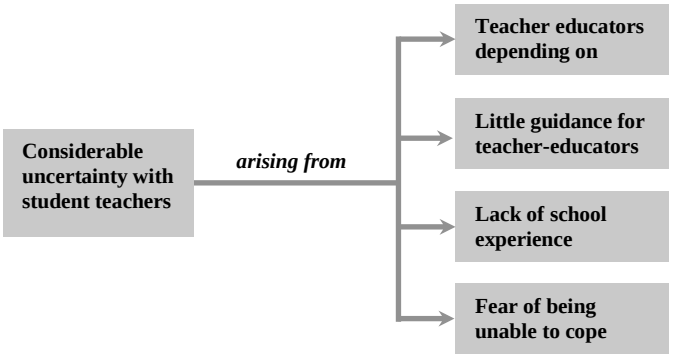

Figure 3

In thinking about the apprehensions in using inquiry based activities, one teacher-educator suggested that student-teachers could be given an assignment to explore a scientific problem according to their interest. In addition, the majority of teacher-educators reported that the student-teacher background in science was insufficient to support inquiry-based instructional strategies: *I think our student-teachers are good enough to work hard but they are lacking initiative skills to participate in inquiry-based pedagogy and are not prepared to use inquiry. Firstly, they do not understand the procedure of inquiry-based strategies; secondly they have not enough confidence to take part in inquiry-base activities* (T14), a view supported by T3, T7 and T19). However, it is too easy to blame the students! In many countries inquiry-based approaches have been used in the sciences at very young ages for decades, with no real difficulties. Thus, the series of textbooks entitled *Chemistry Takes Shape* were first published in the 1960s in Scotland and changed the shape of chemistry learning (Johnstone and Morrison, 1964, 1965, 1966, 1967, 1969) with considerable success.

There are two aspects apparent in teacher-educator responses:

Figure 4

Typically, T3 suggested that teachers could not cope until students could cope: *When I use inquiry properly then my student-teachers do not immediately accept this method or become confused soon because student-teachers are not used to do it.* However, this does seem to be inconsistent with the successes associated with the *Chemistry Take Shape* approach described above, this being used for age 12.

Almost certainly, the teacher educator views were influenced by lack of experience of the possibilities. They saw students unable to cope, saying for example; *most student-teachers come from public schools where their social and thinking skills are not developed. They do not seem prepared for inquiry-based activities; but they gradually start developing their interests in taking part in inquiry* (T10). However, this view will prevent any change. Unless teacher-educators face their responsibilities and move things forward then the next generation of teachers will be no further forward and the next generation of student teachers to emerge for school will still depend on lecture-based learning. Student-teachers saw it clearly: *We got used to lecture methods and also big classes minimise student-teachers' questions* (G2-S3). Somehow, at some point, someone has to break out to move away from lecture dependence.

Teacher and Student Assessment Autonomy

The majority of comments by teacher-educators and student-teachers from interviews show similarities in perceptions about assessment treated to inquiry-based. Teachers think that learning is not assessed through examinations: *Our entire assessment is summative using exam and student-teachers are not assessed for their learning* (T3). All the teacher-educators indicated that the examinations simply tested student recall. They felt that inquiry-based learning did offer opportunities to break away for the dominance of recall. Thus, *inquiry-based*

assessment is a way to assess student-teachers' learning and inquiry-based skills. I therefore suggest that inquiry should be encouraged (T14).

Similarly, the majority of student-teachers reported their apprehensions about assessment. One aspect of their hesitation about inquiry-based learning was that it would not help them cope with examinations where all the rewards came for recall. Thus, *Curriculum offers a lot of information to recall and memorise. Examinations test memory and do not assess learning* (G2-S1). Both teachers and students saw the mismatch between inquiry-based learning and the current assessment procedures. The students also revealed their ambivalence. They wanted something better but they were used to the security of examination where all that was required was to memorise. In addition, some of the teachers were at least partially aware that changing the assessment system would be demanding: I*t seems teachers want to get rid of hard work in assessment. If they are to assess using inquiry, I am afraid that teachers will leave this task up to student-teachers* (T20). Similarly, G1-S4 highlighted their apprehensions: *Additionally, our assessment method tightly binds us with examinations and we have very little chance in getting involved using inquiry-based assessment.* (G1-S4)

Also, some student-teachers stated that the role of teacher should be independent and autonomous in handling how inquiry works out with curriculum: *Curriculum should include inquiry-based and problem-based activities. Some specific chapters should be restructured to include inquiry-based activities* (T15). Overall, while teacher-educators saw value in enquiry-based learning, they felt they lacked the freedom to implement and assess. In parallel, the student longed for a move away for the dominance of memory-recall, but grasped the security that this form of learning brought. The picture is summarised in figure 5. Assessment limitations dominated the possibilities.

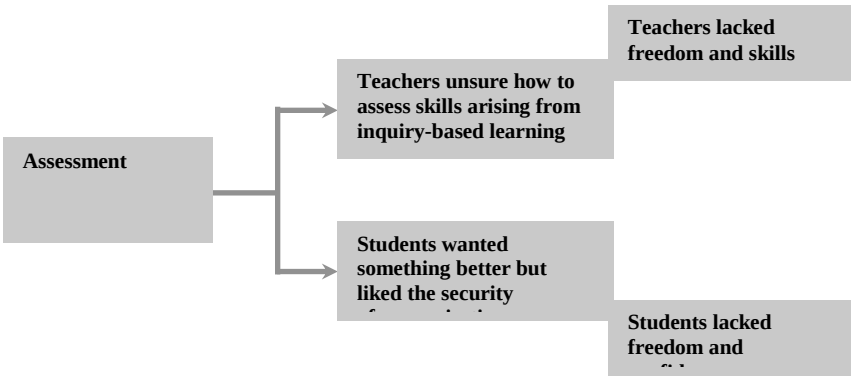

Figure 5

Teacher Autonomy in Adopting Inquiry-based Pedagogy

The majority of teacher-educators' responses indicated that they feel that they had no freedom and autonomy in choosing the method teaching in the classroom in Initial Teacher Education. Furthermore, the choice of adopting an approach to teach is influenced by university culture and custom, how other teachers teach, the curriculum and established methods of assessment. Thus: *The teacher's task in this university is to lecture student-teachers. I am not independent enough to choose inquiry-based method myself. The biggest hurdles are curriculum and assessment; these are set by the top authority of university not the working lecturer* (T2). Likewise, T6 reported: *I am neither autonomous in choosing my teaching nor*

I develop questions to assess to student-teachers' performance. The exam pattern is set. I am instructed to do so. In such a situation, I do not feel motivation to adopt inquiry-based approaches (T6). Similarly, G1-S4 highlighted their apprehensions on teacher lack of autonomy: *We can notice that our teachers are teaching as their seniors have been taught as they have a stereotype in their teaching. They do adopt any innovation in their teaching style. It seems they are not autonomous to choose method of teaching and method of assessment according to their choice.* (G1-S4)

Also, some student-teachers reported that the teachers do not seem independent and self-directed in handling how inquiry works out with curriculum and examination. Another student-teacher shed light in saying: *I think curriculum and examination that hinder teachers' independence to make the choice of adopting inquiry-based approaches. Teachers are to teach what are they instructed* (G2-S3). Moreover teachers were of the view that the majority of student-teachers feel comfortable in memorising information. Therefore, the teachers have to choose method of teaching according to student-teacher needs. Thus: *Another reason that teacher are not enough autonomous that student-teachers are in habit of rote learning. Lecture is well received. They feel that teacher are not going to assess them using inquiry-based assessment. That is the reason, I would not prefer teaching inquiry-base approaches in presence of all these constraints* (T15). In conclusion, both of the teachers and student-teachers agreed that teachers lacked autonomy in deciding to employ inquiry-approaches because the desired learning outcomes were laid down. Rather teachers have to face a number of problems that does not support inquiry in the current situation, such as curriculum, examination and the habits of student-teacher rote learning. The pressures on teachers are shown in figure 6.

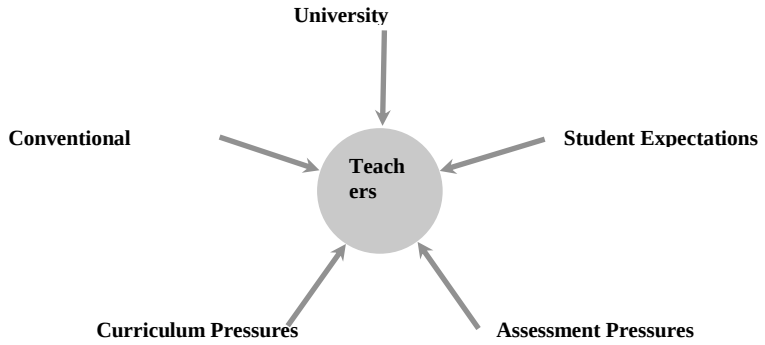

Figure 64

Discussions

The data from interviews and focus groups found that the teachers felt that they lacked autonomy in adopting inquiry-base approaches in their teaching. The curriculum they were required to teach was based on content to be covered while the examinations set for students reward the correct recall of that content. In addition, the teachers were working with students who had been brought up (and been successful at) finding rewards in memorisation and recall. Indeed, the entire university system tended to reflect that approach. Luke (2009) makes the important point that teachers need to be aware of the origins and the consequences

of their own decisions, actions, behaviours and the realities that may constrain these actions. Darling-Hammond (2002) argues for teachers not to be dependent on a fixed body of knowledge but base their teaching in a range of technical skills and experiences so that the keeners can gain new insights and understandings. However this is simply not realistic given the powerful constraints on teachers.

In simple terms in Pakistan in teacher-education, the teachers felt that they simply did not have the freedom, or the expertise, to embrace radically new ways forward. This underscores the need for recognizing the links between political, socio-economic contexts and teacher education, within which the teachers develop and work (Mohammed, 2006; Majeed, 2009; Ahmed, 2012; Khan and Saeed, 2009; Hussain, 2010). While the pedagogical practices of teachers can be seen as grounded in their skill, personalities and experiences, they cannot stand aside for the prevailing social-cultural and political forces. Hargreaves (1991a) argues that changing the teacher is to change the person the teacher is. However, the teacher is not free to change or be changed, given the powerful external constraints. Long ago, Dewey (1964) suggested that education programmes should produce student-teachers who are thoughtful about educational theory and principles rather than only being skilled in routines, copiers, and followers of tradition. He was writing in a western culture where there signs of breaking away from seeing education as knowledge transmission. Pakistan is on the brink of that change but has not yet fully embraced it.

There is a freedom-authority conflict implicit in all this. Pakistan teacher-trainers depend on the authority and control in setting the curriculum, assessment and accepted pedagogies. It takes enormous courage and self-confidence to break away from this and release students to direct their own learning, at least in part, as implied in inquiry-based learning. There is, at the outset in apparently reduced teacher control and authority in the classroom (Hayes, 2002; Anderson, 2002), especially in a culture where the lecture is the norm. Students are passive receivers of what is transmitted and examinations reward the efficiency of that transmission.

It might be thought that teachers enjoy a relatively high degree of privacy and autonomy in the classroom. Teachers do not appear to work under constant supervision and their student-teachers can work with relative autonomy. However, the pressures to conform are subtle and powerful. Interestingly, the development of inquiry-based leaning might involve increased collaborations between teachers, sharing experiences, practices and successes. The data also revealed that the university culture contributes to the centralized structure of the administration of the university (Ahmed, 2009; Majeed, 2009; Khan and Saeed, 2009; Hussain, 2010). Thus, teachers and student-teachers were of opinion that the university administrative structure imposes constraints on teacher autonomy in implementing a new teaching method. Hence, the development of an inquiry-based approach and the new curriculum may be strongly affected by the views of the university staff, instead of the views of the teachers. If a teacher breaks away, there will be inevitable concerns in a new pedagogy: maintaining classroom order, discipline and efficiency with the dissemination of knowledge: still the major concerns teachers have to face in relation to the university administration.

Conclusions and Implications

Both teachers and students saw something of the value in changing ways of teaching and learning to embrace approaches more based on inquiry. They saw the benefits in terms of becoming interested in learning, developing an understanding of procedure in science and becoming literate in science (Akhter,

2013). However, the two groups saw major barriers in moving to this approach. While lack of resources and time in a curriculum constrained by content coverage are factors, the more major factors are deep seated:

- A lack of training, pedagogical knowledge and skills development within the University impacts upon the science teaching practices and choices.
- The poor facilities and resources influence the teaching and learning processes and do not allows teacher-educators to use inquiry-based pedagogy.
- The poor levels of readiness and lack of collaboration among teachers and also between student-teachers and teachers mean that they cannot be autonomous confidently.
- The university culture (mainly dominant with lecture method) has a strong influence, as teachers find it hard to apply inquiry-based methods and methodologies to their teaching, and the majority of teachers and students find no help to be autonomous in performing their part.

Overall, the majority of teachers still retained their dependence on the lecture approach although some had started to develop a more questioning approach with students. Any evidence of genuine inquiry-based approach was not yet apparent. Although this was a mere snapshot, due to the length of this report and the focus on a specific context in Initial Teacher Education in Pakistan, a number of compelling issues were highlighted. The study did not aim to justify, support or undermine inquiry-based learning. Kirshner *et al.* (2006) have considered that in their review. It aimed to explore the levels of freedom for students and their teachers in considering the possibility of implementing such a teaching strategy.

If there is to be a move away from the dominance of the lecture method, then a number of major changes need to be implemented:

- Assessment policies and assessment methods should be clearly rewarding for the outcomes from inquiry-based learning.
- Inquiry-based learning should be implemented to the university, there has to be some agreement on what constitutes inquiry-base methods therefore teachers and students both should know the process.
- The whole area of assessment needs re-considered. Currently, the rewards come from the correct recall of memorised information (Akhter, 2013). Some recent policy docents for the Higher Education Commission are very encouraging in moving this forward (HEC, undated) However, the practicalities of how to assess beyond recall need to be collated and training offered.
- It is highly recommended that the interested teachers could get together to discuss their classroom difficulties and student-teacher interest in learning. Through this sort of activity, teachers will be engaged in understanding the problems and finding solutions to them.
- Of particular importance, teachers need to be given the autonomy to develop their own curricula and their own assessment strategies (within broad policy guidelines). This will give the freedom to develop new pedagogical approaches that will enable the next generation of learners to move forward to w died range of skills and experiences.

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