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Inquiry-Based Learning Towards Functional South African Schools

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Abstract: A common thread in contemporary research on school effectiveness and school improvement is inter alia, the continuous introduction of new and relevant strategies to promote teaching and learning in schools. One of the more recent strategies to be introduced in South African schools is that of "inquiry-based" learning. The use of inquiry as a tool to strengthen teaching and learning in schools has been documented and discussed extensively in the research literature but very little has been done or written on this concept locally. This study raises issues that South African schools face as they engage in inquiry-based learning. The paper begins by describing what inquiry-based learning entails and distinguishes inquiry-based learning from other teaching and learning activities. The study highlights the rise of inquiry-based learning as a potentially useful and meaningful way to improve learning outcomes and concludes with qualitative evidence that inquiry-based learning can assure more effective schools.

Key words: Learning, inquiry-based, functional schools, effective, South Africa

INTRODUCTION

The use of inquiry as a tool to strengthen teaching and learning in schools has been discussed by among others, Brew (2003), Badley (2002), Kivinen and Ristela (2002), Healey *et al*. (2005) and Fielding (2012). In addition, the notion that teaching and learning should occur in communities of inquiry in which teachers and learners are co-learners has been suggested by many researchers (Brew, 2003; Heron *et al*., 2006; Justice *et al*., 2007).

Justice *et al*. (2007) comment in this regard that Inquiry-Based Learning (IBL) refers to both a process of seeking knowledge and new understanding, as well as a method of teaching based on this process. Moreover, Kuklthau state:

> Inquiry requires more than simply answering questions or getting a right answer. It espouses investigation, exploration, search, quest, research pursuit and study. It is enhanced by involvement with a community of learners, each one learning from the other in social interaction

These and other researchers in the research literature see IBL as inherently a learning-centred approach to education and as an enhancement of the involvement of a community and learners, each learning from the other in social interaction. In this process, teaching and learning are integrated as both teachers and learners are "compatriots in the search for knowledge" (Justice *et al*., 2007). Pauli describes the importance of IBL as follows:

> If we are only teaching what we know, our children can only do as bad as we are doing and this is the challenge we are facing; we have to go beyond it

In South Africa, the main goal of the education system is inter alia to "equip learners with the skills, knowledge, attitudes and values to think critically and adapt to change" (Botha, 2015). In particular, it is expected that schools will develop new knowledge that will inform quality teaching and learning. IBL can play an important role in this process.

MATERIALS AND METHODS

Inquiry-based learning or IBL is an approach to teaching and learning that places learners' questions, ideas and observations at the centre of the learning experience. Educators play an active role throughout the process by establishing a culture where ideas are respectfully challenged, tested, redefined and viewed as improvable, moving learners from a position of wondering, to a position of enacted understanding and further questioning.

Underlying this approach is the idea that teachers and learners share responsibility for learning. For the

learners, the process often involves open-ended investigations into a question or a problem, requiring them to engage in evidence-based reasoning and creative problem-solving.

For the teachers, the process is about being responsive to learners' learning needs and most importantly, knowing when and how to introduce learners to ideas that will move themselves forward in during the process of inquiry. During this approach to learning, educators and learners co-author the learning experience by accepting mutual responsibility for planning, assessment of learning, the advancement of the individual as well as an understanding of personally meaningful content and ideas. According to Fielding (2012), authentic inquiry begins with questions and problems that learners want to find out more about. A common misconception is that educators must follow the learners' lead and wait until the "perfect" question emerges before proper inquiry can begin. With this in mind, Jedlickova states:

> Students spontaneous questions when they reflect genuine curiosity can be a powerful place to start the IBL approach

While all learners at some time ask questions and express an interest in world phenomena, it takes creative and responsive teaching to transform the process into an effective IBL tool. To begin with, inquiry works best in a classroom in which ideas are placed at the centre. No matter what the topic or direction of inquiry, it is important to bring the class together to share and to discuss the big ideas of the subject/investigation/inquiry at hand. By doing so, everyone benefits (Healey *et al*., 2005). According to Justice, it is a misconception that inquiry-based pedagogy means letting go of the class and allowing learners to self-direct all aspects of their learning, as learners' thinking can be limited when confined to their own experience.

When introducing learners to new ideas and new "ways of seeing", it is important to do so in a way that remains faithful to their line of inquiry, helping them to overcome obstacles in their paths of learning and extending their understanding beyond what they are capable of doing alone. In helping learners move forward in their inquiry, it is important to recognise that not all learning opportunities call for an inquiry approach (Fielding, 2012). In addition, Healy *et al*. (2005) warn that the research on learning styles may give rise to caution as many learners may be uncomfortable with inquiry approaches and thus need adequate support to make the transition.

The introduction and clarification of the concept of IBL above now leads to the following statement of the problem of the study, phrased as a research question: how can inquiry-based learning be used as a strategy to ensure functional schools in South Africa? The following four sub-questions were developed to guide the study and to provide answers to the abovementioned main research question:

- What is inquiry-based learning?
- What distinguishes inquiry-based learning from other teaching and learning activities?
- What evidence is there that inquiry-based learning can assure better outcomes?
- How can inquiry-based learning be used as a strategy to ensure functional schools?

In order to promote the use of IBL in secondary education, the researcher has embarked on an investigation of IBL at two Gauteng schools. In each institution five teachers were interviewed with regard to their conceptions of IBL. This study is based on a qualitative research design and is narrative rather than statistical in nature with data having been collected in words rather than figures. Kaplan and Maxwell explain that the goal of understanding a phenomenon from the participants' point of view and in its particular social and institutional context is largely lost when textual data are quantified. The overall purpose of adopting the qualitative research design for this study was to gather data through investigating and to understand the challenges with regard to IBL as a strategy to improve school effectiveness in South African schools.

McMillan and Schumacher (2010) define the population of a study as "a group of elements or cases, whether individuals, objects or events that conform to specific criteria and on which the researcher intends to generalise the results of the research". In this study, the population refers to all 12 secondary schools in a selected ward of a specific school district in Gauteng, South Africa. Edwards and Newton state that purposive sampling is sampling based on the knowledge and the expertise of the participants selected for a study. In this study, the sample was purposefully selected and consists of 10 members of the school management teams from two selected public secondary schools in the district (five members of each of the two schools).

Participants were given information about the research procedures, the depth of the interviews and the use of a digital recorder and field notes and were informed that they were expected to give as much information as possible during their discussions relating to their experience of IBL as a strategy in ensuring school effectiveness. Ethnographic interviews are used often in qualitative research to combine immersive observation

and one-on-one interviews. The advantages of using ethnographic interviews are that they enable a clear relationship with research participants over the period of study, provide a rich source of visual data, help to reveal unarticulated needs and capture behaviour in the different contexts of everyday life (Botha, 2014).

After a small-scale pilot study was done, ethnographic interviews were conducted with individual participants and small focus groups (five members of the school management team of each school) in order to elaborate on their perspectives of their world and how they made sense of important events. Permission was obtained from the participants to use a digital recorder. Verbatim transcripts of the digital recordings were used as the basis for data analysis.

According to Krefting (1991), triangulation is used to enhance the quality and the credibility of research findings. Triangulation was done by analysing how each set of data answered the sub-questions. The subsequent analysis considered each set of data in relation to the sub-questions.

In ensuring the trustworthiness of the study, dependability was maintained by ensuring that all the data were collected systematically and that all the contributions and experiences of the participants' were represented by being recorded and transcribed for analysis. The researcher established credibility by representing the experiences of the participants as accurately as possible. This was achieved through intense observation and member checking.

Furthermore, to minimise ambiguity in this study, the researcher made sure that the questions were clear and meant the same to all respondents. Objectivity and validity in this study were maintained by ensuring that all the data were collected systematically and that all the contributions and experiences of the participants were represented.

RESULTS AND DISCUSSION

The empirical research findings are a culmination of a process of data triangulation where by data from semi-structured interviews were triangulated with data from focus-group interviews. The use of literature supports the outcomes of the empirical study. In addition, the researcher reviewed the transcripts of the interviews by comparing them to determine the similarities and differences between the data, in order to determine patterns in the data.

Findings with regard to research sub-question 1 (what is inquiry-based learning and what does it entail?): Inquiry-based learning, abbreviated as "IBL" is a contested term. The term has many permutations and alternatives such as "i(e)nquiry", "guided-inquiry", "undergraduate research", "research-based teaching", "discovery learning", "teaching research links/nexus" and "inductive teaching and learning". Despite the different permutations and alternatives, there was a commonality of opinion among the participants in this study about what constitutes IBL and what it entails. The researcher has drawn on this commonality to provide a working definition of IBL for this study and sees IBL as a concept that best enables learners to experience the processes of knowledge creation. Jedlickova also emphasises the importance of "knowledge creation" during IBL and states that the core ingredients of an IBL approach is that learning should be:

- Based on a process of seeking knowledge and new understanding
- Stimulated by inquiry that is driven by questions or problems
- A learning-centred approach to teaching in which the role of the teacher is to act as a facilitator
- A move to self-directed learning with the learners taking increasing responsibility for their learning and the development of skills in self-reflection
- An active approach to learning

According to this view, the central goal of IBL is for learners to develop valuable knowledge-seeking skills that will prepare them for life-long learning. This entails that learners should achieve learning outcomes that include critical thinking, the ability of independent inquiry, responsibility for own learning and intellectual growth and maturity (Plowright and Watkins, 2004).

With this in mind, IBL can range from a rather structured and guided activity, particularly at lower levels (where the teacher may pose the questions and give guidance on how to solve a problem) to independent research where the learners generate the questions and determine how to address and solve them. Fielding (2012) refers to this process as a "discrete activity" that does not happen haphazardly but should be planned for well in advance.

During the focus group interviews all participants came up with their own definition or view of IBL but all agreed that learners should be more involved in the teaching and learning process. The participants in the study also pointed out that the teaching process in South African classrooms should be more learner centred and that IBL can play a significant role in achieving this aim.

One of the participants explained his view or perception of IBL as follows:

> Inquiry-based learning means learners must look for answers themselves and not believe everything that the teacher say, so it involves learners who must do more than mere answering questions, I mean learners should also come to the party and buy into the concept

Another one said the following:

> I see inquiry-based learning as learners who want to learn, who want to find out more, who want to explore the ideas that they have just learn they must be part of the process by critically be involved with the subject matter

Underlying this approach is the idea that both teachers and learners share responsibility for learning. The teacher plays an important role in modelling the different ways of contributing to the group discussion for learners. The participants in the study all emphasised the extremely important role that teachers themselves should play when using an IBL approach. One teacher commented as follows in this regard:

> Through asking learners to question their method of inquiry and by introducing them to new ideas or information, we [our teachers] can play a key role in keeping the inquiry focused and robust

Findings with regard to research sub-question 2 (what distinguishes inquiry-based learning from other teaching and learning activities?): Given the rather broad framing of IBL described above, it is a challenge to articulate how an IBL course differs from a traditional course. All respondents interviewed argued that they are already using an IBL approach through, for example, laboratory or project work. One of the participants explained his commitment to IBL as follows: "I am a Maths teacher and I have been using inquiry-based learning for years".

It was however, clear during a follow-up question that this teacher relates IBL to a process where learners are allowed to find their own ways of solving a mathematics problem when she stated clearly: "Letting learners find their own ways of solving a problem is for me the basis of inquiry-based learning". It was clear from this response that this participant could clearly not distinguish IBL from other learning approaches. Key aspects that indicate an IBL approach as "asking questions" and "creating knowledge" was not addressed by this participant during the interview session.

In an attempt to clarify the criteria for an IBL course and to consequently distinguish it from other teaching and learning approaches and activities, the following 10 questions regarding the respondents' teaching styles were included in the interview guide. The respondents were requested to answer the questions (in the form of a checklist) with the following four responses only: "always", "usually", "sometimes" and "rarely". Table 1 gives an indication of the responses:

For these questions the researcher anticipates beforehand that most respondents will answer "always" or at least "usually" but surprisingly there was considerable variation in the responses. Less than a quarter (23%) of the respondents indicated that they use the IBL approach on a regular basis and <20% use it "sometimes". The majority (61%) of the respondents replied with the answer "rarely" when these questions were set to them during the interviews. This clearly indicates that the participants are currently not engaging in IBL while teaching their respective subject areas, although, they are under the impression that they are. This is disturbing as the researcher gained the impression during the analysis of the research findings for sub-question 1 that all the respondents were aware of what IBL entails.

The only question in respect of which the majority of the participants (70%) provided almost similar answers was whether IBL entails that all stakeholders should work together and whether the teacher should be regarded as a co-learner. One of the participants said the following in this regard:

Table 1: Responses with regard to the open-ended questions asked to respondents

Open-ended question	Always	Usually	Sometimes	Rarely
Do your questions lead to the formation of defensible answers?	0	0	1	9
Are tasks focused on areas that have more than one possible outcome?	0	2	2	6
Do learners work through the process of constructing knowledge?	0	3	3	4
Do your questions challenge learners?	1	1	2	6
Do you regard teachers as co-learners?	7	0	0	3
Are elements of learner choice included in your selection of questions and/or methods of inquiry?	1	2	2	5
Are relevant transferable skills taught?	1	2	2	5
Is there constructive alignment of outcomes, teaching method and assessment?	0	0	1	9
Is there a transparent assessment scheme?	0	0	1	9
Do learners reflect on the process of constructing knowledge?	1	2	2	5
Total (%)	11	12	16	61

> Teachers should work together with learners as a team during IBL. This will ensure more effective schools. We (as teachers) need to work together with learners to encourage them to ask questions all the time during a lesson

Another respondent remarked:

> We often discourage our learners to ask questions in the classroom, this is to protect ourselves; sometimes we don't know the answers ourselves

One the other end of the scale, the empirical study also revealed that 90% of the respondents agreed that their questions rarely lead to the formation of defensible answers that there rarely is constructive alignment of outcomes, teaching method and assessment and that they rarely use a transparent assessment scheme. One participant stated: "Why should learners have insight in the way that I do their assessment? This is my job and has nothing to do with them". Another participant (an English teacher) stated in this regard that "each teacher has some responsibility with regard to the questions he or she set in the class, he or she must lead and coordinates the ways in how the learners ask and respond to questions", making it very clear that there is little room in her classroom for questions to be answered by learners in an inquiry-based manner.

Findings with regard to research sub-question 3 (what evidence is there that inquiry-based learning can assure better outcomes?): While there is indeed a growing list of research literature and studies that evaluate the outcomes of project-based learning (Thomas, 2000) there is a lack of such literature and studies for IBL activities and approaches. Certainly in the IBL literature some studies are purely descriptive, making little effort to fully evaluate the impact of the IBL activities on learners' learning and teachers' teaching (Fielding, 2012).

Many studies give patchy anecdotal evidence for improved learning, some triangulate evidence using a range of quantitative and qualitative sources while others involve careful comparative analyses to demonstrate, in a statistical sense, how learning in an IBL framework differs from traditional teaching (Berg *et al*., 2003; Justice *et al*., 2007). Several other studies concur that IBL produces improved learning in terms of learner engagement, academic achievement and higher order learning outcomes (Robertson and Bond, 2005; Prince and Felder, 2006; Sponken-Smith *et al*., 2008).

According to other studies (Plowright and Watkins, 2004) learners may have difficulty adjusting to the IBL approach and more specifically, coping with group dynamics when collaborative learning is employed. Also, according to Justice *et al*. (2007), there is a perceived higher workload associated with IBL. Teachers, too can reap benefits from using IBL through the increased enjoyment and interaction with their learners and the consequent rewards gained from improved learner engagement and academic achievement.

When learners are invited to take part in the learning process from start to finish they experience a sense of agency and responsibility for their learning, an approach that lends itself to greater student engagement and intrinsic motivation (Ryan and Deci, 2000). Learners are better able to evaluate and to reflect on their own learning and the collective learning of the class when they have been part of the learning process from the beginning, having played an active role in the initial planning and identification of main learning goals. In fact, a key feature of IBL is the practice of revisiting initial theories and ideas, both as individuals and as a class and reflecting on the ways in which current understanding differs from former understanding. Learners begin to experience learning in this way as an ongoing process, not an end point.

When participants in the study were asked if they think that IBL can assure better outcomes than other, more traditional, approaches, a variety of responses were given. One participant said:

> With IBL our ability to assess has enormous implications for what we teach and how effectively we teach it, the outcomes therefore depends on our effectiveness

While another one responded as follows:

> Learners who engage in IBL experience gains in factual learning that are equivalent/superior to those who engage in traditional forms of instruction. IBL learners developed a more flexible, useful kind of knowledge that engaged them in 'exploration and thought

Other positive changes as a result of participating in IBL that were mentioned by participants include positive attitudes toward learning, enhanced working habits, critical thinking skills and problem-solving abilities. One participant commented:

> Learners who do less well in traditional instructional settings excel when they have the opportunity to work in an IBL context which better matches their learning style or preference for collaboration and activity type

Participants all agreed that children learn deeply when they are asked to design and to create an artefact that requires the understanding and application of knowledge.

Findings with regard to research sub-question 4 (how could inquiry-based learning be used as a strategy to ensure effectiveness in South African schools?): The theoretical framework provided earlier in the study emphasises that developing and implementing an IBL approach could be used as strategy to improve school effectiveness. According to a number of the more recent studies (Plowright and Watkins, 2004; Fielding, 2012), IBL as a strategy can go a long way in improving the teaching-learning experience and as a result, improve school effectiveness. According to Justice *et al.* (2007), improved educational outcomes are associated with IBL.

When participants in the study were asked if they think that inquiry-based learning can enhance school effectiveness, several contradicting responses were given. One participant said:

> Of course it will that is what schooling is all about, if we can improve learners' learning, this means better results and the school will functions better; is this not what school effectiveness means?

While another one responded as follows:

> If learners really want to learn, it will not matter what approach we use, they will learn and the school will ultimately be more effective; so I don't think this new approach will help

Apart from these contradictory views, the majority of participants were very adamant that the introduction of any new approach that will increase the learning experience of the learners will ultimately lead to better outcomes and improved school effectiveness. One participant commented as follows in this regard:

> I just love the way kids in my class want to explore new ways to gain knowledge. I am disappointed in myself that I have let them down in the past by not introducing this approach much earlier in my teaching career

CONCLUSION

Along with the belief that learners are capable of taking responsibility for their own learning is the belief that all learners are capable of contributing to the collective improvement of ideas and understanding. To create this type of culture, learners need to be made aware of the different kinds of contributions that can be brought to the group. Proposing theories, building on a theory or an idea, choosing to agree or disagree with a statement, synthesising individual ideas and class-wide themes and making connections to related experiences in the wider world are all examples of the various kinds of contributions that learners can make and that were mentioned by the participants during the interviews.

Over time, the goal is to have a classroom of learners who are able to carry on a group discussion, led by learners, in a way that demonstrates flexibility and recognition in knowing when and how to contribute in order to move the entire group's learning forward. During this process, it is important to honour the diversity of contributions and to make it clear to the class that all contributions are not only welcomed but also necessary in helping everyone's learning.

Learners learn more intensely when they can apply classroom knowledge to real-world problems. IBL approaches can encourage learners to develop 21st century skills and competencies. It became clear from this study that IBL is challenging, both for teachers and learners. Teachers need time to support their capacity to organise sustained project work. Assessment strategies must be designed to meet formative and summative evaluation. Successful IBL teachers will therefore continue to ask themselves the following questions in their conquest to improve school effectiveness:

- What are we doing well?
- What do we need to work on?
- How do we get there?
- How can we create conditions in our class to build capacity?
- Did we achieve our learning goals?
- What do we know now that we didn't know at the beginning?
- What route did we take to get here?
- Would we take the same route again?
- What obstacles did we face along the way?
- How were these obstacles dealt with?
- Did different people approach these problems with different solutions?
- How has the process led to new understanding?
- How has the process led to new questions?
- How does our learning change the way we think about other things in the world?

This study has given a brief background of the rise of inquiry as a theoretical way to improve learning in South African classrooms. The evidence gained from this qualitative study suggests that IBL can improve learning outcomes for learners and that it can ultimately lead to the improvement of school effectiveness. While some ideas and research have been described in response to the first four research sub-questions, a number of issues still

remain. There continues to be a need, inter alia, to determine whether and under what circumstances an IBL approach could offer really useful links between teaching and school improvement.

REFERENCES

Badley, G., 2002. A really useful link between teaching and research. Teach. Higher Educ., 7: 443-455.

Berg, C.A.R., V.C.B. Bergendahl, B. Lundberg and L. Tibell, 2003. Benefiting from an open-ended experiment? A comparison of attitudes to and outcomes of an expository versus an open-inquiry version of the same experiment. Int. J. Sci. Educ., 25: 351-372.

Botha, R.J., 2014. Knowledge beliefs and problem-solving capabilities among South African school principals. J. Social Sci., 38: 247-253.

Botha, R.J., 2015. The principal as distributive leader: Supporting change and improving South African schools. J. Social Sci., 43: 207-215.

Brew, A., 2003. Teaching and research: New relationships and their implications for inquiry-based teaching and learning in higher education. Higher Educ. Res. Dev., 22: 3-18.

Fielding, M., 2012. Beyond student voice: Patterns of partnership and the demands of deep democracy. Rev. Educ., 359: 45-65.

Healey, M., P. Kneale and J. Bradbeer, 2005. Learning styles among geography undergraduates: An international comparison. Area, 37: 30-42.

Heron, R.L., R. Baker and L. Mcewen, 2006. Co-learning: Re-linking research and teaching in geography. J. Geogr. Higher Educ., 30: 77-87.

Justice, C., J. Rice, W. Warry, S. Inglis, S. Miller and S. Sammon, 2007. Inquiry in higher education: Reflections and directions on course design and teaching methods. Innovative Higher Educ., 31: 201-214.

Kivinen, O. and P. Ristela, 2002. Even higher learning takes place by doing: From postmodern critique to pragmatic action. Stud. Higher Educ., 27: 419-430.

Krefting, L., 1991. Rigor in qualitative research: The assessment of trustworthiness. Am. J. Occup. Therapy, 45: 214-222.

McMillan, H.J. and S. Schumacher, 2010. Research in Education: Evidence-Based Inquiry. Pearson, Boston, UAS.

Plowright, D. and M. Watkins, 2004. There are no problems to be solved, only inquiries to be made in social work education. Innovations Educ. Teach. Int., 41: 185-206.

Prince, M.J. and R.M. Felder, 2006. Inductive teaching and learning methods: Definitions, comparisons and research bases. J. Eng. Educ. Washington, 95: 123-138.

Robertson, J. and C. Bond, 2005. The research/teaching relation: A view from the edge. Higher Educ., 50: 509-535.

Ryan, R.M. and E.L. Deci, 2000. Self-determination theory and the facilitation of intrinsic motivation, social development and well-being. Am. Psychol., 55: 68-78.

Spronken-Smith, R., J.O. Bullard, W. Ray, C. Roberts and A. Keiffer, 2008. Where might sand dunes be on Mars? Engaging students through inquiry-based learning in geography. J. Geog. Higher Educ., 32: 71-86.

Thomas, J.E., 2000. Assessment: A new way of thinking about learning. J. College Sci. Teach., 29: 6415-6421.