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Math and Science Post-basic Education School Teachers' Use of Assessment for Learning and Assessment of Learning Practices in Oman

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Abstract: The present study aimed at investigating math and science post-basic education school teachers' use of Assessment for Learning (AfL) and Assessment of Learning (AoL) Practices in Oman from teachers' points of view and as perceived by their educational supervisors. To achieve the objectives of this study, a 31-item of Likert type questionnaire was used. The questionnaire was divided into two subscales. The first subscale contains 12 AoL practices while the second one contains 19 AfL practices. The questionnaire was distributed to 288 math, biology, physics, and chemistry teachers and to 78 math and science educational supervisors. The results show that math and science teachers use AoL practices more than their use of AfL practices from their points of view and based on their educational supervisors perceptions. The study recommends math and science teachers balance between the use of AoL and AfL practices.

Keywords: Math and Science teachers, assessment for learning, assessment of learning practices, Oman.

استخدام معلمي الرياضيات والعلوم في مدارس التعليم ما بعد الأساسي في سلطنة عُمان لممارسات التقويم من أجل التعلم وتقويم التعلم

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مستخلص: هدفت الدراسة الحالية الى تقص استخدام معلمي الاحياء والكيمياء والفيزياء والرياضيات في مدارس التعليم ما بعد التعليم الاساسي في سلطنة عُمان لممارسات تقويم التعلم وممارسات التقويم من اجل التعلم من وجهة نظر المعلمين انفسهم، وكذلك كما يتصورها المشرفين التربويين لتلك المناهج. ولتحقيق هدف الدراسة تم تطوير اداة مكونة من مجالين: الاول يضم ممارسات تقويم التعلم وتكون من ١٢ فقرة من نوع ليكرت الخماسي، والمجال الثاني تضمن ممارسات التقويم من اجل التعلم وتكون من ١٩ فقرة من نوع ليكرت الخماسي. كما تم توزيع اداة الدراسة على عينة مكونة من ٧٨ مشرف تربوي و ٢٧٨ معلم علوم ورياضيات. وبينت النتائج ومن وجه نظر المعلمين وتصورات المشرفين التربويين ان معلمي العلوم والرياضيات يستخدمون ممارسات تقويم التعلم اكثر من درجة استخدامهم لممارسات التقويم من اجل التعلم. وأوصت الدراسة بحاجة معلمي العلوم والرياضيات في مدارس ما بعد التعليم الاساسي الى التوازن بين درجة استخدام ممارسات التقويم من اجل التعلم وممارسات تقويم التعلم.

الكلمات المفتاحية: معلمي العلوم والرياضيات، تقويم التعلم، التقويم من اجل التعلم، عُمان.

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The main goal of educational research is to improve education, and the goal of education is to improve student academic achievement. Improving student academic achievement can be achieved by the changes happening in classrooms. It is expected from teachers to engineer learning environments. Therefore, students, teachers, and educational administrations need assessment, as it determines whether or not the educational standards are met in order to improve students' learning and achievement (Black & Wiliam, 1998, 2009). Assessment in general is an excellent point to start improving students' strengths and weaknesses in learning, and it is a way of teaching more effectively by knowing what students know and do not know. It focuses on the quality of teaching as well as the quality of learning, and it is about changing the students and the teachers' perceptions of assessment (Ramsden, 2003). Therefore, teachers need to focus on developing their assessment practices in order to modify instruction and improve student learning (Philhower, 2018). Assessment helps educators to gather information about students learning by multiple sources in order to understand what students know, understand, and can do with their knowledge as a result of teaching process. On the other hand, Popham (2007) believes that assessment helps teachers to gather information about the students' learning as well as the extent to which the instruction's methods used are effective in achieving the intended learning outcomes.

There are controversies in who decides what is to be assessed, who does the assessment, where the assessment takes place, how the students responses are scored and interpreted. And each one can be the responsibility of who teaches the students, while at the other extreme, all can be done by an external agency (Wiliam & Thompson, 2017). The assessment practices used by teachers in classrooms have a major influence on students' learning and achievement (Black & Wiliam, 1998; Hattie, 2008). Therefore, assessment practices should not be seen as something done to students (Ecclestone & Swann, 1999). Rather, it should be done for and with students, in an effort to empower them (Nicol & Macfarlane-Dick, 2006) and to improve their learning outcomes (Boud, 2000). Classroom assessment should inform teachers decision-making about the needed changes in their teaching practices, and to serve as teaching tools to aid students to improve their learning outcomes. However, there is research evidence that neither students nor instructors may fully understand these aspects of assessment (Higgins, Hartley & Skelton, 2002). One way of understanding classroom assessment is to look at the role of teachers and students in the educational process. Such understanding of assessment has been shaped by the learning theories. On the one hand, behaviorists opt for objective and standardized testing; they see testing as a process separated from instruction (Van de Watering, Gijbel, Dochy & Van der Rijt, 2008). On the other hand, constructivists view assessment as a learning tool (Weurlander, Söderberg, Scheja, Hult & Wernerson, 2012). Assessment was traditionally seen as a way of assigning grades and identifying the achieved objectives. Nowadays, assessment is largely seen as an integration and an interaction between both instruction and assessment (Black & Wiliam, 1998; Green, 2018; Segers, Dochy & Cascallar, 2003). The main functions of classroom assessment are formative and summative. These functions were introduced to the field of evaluation by Scriven (1967). Then, Bloom (1969) extended this point of view to classroom assessment; formative evaluation aims at providing feedback and correctives during the teaching-learning process, and summative evaluation aims at employing judgment about what the learner had achieved at the end of a course or program (Bloom, 1969). Therefore, researchers, teachers, and educators have

been using both "Assessment of Learning (AoL)", which is used synonymously, in this paper, with *Summative Assessment* and "Assessment for Learning (AfL)", which is used synonymously with *Formative Assessment* in order to distinguish between these two paradigms and functions of assessment. This differentiation does not mean favouring one function of assessment over another. On the contrary, the functions of AoL and AfL are irreplaceable in education (Yang & Cheng, 2015), and teachers need to achieve a balance between both of them (Edwards, Turner & Mokhtari, 2008; Struyf, Vandenberghe & Lens, 2001; Zaldivar, Summers & Watson, 2013).

Therefore, educational systems should investigate AoL and AfL practices that are being used by teachers in the classrooms in order to develop the teaching and learning process. The present study attempts to investigate math and science post-basic education school teachers' uses of assessment of and for learning practices in Oman.

Assessment of Learning (AoL) is summative in nature and requires utilizing assessment data after the teaching and learning process has taken place to compare students' achievement according to specific standards (Shute & Kim, 2014). AoL is used for assessing learning outcomes (Stobart, 2008), quality control (Bennett, 2011), reporting objectives (Black, 2013), and for accountability purposes (Vlachou, 2016). It aims at providing evidence of what students know and can do. Green (2018) notes that AoL: a- helps educators to know students' readiness to the next level of education; b- provides evidence for educators and policy makers that the students have met the required standards; c- provides educational managers, parents and other stakeholders with cost benefit analysis of the time and money invested in the classrooms;d- evaluates the effectiveness of teachers, schools, and educational systems.

Assessment for Learning (AfL) is formative in nature and requires utilizing assessment data during the learning and teaching process to help students learn more. Based on reviewing the related literature; Philhower (2018, p12) defines AfL as "a process that involves teachers acting directly or through students to gather information about students' thinking to inform instruction and support student learning. It typically involves multiple methods (or specific practices) to achieve these goals". It aims to get a deep understanding of the learning processes to support learning through tailored instruction and targeted feedback (Guengerich, 2013; Wiliam, 2011; Stobart, 2008). Moreover, it is seen as a process where students and teachers provide feedback to each other to encompass learning and teaching to increase students' academic achievement (Tolley, 2016; McManus, 2008). While Miller and Lavin (2007), and Wuest and Fisette (2012) see AfL as an essential part of blending teaching and assessment process in order to plan for the next lesson, Black and Wiliam (1998, 2009) believe that few teachers use AfL regularly to direct instruction. When AfL is used on a regular basis, it can have a significant positive effect on the educational outcomes through the provision of constructive feedback to students and teachers alike.

The successful AfL depends on teachers' skills and competencies (Green, 2018). The literature shows a number of the main pillars of successful AfL practices (Andrade, Lui, Palma & Hefferen, 2015; Centre for Educational Research and Innovation [CERI], 2008; Hodgson & Pyle, 2010;Wiliam & Thompson, 2017): a- explaining learning objectives and success standards; b- increasing the quality of inquiry; c- increasing the quality of feedback provided to students about their learning and teachers about their teaching; d- using self and peer assessment; e- asking questions. Borich (2014) believes that more than 50 ques-

tions are typically asked in schools during lesson time.

The relationship between AoL and AfL is very complex because AoL should fulfill its main goals of documenting what students know and can do but should also meet a secondary purpose of supporting learning. If AoL content, format and design carefully prepared, AoL practices can be a valuable learning experience (Shepard, 2006). Besides that, research suggests that taking a test can both enhance learning by strengthening the representation of information retrieved during the test and also slow the rate of forgetting (Rohrer & Pashler 2010).

It is excepted for assessment to be only an AoL when the assessment stops at the judgments level and without using the results of assessment to enhance learning (Black & Wiliam (1998). However, it is expected to be an AfL when it prepares students for AoL judgments and using the results of assessment to enhance students learning (Taras, 2005). Therefore, the AoL data can be used to achieve the goals of AfL purposes (National Research Council, 2001). This indicates that teachers may focus on assigning grades to their students based on the tests they use without using these grades (data) to help the students learn more. In this case, they focus on AoL. On the other hand, they focus on AfL when they use the data of their tests or the national wide test (large scale testing) to make changes in classrooms to help their students learn more. It is not easy for teachers to strike a balance between AoL and AfL (Rea-Dickins, 2001). Teachers who attempt to utilize AfL practices in their classes may face a kind of conflict with official the assessment frame work and grading policies or AoL practices (Green, 2018). Birenbaum et al. (2015) argue that educational policies have a major impact on utilizing AfL practices in classrooms. As most educational systems have been under the pressure of the accountability of teachers, teachers find themselves forced to utilize AoL practices such as standardized tests for accountability purposes (Sach, 2015; Shepard, 2000; Stiggins, 2002; Vlachou, 2015). Therefore, Box, Skoog, and Dabbs (2015) direct teachers to be sure that the applicable accountability measures support the shift in their practice from AoL to AfL. Moreover, students should have the main role in classroom life and assessment (Black, 2015). On the other hand, the students' role in AoL practices has less focus as AoL focuses on public reports, grading, and certificates (Green, 2018).

AfL significantly enhances students' learning (Ozan & Kıncal, 2018), but its implementations need some prerequisites concerning the teacher, student, and the school context. Teachers should know how to interpret assessment data, students' involvement is vital, and assessment should provide both teachers and students with substantial and constructive feedback (Andersson & Palm, 2018; Heitink et al., 2016).

Buhagiar and Murphy (2008) conclude that exploring assessment practices of math teachers could enhance students' learning by adapting effective practices that inform future teaching and learning activities.

Vlachou (2018) findings show that science teachers' assessment practices are both AoL and AfL with more focus on the AoL practices without effectively using the assessment evidence to complete the learning loop. In addition, the findings reveal that AoL has a major function in classroom practices, even when science teachers are responsible for balancing between AoL and AfL practices.

Vingsle's (2014) study shows that the AfL practice is very complex as it requires hard task for math teachers. For example, during every classroom teaching, AfL practice requires using teachers knowledge and skills to elicit, interpret, and apply the elicited data to adapt

teaching to better meet students' learning needs.

In Oman, the national framework of assessing students' learning (Ministry of Education, 2018) requires teachers to integrate assessment with teaching to help the students learn more. This means that it is expected from teachers to use both AoL and AfL. Also, the mentioned frame work focuses more on AoL when it is compared with AfL as it is expected from teachers to consider all the grades of the assessment methods they used as a part of the courses final grade.

Research aims and questions

This study aims at exploring the implications of Omani math, physics, chemistry, and biology high school teachers' use of AoL and AfL practices. The review of the literature shows that this area of research has not received the required attention in Oman. Moreover, Al Shibli (2008) revealed that Omani teachers knowledge about formative assessment did not reach the acceptable level. Therefore, the study mainly attempts to answer the following research questions:

1. **What are the AoL and AfL practices that are used by Omani math, physics, chemistry, and biology high school teachers as perceived by teachers themselves?**
2. **Do Omani math, physics, chemistry, and biology high school teachers use AoL practices more than AfL practices from teachers point of view?**
3. **Do Omani math, physics, chemistry, and biology high school teachers use AoL practices more than AfL practices based on their educational supervisors perceptions?**

Methodology

Sampling

Multi-stage procedures were used to select the sample. First, three governorates were selected randomly from the eleven governorates of Oman. Second, from each selected governorate, three districts were selected randomly. Third, from each selected district, a boys' high school and a girls' high school were selected randomly. Forth, the instrument was distributed to math, physics, chemistry, and biology high school teachers in the selected schools. The total number of the sample is 288 teachers. In addition, the instrument was distributed to all educational supervisors in the selected three governorates (n=78).

Instrument

The related literature about AoL and AfL practices was reviewed (e.g. Black, 2013, 2015; Black & Wiliam, 1998, 2009; Wiliam, 2011; Wiliam & Thompson; 2017). 35 Likert-type items were prepared in the first version of the instrument. These 35 items were divided into two subscales; 17 items were categorized as AoL practices, while the other 18 items were categorized as AfL practices. The 35 items (practices) were given to a panel of experts to evaluate them. The panel consisted of professors in educational assessment and educational psychology, math and science teachers, and school educational supervisors. The panel of experts were provided with a brief introduction about the definitions of both AoL and AfL, and they were asked to provide the notes about the items wording, contents, and suitability of the subscales. Based on the panel of experts' notes, 4 AoL items were removed and 9 items were modified. Also, one AfL item was added and 8 items were modified. Therefore, the second version of the instrument consisted of 31 items: 12 AoL items and 19 AfL items. All the versions of the instrument were written in the Arabic language as it is

the language of the targeted population of this study. Moreover, there were two versions of the instrument; one worded in a way that asks the teachers about the their using of the assessment practices (Always, Very Often, Sometimes, Rarely, and Never), and the another one worded in a way that asks educational supervisors about their perceptions of teachers uses of these assessment practices.

Moreover, the final version of the instrument was distributed to a sample of 63 teachers and educational supervisors. Then, item-to-total correlation and Cronbach alpha were calculated. The results show that the item-to-total correlation for AoL subscale range is .36-.71 and Cronbach alpha equals .85. The item-to-total correlation for AfL subscale range is .37-.65 and Cronbach alpha equals .885.

Results

To answer the first research question, the mean and standard deviation for every AoL and AfL practice were calculated from teachers point of view and educational supervisors perceptions of teachers uses of these practices. Tables 1, 2, 3, and 4 show the results of these analyses.

Table 1
Mean and standard deviation for teachers' use of AoL practices as perceived by educational supervisors

Assessment of Learning Practice	Mean	Std.
Math and science teachers follow the official grading procedures, which are required by the Ministry of Education.	4.32	.814
Math and science teachers encourage students to get high grades.	4.03	.897
Math and science teachers use test questions that range from difficult to easy (all levels of item difficulty).	3.97	.755
Math and science teachers activates the assessment record during the semester.	3.95	.938
Math and science teachers use assessment to know what the students know and can do.	3.94	.873
Math and science teachers use test questions that represent the course content.	3.87	.972
Math and science teachers ask the students to do different tasks and considers them as a part of the course final grade	3.85	.927
Math and science teachers provide parents with reports about their children's academic progress.	3.83	.813
Math and science teachers provide the students with information on how to do the assessment tasks.	3.64	.939
Math and science teachers ask high performance students to keep working hard.	3.53	.936
Math and science teachers compare every student performance with group performance.	3.46	1.002
Math and science teachers give the students the percentile rank of their grades.	3.01	1.253
Grand Mean	3.78	

Table 2
Mean and standard deviation for teachers' AoL practices from teachers' point of view

Assessment of Learning Practice	Mean	Std.
I encourage students to get high grades.	4.48	.718
I use test questions that represent the course content.	4.41	.703
I use test questions that range from difficult to easy (all levels of item difficulty).	4.40	.735
I follow the official grading procedures, which are required by The Ministry of Education.	4.30	.872
I use assessment to know what the students know and can do.	4.23	.890
I activate the assessment record during the semester.	4.16	.886
I provide my students with information on how to do the assessment tasks.	4.13	.894
I ask high performance students to keep working hard.	3.99	.973
I ask my students to do different tasks and consider them as a part of course final grade.	3.95	1.002
I provide the parents with reports about their children academic progress.	3.85	1.051
I compare every student performance with group performance.	3.34	1.197
I give the students the percentile rank of their grades.	3.03	1.468
Grand Mean	4.02	

Tables 1 and 2 show that there is a kind of agreement between teachers' uses and their educational supervisors' perceptions about the highest used practices (among the 12 AoL practices). The educational supervisors rated the item "*Math and science teacher follow the official grading procedures that are required by Ministry of Education*" as the highest AoL practice used by math and science teachers with a mean of 4.32 out of 5. On the other hand, teachers reported this item as the forth used practice. Moreover, math and science teachers rated the item "*I encourage my students to get high grades*" as highest used AoL practice with a mean of 4.48 out of 5., while educational supervisors reported this item as the second AoL used practice. In addition, the AoL practice "*Using test questions that range from difficult to easy (all levels of item difficulty)*" was ranked as the third AoL used practice from both teachers points of views and educational supervisors' perceptions. The mean was 3.97 from educational supervisors' point of view and 4.40 from teachers' point of view.

Tables 3 and 4 show that there is a relative agreement between teachers' uses and their educational supervisors' perceptions about the uses of AfL practices. The highest AfL practices as reported by teachers and perceived by educational supervisors was the item "*The teacher acknowledgement of the high performance students*". Moreover, Tables 3 and 4 show that teachers rated their uses of AfL practices higher than their educational supervisors. Also, it is noticed from Tables 3 and 4 that the least used

Table 3
Mean and standard deviation for teachers' use of AfL practices as perceived by educational supervisors

Assessment for Learning practice	Mean	Std.
Math and science teachers acknowledge the high performance students.	4.00	.967
Math and science teachers give the students a chance to discuss the test questions after the grading process.	3.97	.911
Math and science teachers use assessment to encourage students to learn more.	3.87	.843
Math and science teachers provide the students with immediate feedback after the assessment takes place.	3.74	.932
Math and science teachers use assessment to take decisions that enhance the learning process.	3.74	.959
Math and science teachers measure students' performance during and at the end of the classes.	3.71	.870
Math and science teachers use assessments to know the learning needs of the students.	3.60	1.036
Math and science teachers provide the students with their weaknesses and strengths based on the used assessment.	3.60	.917
Math and science teachers use table specifications to develop tests.	3.59	1.189
Math and science teachers use assessment to develop their teaching methods.	3.59	1.086
Math and science teachers dedicate enough time for the students to reflect on their performance on the used assessment tasks.	3.47	.936
Math and science teachers use assessment tasks that are not a part of the course final grade.	3.41	1.037
Math and science teachers categorize students into homogeneous groups based on the used assessment methods.	3.35	1.079
Math and science teachers use diagnostic tests at the beginning of the semester to know students' levels.	3.33	1.326
Math and science teachers train students on how to do assessment tasks.	3.32	1.026
Math and science teachers provide students with feedback on the graded tests.	3.29	.995
Math and science teachers show the aims of the assessment at the beginning of class to the students.	3.18	1.159
Math and science teachers give the students a chance to correct their answers (a sort of self-assessment strategy).	3.15	1.218
Math and science teachers use multi-assessment methods for every unit in the course as a part of the course final grade.	3.13	1.323
Grand Mean	3.53	

Table 4
Mean and standard deviation for teachers' use of AfL practices

Assessment for Learning Practice	Mean	Std.
I acknowledge the high performance students.	4.27	1.066
I use assessment to encourage students to learn more.	4.24	.818
I give the students a chance to discuss test questions after the grading process.	4.18	.922
I provide the students with their weaknesses and strengths based on the used assessment.	4.08	.835
I measure students' performance during and at the end of the classes.	4.04	.975
I provide the students with immediate feedback after the assessment takes place.	4.03	.840
I use assessment to know the learning needs of the students.	3.98	.948
I use assessment to develop my teaching methods.	3.97	.936
I use assessment to take a decision that enhances the learning process.	3.92	.947
I use table specifications to develop tests.	3.89	1.180
I dedicate enough time for the students to reflect on their performance on the assessment tasks.	3.82	1.095
I use assessment tasks that are not part of the course final grade.	3.77	1.199
I show the aims of the assessment at the beginning of class to the students.	3.75	1.081
I train students on how to do the assessment tasks.	3.70	1.056
I categorize students into homogeneous groups based on the used assessment methods.	3.61	1.010
I use diagnostic tests at the beginning of the semester to know the students' levels.	3.57	1.337
I provide students with feedback on the graded tests.	3.35	1.303
I give the students a chance to correct their answers (a sort of self-assessment strategy).	3.30	1.239
I use multi-assessment methods for every unit in the course as part of the course final grade.	3.22	1.330
Grand Mean	3.82	

AfL practices as reported by teachers and perceived by educational supervisors were "*Using multi-assessment methods for every unit in the course as part of course final grade*" and "G*iving the students a chance to correct their answers (a sort of self-assessment strategy)*". Research questions two and three will add more details about the differences between practiced AoL and AfL.

To answer the second research question, the paired sample T test was used to investigate the differences between AoL and AfL uses among Omani math, physics, chemistry, and biology high school teachers as reported by teachers themselves. Table 5 shows the results of this analysis.

Table 5
The Paired sample T test results of investigating the differences between AoL and AfL practices

Assessment Function	Mean	Std.	Corr. Coff.	T Value
Of Learning	4.02	.51	.85	10.71
For Learning	3.83	.60		

Table 5 shows that the math and science teachers reported that they used AoL practices more than their use of AfL practicees. This means that Omani math, physics, chemistry, and biology high school teachers focus more on AoL practices

(mean=4.02 out of 5) than AfL practices (mean=3.83 out of 5). Moreover, Table 5 shows that the correlation between AoL and AfL practices equals .85, which indicates that the math and science teachers who frequently uses AfL practices probably uses AoL practices frequently.

The results of answering the first and the second research questions show that AoL practices are used more frequently compared with AfL practices. Teachers might see AfL practices as extra work (Taras, 2005), which might cause the use of AoL more frequently. This result agrees with Gilson (2009) and Schneider and Randel's (2010) results as the AoL has a deeper history in the educational literature and systems. In addition, teachers usually focus on the key elements of the course contents and the intended learning outcomes (Bloom, Madaus, & Hastings, 1971), which might be the reason why both teachers and educational supervisors were sensitive towards noticing math and science uses

of AoL practices. Moreover, AoL is used for record keeping, public reports, accountability, awarding degrees (Stobart, 2008; Bennett, 201; Black, 2013; Vlachou, 2016). This might direct math and science teachers to have an official documentation plan for the implementation of the AoL. Educational systems might need to be aware of teachers' focus on AoL, as this might lead to *teaching for testing* rather than focusing on *teaching for learning* (Herrera, Murry, & Cabral, 2013). Black and Wiliam (1998) stress the importance of using AfL practices in order to provide students with effective feedback, diagnose students' weaknesses and strengths, and plan for the next step in the teaching and learning process as these uses support students' learning.

To answer the third research question, paired sample T test was used to investigate the differences between educational supervisors perceptions of math and science teachers uses of AoL and AfL practices. Table 6 shows the results of this analysis.

Table 6
The Paired sample T test results of investigating the differences between teachers uses of AoL and AfL practices as perceived by educational advisors

Assessment Function	Mean	Std.	Corr. Coff.	T Value	Sig
Of Learning	3.78	.75	.92	7.63	.000
For Learning	3.53	.63			

Table 6 shows educational supervisors believe that math and science teachers use AoL practices higher than the using of AfL practices. This result is consistent with the results of the first and the second research questions, and it means that Omani math, physics, chemistry, and biology high school teachers focus on AoL practices more than their focus on AfL practices. Moreover, the results of a study conducted by Alshibli (2008) showed that math teachers have unacceptable level of knowledge about formative assessment (AfL). This could be another reason behind focusing math and science teachers on AoL more that they focus on AfL practices.

In most cases, teachers are responsible to design, administer, and use assessment (whether it is AoL or AfL) (Green, 2018). This might be the reason why teachers rated their uses of AfL and AoL practices higher than their educational supervisors. As suggested by Heitink et al. (2016), teachers are recommended to give more reports and information about students' achievement and the learning process (AfL) instead of results and test scores (AoL). In addition, the roles of teachers and students should change. The traditional role of students needs to be shifted from passive receivers of assessment practices to active participants in the assessment process. Vlachou's (2015) work shows how the focus on AoL and the fear of accountability have urged teachers to evade creative practices for evaluating students' learning. In order to empower teachers for this role, educational systems and administrations should provide teachers with the required skills and competencies (Andersson & Palm, 2018), so they can transfer these skills to their lesson plans and narrow the gap between what the students know and the intended learning outcomes (Bugni, 2017).

Conclusions and Recommendations

In summary, the results of this study show that math and science teachers in post-basic schools in Oman use AoL practices more than the AfL practices from their points of views and based on their educational supervisors' perceptions. Therefore, it is recommended to achieve a balance between the use of AfL and AoL practices. Moreover, the results of this study suggest the need for carefully designed professional development programs to provide teachers with the needed skills and competencies in order to help them activate the uses of AfL by integrating assessment with their teaching and preparing for the next steps in the teaching process. Besides, educational systems should develop accountability indicators that support AfL

teachers practices to assess students' learning.

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