Internal and External Factors Affecting Teachers' Adoption of Formative Assessment to Support Learning

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***Abstract*—**Assessment forms an important part of instruction. Assessment that aims to support learning is known as formative assessment and it contributes student's learning gain and motivation. However, teachers rarely use assessment formatively to aid their students' learning. Thus, reviewing the factors that limit or support teachers' practices of formative assessment will be crucial for guiding educators to support prospective teachers in using formative assessment and also eliminate limiting factors to let practicing teachers to engage in formative assessment practices during their instruction. The study, by using teacher's change environment framework, reviews literature on formative assessment and presents a tentative model that illustrates the factors impacting teachers' adoption of formative assessment in their teaching. The results showed that there are four main factors consisting personal, contextual, resource-related and external factors that influence teachers' practices of formative assessment.

***Keywords*—**Assessment practices, formative assessment, teachers, factors for use of formative assessment.

I. Introduction

ASSESSMENT has always been an essential part of education, and researchers have shown that teachers spend almost a third of their instructional time in assessment activities [1], [2]. Assessment is used for various purposes, like grading, but it is also important to use different forms of assessment to improve students' learning. The National Research Council (NRC) [3] and the American Association for the Advancement of Science (AAAS) [4] have also emphasized the integration of diverse forms of assessment into science classrooms for the purpose of mediating students' learning. In their seminal work, Black and Wiliam [5] showed that the use of formative assessment (FA) in classrooms improves students' learning and performance. They suggest that the use of assessment for enhancing students' learning should be an integral part of classroom. The usages of FA can double the pace of students learning [6], and students' achievement is strongly associated with their teachers' ability to develop and use FA effectively in their classrooms [7], [8]. Though there are many definitions for FA proposed in the literature [1], [5], [9], the common notion in these definitions is to use assessment processes and products to improve students' learning. The term assessment for learning is, also, used interchangeably with the term FA in the literature though some researchers differentiate these two terms [10].

Even though the contributions of using FA to improve students' learning, teachers' effectiveness, and school achievement have been obvious, the results of extensive researches have shown that FA has been rarely adopted in classrooms [5], [11]-[14]. Besides, research shows that although teachers may know about the notion of FA and its strategies, they do not practice FA in their own classrooms [15]. There is a gap between theory and practice of FA, and teachers are the most important stakeholder to close this gap [16]. Thus, it is essential to identify the potential factors that may affect teachers' likelihood of adopting FA into their classrooms.

II. Methods

Adoption of FA cannot be achieved by forcing teachers to use FA strategies. It requires that stakeholders, such as administrators and policy makers, motivate teachers to improve their FA practices [11], [12]. It also requires researchers to develop motives and identify hinders for practicing FA into classrooms and then encourage stakeholders support motives and reduce or eliminate hinders to facilitate teachers' FA practices. Practicing FA urges teachers to change their authoritarian roles and conceptions of assessment from summative assessment, which is used for grading and accountability purposes, to assessment for students' learning. Clarke and Hollingsworth [17] identified four factors that influence the change environment of teachers for professional growth. These factors include "external source of information or stimulus (external domain), personal knowledge, beliefs, and attitude (personal domain), professional experimentation (domain of practice), and salient outcomes in teaching (domain of consequences" [17, p. 957].

The study aims to review the educational research literature to demonstrate possible factors that affect teachers' adoption of FA into their practice and classify these factors using a framework similar to the teachers' change environment developed by Clarke and Hollingsworth [17]. In our framework, we consider four components of the change environment that facilitates adoption of FA in classroom. These include personal, contextual, external, and resource-related factors (see Fig. 1).

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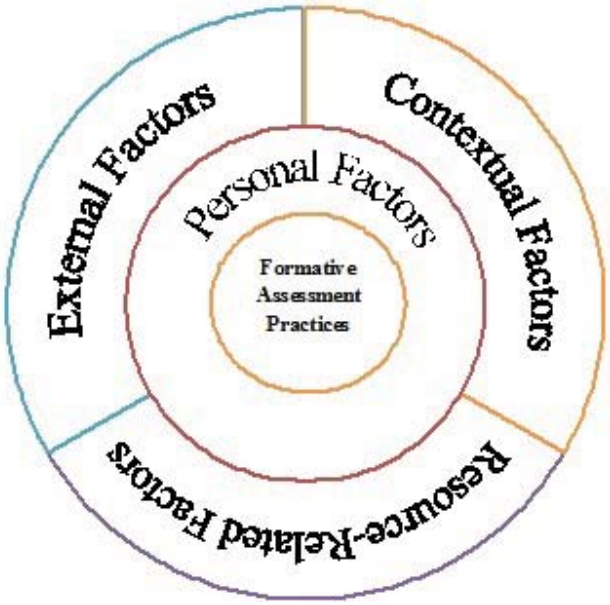

Fig. 1 A tentative framework to present the factors that affect teachers' adoption of FA

III. Findings

The first component, personal factors, is directly from Clarke's and Hollingsworth's [17] model and include factors like teachers' perceptions of FA. The rest of the change environment is divided into three parts, including contextual, external, and resource-related factors. Contextual factors are related to school context such as school environment and policy that affect teachers' FA practices. External factors, such as high stake and accountability assessment, are related to local and national educational characteristics. Resource-related factors such as professional development (PD) activities are factors that require resources such as money, time, and information. After reviewing factors that affect teachers' adoption of FA into their practice within this framework, we conclude by highlighting some of the limitations of the framework.

A. Personal Factors

Teachers' decision making about FA is influenced by many internal and external factors [18]. The internal factors are related to teachers' personal and professional values and can change from one teacher to another. According to some studies, the following factors affect teacher's FA adoption: teachers' beliefs and values; teachers' knowledge/pedagogical content knowledge (PCK); teachers' attitudes; teachers' orientations; teachers' perceptions; teachers' self-efficacies and motivations; teaching and professional experience; and teachers' conceptions/understanding of assessment.

1) Teachers' Beliefs and Values

Teachers' beliefs and values about learning, teaching, and assessment are vital to change teachers' assessment practices and influence their FA adoption. According to McMillan [18], teachers' beliefs and values including their supports for students' success, their willingness to provide various assessment strategies to meet students' needs, and their ability to engage students in assessment process influence teachers' FA adoption. For instance, a traditional teacher's belief does not encourage students to have the responsibility of learning and to engage in learning process by using FA strategies [11], [12]. Teachers' values for teacher-centered (instructivist) and student-centered (constructivist and sociocultural) teaching, also, influence teachers' FA adoption. While student-centered view of teaching positively affects the adoption of FA, teacher-centered view of teaching limits it [19]-[22]. If the teachers' beliefs and values of teaching and learning fit with student-centered and learning-oriented views of teaching, they more likely adopt FA [23] while other teachers more likely use summative assessment, which focuses on grading in teachers' practices by the pressure of external factors such as high stake tests [23], [24]. Teachers' beliefs about forms of knowledge, also, affect their FA adoption. Teachers, who give more value on factual and recall forms of knowledge, are more unlikely to adopt FA than other teachers, who value on synthesis and evaluative forms of knowledge [19].

2) Teachers' Knowledge / PCK

PCK can be defined as the knowledge teachers have for teaching and differentiate a teacher from a subject matter expert According to Magnusson et al. [25] PCK includes "teachers' knowledge of assessment, learners, curriculum, and instruction" (p. 108). The literature has shown that teachers with weak PCK cannot integrate FA into their practices, view assessment as a tool for accountability, and see assessment and teaching as distinct activities [26]. In contrast, teachers who have strong PCK can make sense of how their students think and understand the assessment activities and questions, and give proper feedback to the students to support their learning [11], [12]. FA requires teachers to make immediate professional judgments during instruction, and this requires them to have a strong PCK to confidently meet students' emerging needs to advance their learning [9], [13]. Teachers, who have robust PCK, highlight the quality of students' work and show their strengths and weaknesses in order to promote self-learning. In contrast, teachers, who have less robust PCK, emphasize the quantity of their students' works and grade students' work just for summative purposes [5], [26].

3) Teachers' Attitudes

Research literature has shown that there is a strong relationship between teachers' attitudes and their use of FA in their practices [27], [28]. Attitude is defined as "… a subset of a group of constructs that name, define, and describe the structure and content of mental states that are thought to drive a person's actions" [29, p. 102]. Teacher's attitude toward teaching, learning, and assessment affect his/her FA adoption. It is also found that teachers, whose attitudes toward assessment are shaped by external and accountability examinations, are unlikely to adopt and practice FA in their classrooms and more likely to talk about constrains such as lack of time [30]. Research also has shown that teachers, whose attitude toward learning is dominated by teacher-

centered view of learning, do not adopt FA or emphasize students control and management as an issue [31]. In contrast, research has shown that teachers, who held positive attitude toward the role of FA in students' learning, are more likely to incorporate FA into their practices [28]. It is asserted that, "Even if teachers have all the required knowledge and skills for FA, without the appropriate attitudes toward the role that FA can play in teaching and learning, their knowledge and skills will lie dormant" [32, p. 6].

4) Teachers' Orientations

The assessments teachers use are affected by teachers' orientations to learning and teaching. The literature has suggested two different teachers' orientations that effect on their assessment practices. The first one is performance-oriented teachers who value knowledge acquisition and retention. The second one is learning-oriented teachers, who focus on understanding and conceptual change of learners [33]. Researchers have found that while teachers that are performance-oriented tend to use summative assessment strategies such as quizzes and tests, learning-oriented teachers are inclined to use FA strategies such as peer and self-assessment [1], [33]. Research has also shown that teachers' orientation to uncertainty affects their adoption of FA because "…formative assessment requires teachers to tolerate uncertainty, to be flexible, and to take risks" [9, p. 131]. Teachers, who can tolerate the uncertainty in classroom practices and take risks, are more likely to adopt FA.

5) Teachers' Perceptions

Perception is defined in literature as a process or a way people give meaning to their experiences and evaluate others [11] and therefore perception is important as it impacts behaviors and practices. There is a strong association between teachers' perceptions of teaching and learning, and their classroom practices [34]. Teachers' perceptions of their roles in classroom affect their usage of FA. Teachers, who see their role as facilitator and promoters of students' involvement in learning process, are inclined to adopt FA more than other teachers who perceive their roles as lecturer [11], [12]. Furthermore, teachers' perceptions of purposes of FA affect their FA adoption [23], [35]. Teachers, who perceive FA as a way of promoting students' learning, critical thinking skills, and improving learning standards, are more likely to integrate FA into their practices while other teachers, who see assessment as a way to measure students' learning and validate their authoritative knowledge, are inclined to use more summative tests and rely on externally prepaid assessment [36]. Teachers' perceptions of curriculum and students' abilities are, also, effective on their adoption of FA [31]. Research has shown that teachers, who does not view FA as an approach to improve student's learning, may use an FA task for a specific unit but may not adopt FA entirely in their practice [19].

6) Teachers' Self-Efficacy and Motivation

According to Bandura [37], people performances and behaviors are affected by their own abilities and expectations on the desired behaviors. Bandura [37] called "self-efficacy" for people's beliefs in their own abilities to perform a performance and "outcome expectancy" or motivation for people's expectations based on their prior experiences that this performance will produce a desired outcome (p. 217). Teachers' self-efficacy motivates teachers to adopt FA into their practices by overcoming difficulties related to FA [19], [38]. For instance, teachers, who believe that they can control their classroom activities and management issues, are more inclined to practice FA in their teaching. Teachers' extrinsic and intrinsic motivations, also, affect their FA adoption. Teachers, who have positive experiences about the outcomes of FA, tend to frequently use FA in their practices and this intrinsic motivation is needed for teachers to maintain their practices of FA [38]. Moreover, the extrinsic motivations from colleagues, principals, and educators motivate teachers to adopt FA.

7) Teaching and Professional Experience

Teaching and professional experiences of teachers influence teachers' appreciation and adoption of FA [9], [39]. Teachers, who have more teaching experience including "experiences of the topic, of the students as learners, and from having taught the unit of work before", tend to frequently use FA strategies in their practices [9, p. 75], [39]. In contrast, teachers, who have more teaching experience with summative assessment as a learner or teacher, are less likely to use FA [14]. Teachers' professional experiences including participating in PD programs, conferences, and professional learning environments positively affect their use of FA [18], [41]. Particularly, teachers' experience with professional learning promotes them to be their "own agency of change" to use more FA by changing their past summative practices [40, p. 114].

8) Teachers' Conception/Understanding of Assessment

Teachers' decision making about assessment is, also, affected by teachers' conception of assessment [42], which impacts their FA adoption [1], [5], [42], [43]. Teachers' conceptions of assessment have been defined in four aspects: "a) assessment's role in learning; b) assessment's role in teaching; c) assessment's role in the certification of learning; and d) assessment's role in the accountability of learners' achievement" [43, p. 31]. The first two conceptions are related to the notion assessment for learning and the last two are aligned with the notion assessment of learning. Yung [23] studied conceptions of teachers applying classroom assessment and found that teachers who highlighted the assessment of learning concept regarded assessment and teaching as different activities and less likely adopted FA. In contrast, teachers, who emphasized the assessment for learning concept, incorporated assessment and teaching and use more FA. Researchers also have found that teachers' conceptions of assessment are shaped by the tension between external and accountability tests, and their own values and conceptions [1], [3], [42]. This tension may make teachers to only use assessment for summative purposes and perceive FA

as time-consuming, additional workload, and useless activity [1].

B. Contextual Factors

The contextual factors are directly related with the teaching context that includes schools' environment and realities. While these contextual factors are not directly associated with teachers' internal ideas, they affect teachers' decisions about FA. These contextual factors can be listed as follows: a) school context and policy; b) internal school support; c) students' attitude, mistrust, and resistance; d) parents' views; and e) social and cultural preferences.

1) School Context and Internal Policy

Teachers' decision making about classroom assessment is affected by school context and policies [44]-[47]. Researchers have found that school policies usually require teachers to use summative tests to report students' improvement on standards. This causes teachers to struggle to focus whether on the need of the students or the school. Typically, because of the pressure of school administrators and head teachers, they tend to use summative assessment to maintain high assessment scores rather than meeting students' learning needs that requires use of FA [13], [48]. With the pressure of frequent summative school tests, teachers adopt transmission teaching and use test driven activities. Moreover, Wilson-Thompson [47] found that schools do not usually have obvious educational policies about FA which discourage teachers' FA adoption. While almost every school has its own assessment team, which is responsible to develop school assessment policies, this team's lack knowledge of FA limits teachers' usage of FA. Researchers have demonstrated that if teachers have a supportive school context including helpful school principals, assessment team, and head teachers, who are knowledgeable about and supportive of FA, they are more inclined to adopt FA [45], [49].

2) Internal School Support

Successful adoption of FA requires an effective support from and collaboration with colleagues and school leaders, such as principal, head teachers, and department leaders [1], [13], [15], [18], [26], [48], [50], [51]. Particularly, studies on teachers have shown the significance of support and encouragement teachers get from their colleagues to adopt, revise, and reflect on their FA practices. Teachers need time, energy, motivation, and professional support to adopt FA. Researchers have offered building learning communities within and across schools to advance teachers' professional learning as an effective way to enhance teachers' practices of FA [40], [51]. "In essence the term professional learning implies the process of teachers developing their own understanding of the processes involved." [14, p. 107]. Building a learning community among teachers to promote FA has many advantages, such as helping teachers to learn new and reflect on different FA strategies, having time to discuss their own challenges, getting support from colleagues, and helping colleagues to support their adoption.

The role of department heads is important in teachers' adoption of FA [13]. In high school level, the head of department is mediator between school and departmental policies and teachers. Thus, the knowledge and attitude of departments head are significant and they can support or limit teachers' adoption of FA. If the head of department had knowledge and positive attitude toward FA, he/she allocates extra time for teachers to discuss and collaborate to improve FA practices and can integrate FA into departmental policies [27], [49]. Moreover, the critical role of school principals and administrators has been highlighted as an effective factor on teachers' adoption of FA [14], [21], [38], [50]. School principals and administrators have an official power on teachers' practices. If their knowledge and attitudes toward FA are appropriate, they can support school-wide adoption of FA by providing efficient time, motivation, and sources to teachers [14]. However, the research has shown that school principals and administrators do not have appropriate knowledge and attitudes toward FA and they apply pressure on teachers to use summative assessment to improve school success at large scale external exams [14], [21], [51]. Teachers want to see the official support and external motivation from principles, department heads, and other colleagues to adopt FA. If they do not see the official support and external motivation, they will frustrate and continue to apply summative assessment to improve school success rather than students' learning [52].

3) Students' Attitude, Mistrust, and Resistance

Researchers have found that the students' attitude toward, mistrust, and resistance to FA affect teachers' FA adoption [24], [42], [52]. Students' past experiences with summative assessment cause them to have a negative attitude toward FA. This discourages students to use and give feedback to teachers and their peers, which decrease the classroom interactions and teachers' motivations to use FA [51], [52]. It is difficult to change students' perspectives from summative dominated assessment, in which students' grades are competitively compared with others, to FA practices. This absence of grading makes them to mistrust and disregard FA and resist teachers' FA practices. Researchers have, also, pointed out that student' poor attitude, excessive absenteeism, unsupportive approaches, and variety of student ability discourage teachers to adopt FA [42], [52]. Researchers suggest that establishing a trust environment between the teacher and students as a first step to overcome these obstacles [9].

4) Parents' Views

Literature has highlighted the parents' views of assessment as another factor that affects teachers' FA adoption [27], [33], [42], [47], [52]. Parents usually prefer their children to have traditional paper-pencil tests and examinations because they accustom to see grades and marks in order to compare and see the progress of their children [33], [38]. Researchers, also, showed that parents are unwilling and refusing to accept the use of FA for their children because FA tasks are not grade-

oriented [27]. This contributes the tension between summative and FA and forces teachers to use summative assessment rather than FA because it is easy to report graded or marked assessment to parents [42], [52]. Consultation with parents to show the benefits of FA on students' learning has been suggested as a way to overcome this problem [11], [12].

5) Cultural and Societal Preferences

The adoption of FA is, also, affected from cultural and societal preference of all people that are part of the school population such as teachers, students, administrators, and parents [14], [21], [22], [44]. Teaching, learning, and assessment culture of a society influence the school culture and practice. If the new innovation, FA, is relevant to this society and its culture, it can be quickly adopted. Otherwise, the society and culture resist adoption of FA and practitioners can face difficulties to convince parents, administrators, and students to adopt FA [44]. For instance, in Hong Kong, which is mainly dominated with Confucian culture, assessment consists of summative purposes and external examination including competition and is understood as a final point, which shows the result of students' learning and competition, as opposed to an integral part of learning. Researchers have demonstrated that in these kinds of cultures and societies traditional teaching is dominated and teachers face many cultural and societal pressures when adopting FA [20], [33], [44]. Thus, alternative forms of assessment such as FA cannot be adopted by just providing appropriate knowledge, skills, and materials to teachers because the cultural and societal sensitivity should be considered to provide relevant forms of assessment [35].

C. External Factors

The external factors are not under the control of teachers and directly related with the teaching context but they affect teachers' classroom practices and decisions about FA. The following external factors affect teachers' FA adoption: a) state and local educational policies; b) high stakes and accountability assessment; and c) curriculum developers.

1) State and Local Educational Policies

State and local policies as an external factor have a huge impact on teachers' classroom practices including assessment [18], [21], [30]. A review of literature for the effect of state policies on teachers' practices showed that teachers are directly or indirectly affected by these policies [21], which frequently are mentioned as impetus to encourage teachers to apply reforms in their practices. However, the literature cites some negative effects on teachers' practices including assessment. For instance, "No Child Left Behind" (2001) policy in the US and other provincial examination policies for other countries have been discussed in literature and their impact on FA was considered as harmful [49]. Most of the researchers have mentioned about the pressure these policies put on teachers by mandating schools to apply accountability and external examinations [18], [21]. Although the intention of the policies is to improve the accomplishment of educational system and students' success, they may have detrimental impacts on teachers' FA practices [14]. Furthermore, the administrators of governmental agencies who are responsible to control and improve educational systems are mentioned in literature as another important factor that influences teachers' classroom practices [11], [12], [52]. Researchers have highlighted the critical roles of national and local governmental agencies in order to support development and dissemination of FA across schools. However, research has shown that the administrators' lack of knowledge about FA caused those agencies to criticize the validity of FA, "to react defensively and pay more attention to summative than to formative assessment" [52, p. 92].

2) High Stake and Accountability Assessment

The major inhibitor of FA is high stake and accountability assessment, which dominate the educational systems of many countries [1], [5], [16], [19], [30], [48]. High stake tests include standardized tests that aim to certify and measure individual students' knowledge attainment to rise to a higher level while accountability test consists of the national and local exams that aim to maintain school success. The high stake and accountability assessments put pressure on teachers to prepare students for and cover the whole curriculum before these examinations by sacrificing students' learning [1], [11], [12], [42]. Instead focusing on students' learning, teachers prioritize covering the content in high stake and accountability exams in their teaching, teach tricks and test techniques to their students to get higher scores from these exams, and used similar kinds of questions in their classroom assessment [1]. The nature of high stake and accountability exams have been identified as distorting the use of FA and breaking the link between assessment, teaching and learning [16].

3) Curriculum Developers

Curriculum materials such as syllabuses and teachers' source books are another factor that influences teachers' adoption of FA. Teachers generally use nationally or state-wide developed curricula and books as guides that enable them to plan specific teaching and assessment activities [9]. If the curricula and books are appropriately developed, they can promote practice of FA by providing appropriate teaching and FA activities. Curriculum developers should explicitly address the need for FA, provide extra activities, prompts and time, and supply some interactive and flexible FA tasks that engage both teachers and students. However, research has illustrated that even if developers believe in the importance of FA, they generally focused on knowledge acquisition and promote summative assessment activities [14].

D. Resource-Related Factors

Resource-related factors, which are related to resources such as information, material, funding, and time, affects teachers' FA adoption [31], [52]. These factors can be grouped as: a) PD and educational research; b) teacher preparation programs; c) time and crowded curriculum; d) working conditions of teachers; and e) materials and funding.

1) PD and Educational Research

Educational studies, PD activities, and support from academics as external sources of information have significant impacts on teachers' adoption of FA [9], [18], [41], [48], [52], [53]. Teachers want to see successful examples of FA that motivate them to change their assessment practices. When teachers see the contribution of FA on students' learning, they are more likely to change their attitudes toward FA and adopt it [28]. Therefore, academics can play a key role in helping teachers to get the theoretical knowledge of FA and turn this knowledge into classroom practice [53] by highlighting successful examples of FA. However, teachers do not read research literature because of their busy schedule and excessive workload [52]. Therefore, the best way for academics to help teachers improve their FA practices can be done through PD activities that include practical and theoretical knowledge of FA. Researchers have shown many successful PD programs that positively affect teachers' adoption of FA [9], [18], [19], [48]. Participation into PD programs helps teachers to improve their understanding of FA, and enhances the types and frequency of FA used in their practices. PD programs should be designed to transfer the theoretical knowledge of FA into classroom practices. If not, these programs just improve teachers' understanding of FA without changing their practices [51]. Researchers have identified two types of PD programs, namely acquisition and participation oriented PD programs [40]. While participation-oriented PD requests teachers to engage into hands-on activities, in acquisition-oriented PD, teachers are passive and are just informed about FA methods. PD programs for FA should be participation-oriented, provide safe learning environment that encourage discussions, promote collaboration among teachers and researchers, provide flexible time and strategies, and continuous rather than just one shot workshop to improve FA adoption [21], [51].

2) Teacher Preparation Program

Researchers have identified the quality of teacher education program as a factor that impact teachers' use of FA [1], [54]. Several researchers have uncovered that teachers usually leave teacher education programs without an appropriate understanding of FA [46], [54]. Even if some teacher preparation programs provided skills and knowledge of FA, they do not provide time for application of and reflection on FA practices [14]. Accordingly, the newly graduated teachers come into school without having an understanding of and experience with FA, which cause frustration in adopting FA. If they gain confidence with FA in their preparation programs, they will be confident to adopt various forms of FA.

3) Time and Crowded Curriculum

Even if teachers have appropriate skills and knowledge to practice FA, literature has shown that they do not adopt FA because of overcrowded curriculum and lack of time [19], [38], [48]. The pressures teachers feel to cover whole curriculum to prepare their students to external and end-of-year exams affect teachers' use of FA [19]. Furthermore, the dominance of mandatory curricula in schools is mentioned as another factor that increases the pressure on teachers to prioritize coverage of curricula over students' learning [38]. When teachers are asked to adopt FA, they frequently claim they do not have time to use FA [21]. The extra workload related to daily and weekly school rhythms, the pressure of covering curriculum, and lack of time cause teachers to use summative assessment to assess learning outcomes rather than adopting FA to improve students' learning [28], [48]. Reducing workload of teachers and the pressure of covering whole curriculum, encouraging teachers to practice, collaborate, and reflect on FA activities are the ways to eliminate these time and overcrowded curriculum problems [48].

4) Working Conditions of Teachers

Teachers' working condition including class size and number of lessons taught is recognized as a factor that affects teachers' adoption of FA [44]. Researchers have found that it is hard for teachers to use FA in large classes (i.e., more than 39 students) because classroom management, given effective individual feedback, and paying attention to individual students' learning would be extremely difficult [38]. Furthermore, if the number of lessons taught by teachers is high, giving feedback on written work and projects, and management of marking will be infeasible.

5) Materials and Funding

It has been indicated that the availability of assessment materials and funding may affect teachers' use of FA [5], [47]. Teachers need various types of assessment strategies and materials, which are appropriate for their students and teaching unit [54]. However, teachers' misinterpretation of FA as a different form of summative assessment causes them to ask for specific FA items that match the units in their curriculum. This makes it difficult to adopt FA because teachers cannot find appropriate FA tasks for all units and students' needs. The availability of funding for participating FA related PD activities, professional conferences, and purchasing assessment materials have been, also, mentioned as another factor that impact teachers' adoption of FA [44].

IV. Conclusion

This literature review has examined a comprehensive set of factors that affect the adoption of FA to close the gap between the theory and practice. Based on the reviewed literature and adoption of Clarke and Hollingsworth's [17] model of teachers' change environment, this paper proposes a framework that classifies factors that affect teachers' adoption of FA. While this framework is useful in summarizing these factors in a concise way, it has some limitations. First, the importance of these factors may change from teacher to teacher, school to school, and culture to culture. Therefore, a more interactive framework is needed to highlight the importance of these factors and how they interact for a specific classroom case. In particular, some factors can be prioritized by teachers based on their knowledge and

personality, and the culture. The current framework does not consider cultural and personal differences in adoption of FA. Moreover, this framework does not explain the interaction between macro-level factors and their direct impact on teachers' adoption of FA.

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