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Microcredentials as Effective Student Motivators to Enhance Academic Engagement and Progress of High School Students: A Scoping Review

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Abstract: This scoping review discusses findings in relation to the use of technology in the form of microcredentials for high school students. It found that students may benefit from rewards for their efforts with microcredentials as an extrinsic motivational factor that could positively enhance motivation to learn and engage in academic activities. Positive feedback using the award of microcredentials for personal individual achievement tend to lead to support student engagement and motivation and increase self-efficacy, which may result in increased motivation to learn and engage in learning activities. In this regard, evidence suggests that teachers play an important role in motivating students and support them in experiencing academic progress. However, some scholars indicated that the provision of microcredentials as extrinsic rewards may have a negative effect on students' motivation to learn and be counterproductive for their intrinsic motivation. While the implementation of microcredentials is a relatively novel way in the secondary education context, some limited studies indicated that awarding them provides excellent opportunities to celebrate learning progress and create personalized educational experiences in the traditional classroom with the potential to positively influence self-efficacy and motivation to learn. In this regard, it was observed that studies frequently combined different technologies in the form of gamification and microcredentialing, an issue which required further elaboration by this scoping review along with the need for further research.

Keywords: Academic progress; Badges; Gamification; Motivation; Microcredentials; Student engagement; Self-efficacy; Academic progress

1. Introduction

A recent Australian study found that high school students' disengagement and lack of motivation to learn has substantially increased over the past years[1]. As educational leaders, the authors have first-hand experience in the importance of the need to investigate the proactive strategies of positively influencing students' motivation,

engagement, and self-efficacy in high school settings by integrating technology, which may result in academic progress and positive student experiences. We argue that contemporary society teachers ought to integrate technology into lessons so that students experience technology enhanced learning on a regular basis. The first author has successfully incorporated online badges in his classroom, which the students appreciate and enthusiastically work towards receiving. This article resulted from the desire to make a positive contribution to high school students' learning and development.

The literature review commences with an overview of global changes in the field of education. This will be followed by a discussion of areas that have been investigated in this study, namely: microcredentials; motivation, engagement, self-efficacy, and academic progress. While these concepts are discussed separately below, it is important to note that they are not mutually exclusive and that there is a degree of overlap.

1.1 Global Changes in the Field of Education

No industry has changed more significantly than technology in the past 50 years.[2] Given the changing educational environment, innovative approaches to student success are important.[3] One such innovation is the integration of technology to enhance student experiences by different means including the provision of microcredentials, which have been defined as "any virtual representations of a skill or knowledge that learners can use to paint a picture of their unique skills".[4]

1.2 Microcredentials

Microcredentials have become increasingly popular in educational settings, not only at university and vocational training levels, but also in primary and secondary education. They recognize and document students' accomplishments, skills, and experiences in any curriculum context including desired socio-emotional skills (e.g., collaboration, empathy, leadership, and problem solving), which are particularly important in contemporary society.[5,6] The microcredential can be shared and showcase specific skills acquired during the secondary school context, which may assist in high school students being admitted to university or securing an apprenticeship.

While to date, no universally accepted definition of microcredentials exists, the literature indicates that they share specific characteristics including them being visual representations of what they represent. In other words, they show a specific outcome, competency, skill or achievement. One form of microcredentials becoming increasingly popular are digital badges that have been introduced in classrooms. The provision of microcredentials in education emerged later, about a decade ago, which is considered a novel approach in the traditional classroom and recognized as an important emerging trend to recognize student academic achievement. Comparison studies between traditional school curricula with complementing technology including microcredentialing found pedagogical benefits. For example, Young and associates in a pilot study examined how earners perceived the provision of seven different microcredentials throughout their basic engineering training. Each task, including assessment of knowledge and skills, was connected to a badge that could be claimed once the task was successfully completed. The study involved 173 learners who had collected the microcredentials throughout their training and provided feedback via an online survey specifically about the reward system. Findings indicated that the provision of microcredentials was perceived very positively and that earners added them to their CV, along with sharing them on social media (e.g. Facebook) to inform their peers. Learners indicated that the microcredentials helped them develop and advance specific knowledge, skills and proficiency in their area of study. Furthermore, the researchers found that the benefits of awarding microcredentials in the learning environment extended to the training providers in that the program was promoted by the earners themselves and consequently attracted new learners. The researchers concluded that the microcredentialing program was successful and that it was valued by the engineering students.[7] However, the issue of providing badges in educational contexts has been discussed controversially in the literature.

1.2.1 Criticisms

Some scholars expressed open critique about the use of microcredentials as extrinsic motivators, which represent a form of tokenization arguing that may be counterproductive and diminish learners' intrinsic motivation.[8] Hickey and Schenke agreed, indicating that the role of microcredentialing as an external

motivator may result in student disengagement and reduce their intrinsic motivation to learn.[9] However, they conceded that the provision of microcredentials has the potential to support learning.

1.2.2 The future of microcredentialing

Given the global skills shortage and the desperate need of the workforce, there is general agreement that the importance of microcredentials will increase in the future.[10] Furthermore, globalization enables individuals worldwide to earn microcredentials online and seek employment opportunities without local restriction. In this regard, research started to emerge that points to the need for school leavers being able to demonstrate desired skills if they wish to enter the workforce rather than pursue tertiary education.[11] Skills that are desired by the labor market in contemporary society and the rapidly changing marketplace, which are particularly important for those who are entering the workforce, can be showcased by holders of microcredentials. Consequently. microcredentials offer evidence of specific skills, which make them important for the industry and education sectors. The success of implementing microcredentials is based on student motivation to engage in learning activities and their perceived self-efficacy. It should be noted that the issues of motivation, engagement and self-efficacy are heavily interrelated. They are briefly discussed below.

1.3 Motivation

Motivation is at the heart of the credentialing process as microcredentials can create motivation.[12] Student perceptions of a learning activity may change from being mundane or even undesirable to interesting as a result of being motivated by earning a microcredential. However, the relationship between motivation and learning is complex and has elicited much theoretical controversy (see discussion above). Unsurprisingly, numerous motivational theories have been developed over the past decades to explain the concept of motivation. The limited scope of this article does not allow sufficient examination of motivation. However, it is important to note that motivation can be intrinsic (internal) or extrinsic (external). Intrinsic motivation is demonstrated if the person shows specific attitudes towards an activity without an external reward – the activity itself is perceived as the reward. This means, an intrinsically motivated individual completes an activity for the inherent satisfaction of the activity. By contrast, extrinsic motivation is experienced when an activity is completed to achieve an outcome. In other words, a certain behavior (e.g., learning engagement) is driven by an external factor (e.g., the reward of being provided a microcredential). The successful provision of microcredentials is associated with students' perceived mastery of a task. This means, it should be appropriately challenging for an individual student to earn. If the microcredential is too easy to achieve, the student is likely to lose interest as mastery is not necessary. On the other hand, if it is too difficult, the student's beliefs of 'out of reach' may result in lack of motivation to invest the necessary effort to earn the microcredential. Therefore, teachers encourage students to engage with challenging tasks to achieve academic progress. Furthermore, motivation is related to social engagement in terms of specific goal directed behavior and academic outcomes. This means that teachers can have a positive influence on student engagement and motivation.

Meylan and colleagues[13] in a Swiss study of 287 high school students examined teacher behaviors in terms of motivation to learn and emotional distress using a survey questionnaire. Results indicated that students valued teacher support, particularly when they experienced personal issues and/or academic difficulties. Students reported that they were better able to cope, and that teacher support was an important factor in their emotional wellbeing and academic engagement. It also highlighted that even if students experience distress, their ability to cope with life stresses can be positively influenced in the classroom through encouragement such as positive feedback.

1.4 Engagement and self-efficacy

As discussed above, a steady decline in student engagement has been observed in the literature. Therefore, supporting student motivation and promoting engagement means that innovative opportunities for learning need to be created. Even though research on student engagement is limited, studies indicated that technology integration can enhance student engagement.[14] Furthermore, indicators of engagement include not only on task behaviors such as the completion of homework, but also personal

factors, such as self-efficacy perception. This means that student engagement appears to positively influence self-perception and efficacy.

The concept of self-efficacy has received increased attention in education as it has a positive effect on a person's mental health as well as helping an individual to develop resiliency. Consequently, self-efficacy is a psychological resource that not only protects students' mental health but also mitigates against negative effects of stress. Self-efficacy has been defined as someone's capability of coping with life's stresses such as academic demands in a specific subject area.[15] In this regard, microcredentials offer an opportunity for the provision of positive and personalized feedback.

1.4.1 Positive feedback and personalized learning

Research consistently indicates that positive feedback from teachers enhances perceived self-efficacy and academic performance of students.[16] The provision of individual badges may be perceived as feedback for student efforts. Creating a rich learning experience that motivates academic engagement has been described as a specific role of teachers. Therefore, a personalized approach is critically important for students, particularly those with low self-efficacy beliefs and when task complexity is considered. Personalized attention such as receiving a microcredential may encourage task participation for students even if they may be less vocal in the classroom. Given the pedagogical challenges in high school education, and the influence of students' affective states in engagement, recent technological advancements lend themselves excellently to provide personalized learning experiences with the potential to enhance academic progress.

1.5 Academic progress

Academic progress requires adequate engagement with learning tasks and progression towards meeting the learning objectives set out in the subject area. Given the importance of academic achievement to increase the probability of entering a high school student's chosen postsecondary pathway, its positive influence is crucial. As discussed above, a range of factors account for academic progress including self-efficacy and motivation to learn.

Dubuc and colleagues[17] conducted a longitudinal study among 185 Canadian high school students enrolled in years 7–9 to investigate the most important elements related to effective academic progress including motivation and self-efficacy along with socio-demographic characteristics. The students' mean age was 13 years (115 girls, 70 boys) with 61% of students being Caucasian, 22% being Asian and 17% being of another Ethnicity. The majority of students came from high income families. The study was conducted in numerous subjects (i.e., French, mathematics and science) with the same students and data were collected over the course of three years. Findings indicated significant gender differences whereby girls performed more consistently and at a higher rate when compared to boys across all subjects. Furthermore, academic progress varied across subjects and decreased with increasing age. Younger students enrolled in year 7 were more motivated to learn and had higher levels of self-efficacy when compared to those enrolled in year 9. Following on from these results, the researchers pointed at the need to investigate factors associated with academic progress across both sexes separately to obtain a more accurate picture of motivation and self-efficacy along with other influencing factors that contribute to academic progress and outcomes. It follows, therefore, that by encouraging students, teachers who set a higher standard of achievement (e.g., using microcredentials to reinforce students' efforts) motivate students to persist in their tasks, which may be supported through the provision of microcredentials.

2. Methods

Scoping reviews have been used in educational research, which have been described by Peters and colleagues[18] as a type of systematic review that is chosen when a topic under investigation typically does not have a lot of scientific evidence due to its novelty. Given that the issue of microcredentialing in high school is not well understood and is still in its infancy with some contradictory assessment in the literature, a systematic review of the current knowledge utilizing a scoping review approach was warranted.

As discussed previously, to date, there is no agreed definition of what microcredentials represent. For the purpose of this study, the following definition has been adopted: "Microcredentials are a record of the learning outcomes that a learner has acquired following a small volume of learning. These learning outcomes will have been assessed against transparent and clearly defined

criteria".[19]

2.1 Search strategy

The search method was systematic and structured as follows: First, consideration was given to the databases selected in an attempt to minimize bias of selecting publications. Records were identified using ERIC, Google Scholar, Scopus and Web of Science databases from 19 March to 25 April 2024. Previously identified keywords (see **Table 1**) derived from examining the literature in relation to technology, high school students in education were combined with Boolean phrases (AND, OR) to identify relevant studies.

Table 1. Keywords used to search the databases

Keywords used to search the databases	
Education	*Education*, *Engagement*, *Motivation*, *Self – Efficacy*, *Academic*, *Progress*
Technology	*Badges*, *Microcredentials*
Students	*Student*, *teacher*, *high school*, *secondary*

The following inclusion criteria were applied: Only academic articles, books or book chapters published in English from 2016 to present that addressed the provision of microcredentials within the high school curriculum. We were conscious of the need for transparency and a systematic approach of the data extraction process to ensure trustworthiness, which was strictly followed including producing a data chart (see **Figure 1**).

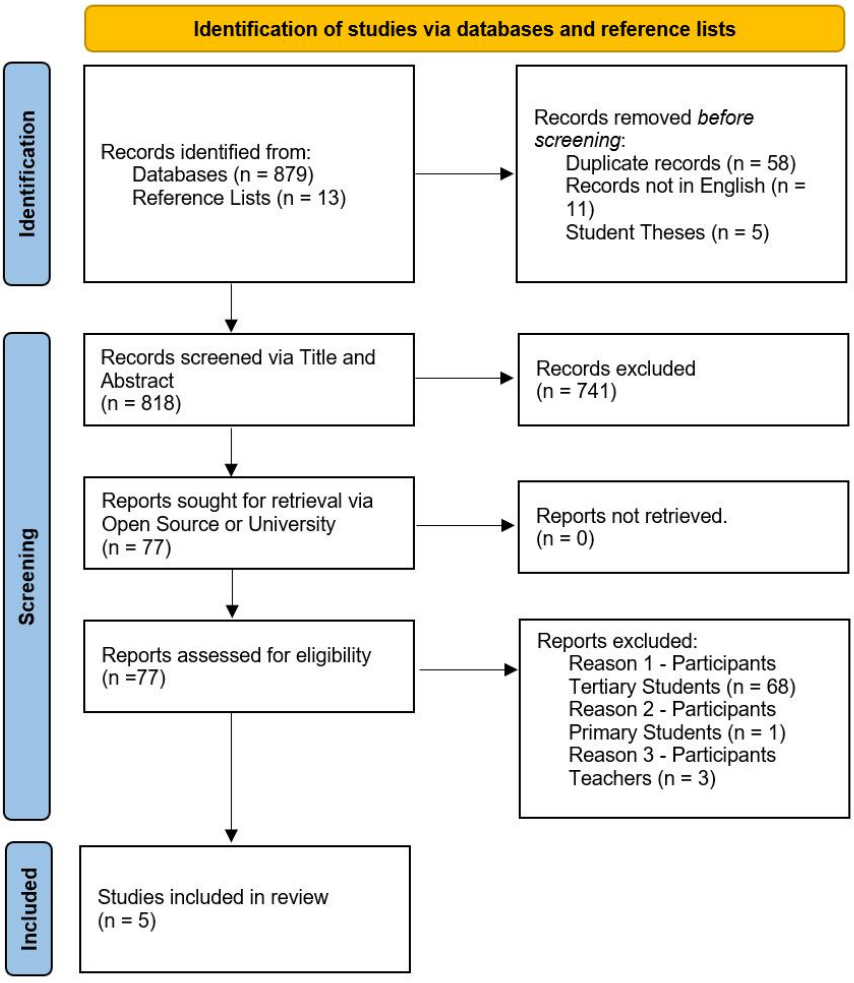

Figure 1. PRISMA Flow Diagram

The above figure indicates that we identified 879 records from the database searches and a further 13 from the Reference Lists. A total of 892 records were identified including 58 duplicates, 11 not being in English (e.g., Dutch, German, Spanish, and Portuguese), and five student theses, which were removed before 818 records were screened via title and abstracts. The screening process resulted in 741 records being excluded following assessment via the inclusion criteria. We retrieved 77 reports (fulltext academic articles and books) via open sources and accessing the university's online library. After reading 77 fulltext articles and book chapters, we ended up including five studies for analysis. Reports were excluded for three reasons: firstly, 68 studies used tertiary students as participants; secondly, one study used primary students as participants; and thirdly, three studies used teachers as participants. When the publications did not focus on the provision of microcredentials in the high school context, we used them in the literature review if appropriate.

3. Results

Table 2 provides information on the analyzed studies. Given that research on the use of microcredential provision in the high school context is in its infancy, it is not surprising that despite extensive efforts, only five studies could be located.

Table 2. Included studies in the analysis

Included studies in the analysis			
Bell and Davi	2016	USA	Qualitative
Da Rocha Seixas *et al.*	2016	Brazil	Quantitative
Hennah and Seedy	2017	UK	Quantitative
Laubersheimer *et al.*	2016	USA	Qualitative
Rincon-Flores *et al.*	2023	Mexico	Mixed Methods

Bell and Davis[20] in a study of five (four girls and one boy) secondary school students examined how participating in the design of digital badges were perceived in an after-school science program aged between 15 and 18 years. The purpose was to examine how adolescents' learning can be most effectively promoted. The study involved collecting audio-visual data of six sessions that were analyzed using a qualitative approach. The study found that students valued the opportunity and took ownership of their learning, which gave them a sense of agency. The researchers concluded that microcredentials lend themselves to track students' progress and allowed them to display their individual knowledge and skills acquired over time whereby microcredentials are used to recognize these skills in different science domains such as biology, health and physics. The set of microcredentials in a specific area indicated that a variety of activities and skills were linked to demonstrate learning pathways. Given that the study was very small with five students, of which only one was male, no gender comparisons were made.

Da Rocha Seixas and associates[21] examined how high school students experienced rewards in the form of badges and whether these rewards made a difference in their academic outcomes. The study consisted of 61 girls and boys aged 13-14 years enrolled in a public school in Brazil, South America. Even though the study included the award of microcredentials for educational activities in a geometry class, there was a component of using online gaming technology. The researchers used Facebook groups to communicate with students and microcredentials were given for their engagement online. Furthermore, the researchers investigated student and teacher perceptions through a short questionnaire and an interview. Results suggested that students appreciated being rewarded with a microcredential for activity completions in geometry. Furthermore, those students who were awarded a microcredential also had higher engagement indicators. The teacher interview found that students who had a higher engagement score were also motivated by the expectation of receiving a microcredential. The study concluded that the microcredentials acted as an active motivator for student engagement. We observe that microcredentials in combination with gaming technology and the utilization of social media in combination appear to be an integral and effective

motivator for student engagement.

Hennah and Seedy[22] conducted a study among 39 Year 12 students in the UK who had to demonstrate specific oracy skills to earn microcredentials. The researchers provided the students with three microcredentials after successfully completing practical tasks that are important for entering university or seeking employment in the laboratory field. These credentials provide evidence of being able to show practical laboratory skills (i.e., accurately measuring the volume of a liquid, using a volumetric flask, buret and pipet, and interpreting acid-based indicators in titrations). The teachers created microcredentials for each of the three procedures that needed to be completed competently. The researchers reported that students regarded the badge as an incentive for best effort. The researchers concluded that this approach assisted students developing and demonstrating proficiency in the required technical skills upon which they received a credential that shows their competency using laboratory equipment. However, the study provided no information on the students' demographics and the students were not interviewed about their attitudes towards receiving microcredentials. While the teachers' observations are valuable, further research could examine how students perceive microcredentials with a larger cohort and whether students are motivated to engage with the tasks differently upon the prospect of being awarded a microcredential.

Laubersheimer and associates[23] conducted a quantitative pilot study with 27 high school students in an English class using gamification and the award of four badges to increase engagement and motivation acquiring information literacy skills. The researchers defined these important skills to be successful at university. The students worked independently at their own pace, engaging with the BadgeOS platform and upon successfully completing a quiz after six tasks, were awarded a microcredential. They could earn a total of four badges. Comparisons with the information literacy skills at the beginning of the semester and after completing the class indicated that a modest improvement was observed after the results were recalculated removing scores that were lower post-test than pre-test. The researchers argued that those students likely did not take the test seriously, which skewed the results. Unfortunately, no information on students' demographic characteristics was provided, which is a major limitation of the study. It concluded that awarding microcredentials along with implementing a gamification tool is a successful approach to motivate students to develop essential information literacy skills.

Rincon-Flores and colleagues[24] investigated whether the use of gamification including the award of microcredentials enhanced high school students' motivation to learn mathematics and reduced procrastination behaviors. The study used a mixed methods approach with 454 high school students who completed a pre- and post-test questionnaire and a focus group with teachers. For the purpose of this study, only the quantitative results are reported here. The students who were enrolled at a large high school in Mexico completed a pre-test questionnaire on their attitudes towards mathematics at the beginning of the first semester 2022. Slightly more males (49.8%) than females (48.9%) participated in the study who were aged between 14 – 18 years old. The vast majority of students was 15 or 16 years old (n = 323), followed by 65 students aged 17 years and 54 14-year-olds. Only 12 students were 18 years old. No information was provided on gender differences in relation to age. The study used a gamification platform called Gamit!, which incorporated the award of digital badges to recognize students' skills and achievements to counter students' "Math Anxiety" (p. 2). Findings indicated "an increased liking of mathematics" (p. 5) along with reduced anxiety and enhanced enjoyment engaging with the subject. However, the researchers reported that the study did not find statistically significant differences between pre- and post-test. Conclusions included that the combination of gamification and the provision of microcredentials improved students' enjoyment of mathematics while it reduced anxiety, perhaps increasing self-efficacy beliefs.

4. Discussion

Findings revealed some interesting patterns. All but one of the studies used small to very small samples from five students to 61 students, with the exception of the Mexican study with 454 mathematics students. Two studies were conducted in the USA, two in South America, and one in Europe. Subjects appeared to be mainly STEM related with the exception of one study that focused on information literacy skills.

Participant information was sometimes non-existent or very limited, making replication and comparison challenging. Interestingly, studies that focused on academic subjects almost always combined microcredentialing with a gaming approach. Three of the four identified studies used gaming and microcredentials as a technology in combination, which requires further examination.

4.1 Combining gaming and microcredentials as technologies

Gamification in combination with microcredentials is used in tertiary education settings. For example, Balci and colleagues[25] used gaming elements to motivate 102 undergraduate students in physics to engage with the learning materials. The researchers reported that 40% of students demonstrated improved academic outcomes as a result of this approach.

Similarly, a study by Hensiek and associates[26] among approximately 1000 undergraduate chemistry students in India examined the impact of providing microcredentials to improve and assess laboratory skills. A second aim of the study was to assist students to demonstrate these skills when applying for employment in the STEM field following completion of their university studies. Results indicated that 681 students demonstrated the necessary skills to be awarded with three badges during the course of the semester. In a follow up survey, these students indicated that they increased in confidence and were motivated to work hard in an attempt to be awarded the credentials.

As discussed above, several studies utilized computer games in combination with awarding microcredentials for a range of subjects resulting in enhanced academic progress. In this regard, the studies found that the award of microcredentials increased the desired behaviors such as engagement with the learning materials through positive reinforcement, which benefitted students. We agree with scholars advocating for positive reinforcement being used in the classroom to improve student engagement, and as a result, academic progress. The findings of this study indicate that the provision of incentives in the form of microcredentials is an appropriate strategy to improve motivation to learn, student engagement and academic progress in education generally, but specifically among high school students. Against this background, it is difficult to argue that rewarding students with a microcredential is inappropriate. Scholars who argue that reinforcement is bribery and as such unethical, fail to recognize that commonly bribery involves some adverse elements. Indeed, positive reinforcement for individual engagement in learning activities and reinforcing effort and improvement can hardly be defined as bribery. In summary, critiques continue to point out that rewarding desired academic behavior undermines a student's intrinsic interests, which means, the student will not want to engage in academic work for the sake of studying. Given the limited amount of research to date, further research on the evidence of the use of microcredentials is urgently needed. These studies may shed light into methodological issues such as characteristics of studies including gender differences, small participant numbers, lack of student voices in relation to motivation, self-efficacy, engagement and the use of microcredentials as rewards. Furthermore, student attitudes require examination. For example, an urgent research question could examine whether or not students with different economic backgrounds and social status value the provision of microcredentials equally.

In relation to combining gamification and microcredentials, further research should specifically investigate possible limitations of such an approach. Some recent research emerged on the critique of implementing gamification in the classroom[27] such as the impact on students' ability to collaborate with others given that gamification involves individual self-directed learning, which should be closely examined. Another issue requiring further investigation is teacher attitudes. It is possible that the integration of new technologies in the curriculum is not readily accepted by certain teachers. While we argue that technology in the form of positive reinforcement with microcredentials and/or gamification should be used in the classroom to improve student engagement, and as a result, academic progress, we are aware of gender and other differences. An Australian study among 201 secondary English teachers showed, there is considerably hesitancy among educators to implement technological tools into the curriculum. Consequently, gaining insight of secondary educators' attitudes and beliefs in relation to integrating the provision of

microcredentials and other technological tools such as gamification into the curriculum, will be beneficial for the planning and implementation process.

5. Limitations

Even though we conducted this scoping review with care using a systematic process in an attempt to apply rigor and transparency, several limitations must be considered. First, there is a possibility that we missed a relevant study in the extraction process. Second, we applied a year of publication restriction and only reviewed publications in English. Consequently, it is possible that we overlooked significant research published in a language other than English. Finally, due to the nature of a scoping review, there was no quality assessment of the studies that we included. However, we emphasized methodological issues identified in the studies we included in our analysis.

6. Conclusion

This study set out to review the academic literature to examine how the provision of microcredentials supports student engagement and motivation to learn, which in turn may be associated with academic progress. The publications analyzed illustrate that currently, microcredentials are used in the education sector to demonstrate competencies important for the labor force, which includes high school students who wish to pursue tertiary studies or the workforce. Findings of this scoping review indicated that most commonly, microcredentials are used in relation to adult education contexts, which is reflected in the fact that most research articles found were in the tertiary education sector. The research discussed in the literature review indicates that students may benefit from rewards for their efforts with microcredentials as an extrinsic motivational factor that may positively enhance self-efficacy and learning engagement.

Findings of this scoping review confirmed that there is a very limited number of studies that examined the provision of microcredentials for high school students. Most studies combined the reward system in the form of microcredentials with gamification. Based on this combination, it is difficult to draw conclusions on the issue of microcredentialing alone. Studies on the evidence for the use of microcredentials as rewards either by themselves or in combination with gaming maintain or enhance students' interest in academic work. This means, the provision of microcredentials appears to be beneficial as they establish interest in academic activities and enhance effort and persistence when working on a specific task, particularly when microcredentialing is combined with gaming technology. Indeed, microcredentials are task rewards that reinforce desired behavior as they increase the rate of engagement. Unsurprisingly then, it can be concluded that microcredentials will be used increasingly in the future in the vocational and higher education sectors. We found no evidence that extrinsic rewards in the form of microcredentials resulted in lack of engagement, self-efficacy beliefs and reduced academic progress. On the contrary, microcredentials as tokens have shown to be powerful motivators to engage in learning tasks with or without other technological tools (i.e. video games). Microcredentials, therefore are modern tokens that reinforce desired academic behaviors. They raise the level of academic engagement.

Further research is needed to examine whether students would respond to the award of microcredentials as expected and whether or not they respond differently in relation to self-efficacy beliefs and motivation to learn when gaming technology is not included. We strongly believe research in this area is very timely and it is important to explore students' perceptions using a qualitative approach to give them a voice as a future step.

From an educational leader perspective and knowing that teachers play an important role in motivating students and supporting them to achieve academic progress, they need to be convinced that awarding microcredentials provides excellent opportunities to celebrate learning processes and creates personalized educational experiences in the traditional classroom with the potential to positively influence self-efficacy and motivation to learn. Consequently, researching how teachers can be motivated to engage with the available technology in a meaningful way to enhance their curriculum is critically important. This will advance knowledge and influence policy and practice to benefit students' academic progress.

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Conflict of Interest

The authors declare no conflict of interest.

References

[1] Berry A and Picker K. When students feign interest: New research shows how to get them back. Australian Council for Educational Research (ACER). Available from: https://www.acer.org/au/discover/article/when-students-feign-interest-new-research-shows-how-to-get-them-back [Last accessed on 04 April 2025]

[2] Ellis L E, Nunn, S G, Avella, JT. Digital badges and micro-credentials: Historical overview, motivational aspects, issues and challenges. In Ifenthaler D, Bellin-Mularski N, Mah DK (editors). Foundation of digital badges and micro-credentials: Demonstrating and recognizing knowledge and competencies. New York: Springer International Publishing; 2016. p. 3 – 21 (p. 11).

[3] Kilag, OKT. Exploring the connection of school leadership, educational effectiveness and professional learning: A focus on school leader as researcher. *International Multidisciplinary Journal of Research for Innovation, Sustainability, and Excellence*, 2024; 1(2):57 - 63. https://risejournals.org/index.phpimjrise/article/view/43.

[4] Rimland EA and Raish V. Digital badges: How schools and libraries use them today. *American Libraries*, 2019; 50(5):49. https://americanlibrariesmagazine.org/2019/05/01/digital-badges/. (p. 49)

[5] Gooch M, Chaktsiris M, Jae K, Patterson L, *et al.* The future is micro: Digital learning and micro-credentials for education, retraining, and lifelong learning. Ontario, Canada. Available from: https://fsc-ccf.ca/wp-content/uploads/2022/03/TheFutureisMicro-Report-ENG.pdf. [Last accessed on 04 April 2025]

[6] Organisation for Economic Co-operation and Development (OECD). *Future of education and skills 2030/2040*. Paris, France. Available from: https://www.oecd.org/education/2030-project/teaching-and-learning/attitudes-and-values/.

[7] Young D, West RE, Nylin TA. Value of open microcredentials to earners and issuers: A case study of national instruments open badges. *International Review of Research in Open and Distributed Learning*, 2019; 20(5): 104 - 121. http://www.irrodl.org/index.php/irrodl/article/view/4345/5241.

[8] Casilli C and Hickey D. Transcending conventional credentialing and assessment paradigms with information-rich digital badges. *The Information Society*, 2016; 32(2): 117 – 129. https://doi.org/10.1080/01972243.2016.1130500.

[9] Hickey DT and Schenke K. Open digital badges and reward structures. In: Renninger KA and Hidi SE (editors). The Cambridge handbook of motivation and learning. Cambridge: Cambridge University Press; 2019. p. 209 – 237.

[10] Varadarajan S, Ling Koh JH, Daniel BK. A systematic review of the opportunities and challenges of micro-credentials for multiple stakeholders: Learners, employers, higher education institutions and government. International Journal of Educational Technology in Higher Education, 2023; 20(1): 1 - 24. https://doi.org/10.1186/s41239-023-00381-x.

[11] European Centre for the Development of Vocational Training. *Microcredentials for labour market education and training: Microcredentials and evolving qualifications systems*. Thermi, Greece: Publications Office of the European Union, 2023. Available from: https://data.europa.eu/10.2801/566352

[12] Steinmayr R, Weidinger AF, Schwinger M, Spinath B. The importance of students' motivation for their academic achievement – replicating and extending previous findings. *Frontiers in Psychology*, 2019; 10: 1730. https://doi.org/10.3389/fpsyg.2019.01730.

[13] Meylan N, Meylan J, Rodriguez M, Bonvin P, et al. What types of educational practices impact school burnout levels in adolescents? *Open International Journal of Environmental Research and Public Health*, 2020; 17: 1152. https://doi.org/10.3390/ijerph17041152.

[14] Hickey SB. Conceptualizing goals in motivation and engagement. In: Renninger KA and Hidi SE (editors). The Cambridge handbook of motivation

and learning. Cambridge: Cambridge University Press; 2019. p. 547 – 565.

[15] Pfeifer C, Schönfeld P, Wolters G, Aust F, *et al*. Well done! Effects of positive feedback on perceived self-efficacy. *Frontiers in Psychology*, 2020; 11: 1008. https://doi.org/10.3389/fpsyg.2020.01008.

[16] Young D, West RE, Nylin TA. Value of open microcredentials to earners and issuers: A case study of national instruments open badges. *International Review of Research in Open and Distributed Learning*, 2019; 20(5): 104 – 121. http://www.irrodl.org/index.php/irrodl/article/view/4345/5241.

[17] Dubuc M, Aubertin-Leheudre M, Kareli AD. Predictors of academic performance in high school students: The longitudinal ASAP study. *International Journal of Exercise Science,* 2022; 15(4): 616 – 631. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9365103/pdf/ijes-15-4-616.pdf

[18] Peters MD, Marnie C, Tricco AC, Pollock D, *et al*. Updated methodological guidance for the conduct of scoping reviews. *JBI Evidence Synthesis,* 2020; 18 (10), 2119 – 2126. https://doi.org/10.11124/BIES-20-00167.

[19] European Centre for the Development of Vocational Training. *Microcredentials for labour market education and training: Microcredentials and evolving qualifications systems*. Thermi, Greece: Publications Office of the European Union, 2023. Available from: https://data.europa.eu/10.2801/566352 p. 25.

[20] Bell A and Davis K. Learning through participatory design: Designing digital badges for and with teens. *Paper for the IDC '16: Proceedings of the 15th International Conference on Interaction Design and Children*, 218 – 229. Salford, UK, 2016 June 21 - 24. Salford, UK: IDC Interaction Design and Children. Available from: https://dl.acm.org/doi/abs/10.1145/2930674.2930705.

[21] Da Rocha Seixas L, Gomes AS, de Melo Filho IJ. Effectiveness of gamification in the engagement of students. *Computers in Human Behavior,* 2016; *58,* 48 – 63. https://2/dx.doi.org/10.1016/j.chb.2015.11.021

[22] Hennah N and Seery MK. Using badges for developing high school chemistry laboratory skills. *Journal of Chemical Education,* 2017; 94, 844 – 848. https://doi.org/10.1021/acs.jchemed.7b00175.

[23] Laubersheimer J, Ryan D, Champaign J. InfoSkills2Go: Using badges and gamification to teach information literacy skills and concepts to college-bound high school students. *Journal of Library Administration,* 2016; 56(8), 924 – 938. https://doi.org/10.1080/01930826.2015.1123588.

[24] Rincon-Flores EG, Santos-Guevara BN, Martinez-Cardiel L, Rodriguez-Rodriguez NK *et al*. Gamit! Icing on the cake for mathematics gamification. *Sustainability,* 2023; 15, 1 - 13. https://doi.org/10.3390/su15032334.

[25] Balci S, Secaur JM, Morris BJ. Comparing the effectiveness of badges and leaderboards on academic performance and motivation of students in fully versus partially gamified online physics classes. *Education and Information Technologies,* 2022; 27, 8669 – 8704. https://doi.org/10.1007/s10639-022-10983-z.

[26] Hensiek S, DeKorver BK, Harwood CJ, Fish J, *et al*. Improving and assessing student hands-on laboratory skills through digital badging. *Journal of Chemistry Education,* 2016; 93, 1847 – 1854. https://doi.org/10.1021/acs/jchemed.6b00234.

[27] Zhanni, L. (2023). The effectiveness of gamified tools for foreign language learners (FLL): A systematic review. *Behavioral Sciences*, 13, 331. https://doi.org/10.3390/bs13040331

[28] Guiterrez A, Mills K, Scholes L, Rowe L, *et al*. What do secondary teachers think about digital games for learning: Stupid fixation or future education? *Teaching and Teacher Education,* 2023; 133, 1 – 12. https://doi.org/10.1016/j.tate.2023.104278.