How using a response system in blended synchronous seminars encourages online and onsite student participation

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Abstract

The interest in blended synchronous learning environments has increased dramatically since the COVID-19 pandemic. However, a key challenge is how to simultaneously encourage online and onsite student participation. Response systems have been found to stimulate student participation in classroom and online education settings. This study investigates how online and onsite students participate in blended synchronous seminars where a response system is being used. The data comprises observations of blended synchronous seminars, students' written reflections, and student interviews, all of which were thematically analyzed. It was found that using a response system encouraged online and onsite students to participate in various ways. Although online students mostly remained quiet, they perceived to engage through listening and thinking, participating in the seminars by absorbing information, and interacting with the content displayed via the response system. The onsite students participated vocally and more spontaneously. All students participated in written, anonymous, and game-based modes, suggesting that there were different and complementary ways for students to participate when using a response system, which extended beyond merely talking or chatting. Notably, most students perceived the response system crucial to their participation in the blended synchronous seminars. The findings underscore the importance of encouraging student participation in blended synchronous learning environments, highlighting response systems as effective tools to encourage onsite and, particularly, online student participation.

Keywords Blended synchronous learning environments · Student participation · Response systems · Teacher education · Teaching strategies

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Published online: 04 April 2024

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1 Introduction

Higher education institutions worldwide have adopted information and communication technology to provide students with more flexible ways of participating in courses, such as blended synchronous learning environments (BSLEs) (Bower et al., 2015). In these environments, sometimes also referred to as synchronous hybrid virtual classrooms (Raes et al., 2020a), synchronous hybrid learning (Buts & Stupnisky, 2016), and synchromodal learning (Bell et al., 2014), some students participate in educational activities onsite, while others simultaneously participate in the same activities remotely, through a video conference, from a place of their choice (Raes et al., 2020b). Although delivering higher education courses in a blended synchronous mode affords benefits such as making campus courses more flexible, several challenges remain, often related to online students' lack of engagement and motivation and to how teachers can design educational activities that facilitate student participation, an important factor for learning (Bower et al., 2015; Lakhal et al., 2017; Raes et al., 2020a; Shi et al., 2021; Weitze, 2015). Since the concept of student participation can be regarded as both "taking part" and "being part" (Sfard, 1998), it is not enough to only study the explicit process of taking part, for example, by transcribing student talk during blended synchronous seminars. We also need to study the implicit process of being part, which is more about students' perceptions, if and how they feel that they are participating (Hrastinski, 2008). To better understand the students' viewpoints regarding their participation, we consider conducting interviews a vital component of the data collection process in this study, complementing the observations and written responses.

Response systems (RSs), also known as student, class, and audience response systems, allow students to, often anonymously, answer and submit questions through their devices (Einum, 2020; Kay & LeSage, 2009). These systems have been used in educational activities since the 1970s, primarily aiming to encourage student participation, engagement, and motivation (Blasco-Arcas et al., 2013; Chan et al., 2019; Henrie et al., 2015; Han & Finkelstein, 2013; Hunsu et al., 2016). Although there is research related to students' experiences of using RSs in onsite educational activities (Balta & Tzafilkou, 2019), there is a gap in the literature regarding how the use of RSs affects onsite and online student participation in BSLEs. The significance of addressing this gap lies in the potential of RSs to equalize participation opportunities between onsite and online students in BSLEs. Some research addresses using polls and quizzes initially or at the end of blended synchronous seminars, which positively affect online and onsite students' participation and motivation (Raes et al., 2020a; Bower et al., 2015). However, these studies do not sufficiently illuminate the continuous use of RSs throughout the seminars and its potential impact on participation dynamics. Since encouraging student participation is a known issue in BSLEs and RSs are often used to promote student participation, this study aims to explore how online and onsite students participate in blended synchronous seminars where various functions of an RS are being used throughout the seminars. It is guided by the following research questions:

1. What are the similarities and differences between online and onsite student participation in blended synchronous seminars where an RS is being used?
2. How do online and onsite students reflect on their participation in blended synchronous seminars where an RS is being used?

By exploring these aspects, this study seeks to contribute to the body of knowledge by probing the roles of RSs in promoting participation across different learning modalities. The questions are not only relevant to an academic audience but bear significant practical implications, considering the escalating trend towards blended synchronous settings and the need for pedagogical strategies to bridge the participation gap between online and onsite students.

2 Previous research

This qualitative study adopts a socio-constructivist perspective, which views learning as an active process where individuals construct knowledge through interaction with their environment and others (Vygotsky, 1978; Bruner, 1990). Active student participation enhances understanding (Dillenbourg, 1999) and is also essential for learning (Sfard, 1998). Recognizing different participation modes in varying educational settings allows educators to design better activities for both online and onsite participation. Given this theoretical backdrop, our study centers on observed student participation and students' perceptions and experiences of their participation in BSLEs.

2.1 Blended synchronous learning environments and student participation

Apart from relating student participation to learning (Dillenbourg, 1999; Sfard, 1998), previous research highlights the benefits and challenges of BSLEs, particularly related to student participation. A potential benefit of BSLEs is that they provide multiple communication channels for real-time interaction, which enables students to participate in different ways (Szeto, 2015). Previous research shows that online students report lower levels of connectedness and perceive that they learn less than the onsite students, which, to some extent, can be redeemed by the interactive possibilities that BSLEs can offer (Bower et al., 2014; Butz & Stupnisky, 2016).

Whether the context is onsite, online, or blended synchronous, some define student participation as the extent to which students attend classes, take part in various educational activities and course material, interact with educators and peers, submit assignments, and actively contribute to class discussions or group activities (Dixson, 2010; Martin & Bolliger, 2018). These are examples of observable and, sometimes, quantifiable, measures as they primarily revolve around physical or online presence and contribution within an educational setting. In this article, participation is regarded as a concept of both *taking* and *being* part. It can be understood as the dialectic nature of learning interaction: the whole and the parts affect and inform each other (Sfard, 1998). Previous research states that the amount of effort a student devotes to the academic experience is a crucial indicator of their involvement and, thus, their aca-

demic success: The more students participate, the more they are likely to learn and develop (Astin, 1984). This idea is consistent with the definition of student participation as the act of taking and being part in educational activities. Thus, students can be considered to participate when they interact with peers or educators. However, they can also participate by observing such interactions. Previous research argues that listening and observing, for instance, others' dialogue, is a form of participation (Hrastinski, 2009; McKendree et al., 1998; O'Connor et al., 2017; Romiszowski & Mason, 2004). Recent studies in higher education show that silent participation in digital environments can manifest without active communication and may include non-interactive behaviors such as not using cameras during online classes (Apostolidou, 2020; Sørum et al., 2021). This form of participation is influenced by the sudden shift to online learning due to the pandemic, highlighting the need to understand and improve digital interaction and engagement strategies in virtual classrooms (Bond et al., 2020; Laufer et al., 2021; Berei & Pusztai, 2022).

Previous research highlights challenges that can hinder student participation in BSLEs, and, occasionally, indicate solutions. Insufficient technology, as well as the complexity of managing interactions across different modalities, can put a strain on both educators and students, potentially affecting student participation (Bower et al., 2015; McCaw et al., 2023). To alleviate the sense of detachment that students may feel, it has been studied how educators integrate quizzes into the learning process. If integrated correctly, quizzes can encourage participation by eliciting immediate feedback, stimulating a sense of inclusion among online students (Raes et al., 2020a). However, if not well designed, BSLEs can lead to unequal participation, often with onsite students (Szeto, 2015; Butz et al., 2015; Wang et al., 2017) but occasionally with online students (Bell et al., 2014) dominating the interactions. Therefore, some research suggests that, when designing activities in BSLEs, incorporating digital tools such as video meetings, break-out rooms, online polls, quizzes, shared whiteboards, and RSs that explicitly engage both online and onsite students is vital to encouraging student participation (Bower et al., 2015; Kyei-Blankson et al., 2019; Raes et al., 2020a, b).

2.2 Response systems and student participation

Using RSs in educational activities has been studied since the late 1960s (Judson & Sawada, 2002), and previous research indicates a strong correlation between using RSs and pedagogical contributions, such as enhancing student participation, engagement, and motivation (Blasco-Arcas et al., 2013; Henrie et al., 2015; Han & Finkelstein, 2013; Hunsu et al., 2016). Several systematic reviews related to RSs use have been published throughout the years, where a common conclusion is that encouraging students to answer and react during educational activities increases student participation (Common et al., 2020; Judson & Sawada, 2002; Kay & LeSage, 2009; Owiny et al., 2018). Even though much of RS research indicate a strong correlation between using RSs and pedagogical contributions, a few studies included in a systematic review demonstrated no significant change in student participation when RSs are applied, leading the authors to advocate for further research to determine their impact (Kocak, 2022). Nevertheless, there is consensus that the effectiveness of using

RSs is essentially determined by their implementation rather than the RSs themselves (Dallaire, 2011; Landrum, 2015; Ludvigsen et al., 2015).

Depending on the context, different response technologies to encourage student participation have been studied. For instance, the use of response (paper) cards in onsite classrooms has been systematically reviewed (Owiny et al., 2018) and compared to clickers (Stowell & Nelson, 2007). Using RSs to promote student participation in onsite settings has been explored in qualitative (Diaz et al., 2023; Einum, 2020), quantitative (Chan et al., 2019), and mixed methods studies (Pichardo et al., 2021). Even though some teachers discovered the participatory benefits of RSs in online teaching during the COVID-19 pandemic (Kalleny, 2020; Li & Yu, 2022; Martín-Sómer et al., 2021; Mishra et al., 2020; Tsegay et al., 2022), a considerable number of teachers have been integrating RSs in onsite teaching to increase student participation long before the pandemic years (Mayhew et al., 2020).

A reoccuring enabler of student participation in RS research is anonymity, which has shown to be especially beneficial for students who might be too shy to speak or raise their hands (Caldwell, 2007; Hunsu et al., 2016; Morales-Martinez et al., 2020; Stowell & Nelson, 2007). In a mixed method study examining the educational use of an RS, students emphasized the democratizing potential of the RS since it allowed all students to participate anonymously on equal terms without excluding those who usually feel more insecure about participating (Pichardo et al., 2021). Furthermore, studies indicate that the opportunity to contribute through free-text answers expands student-centered classroom communication (Einum, 2020) and develops and triggers student cognition (Anderson et al., 2013; Hunsu et al., 2016; Liu et al., 2017). Studies also indicate that using RSs might amplify students' intrinsic motivation (Premarathne, 2017) and enhance academic achievements (Iaremenko, 2017; Iwamoto et al., 2017).

Another frequently occuring theme in RS research is the often integrated game-based functions, such as timed quizzes, scoring, player rankings, and options for individual or team competition, aiming to make learning fun and engaging, thereby increasing student participation and motivation (Fotaris et al., 2016; Ismail & Mohammad, 2017; Ranieri et al., 2021; Wang & Lieberoth, 2016; Wang et al., 2016; Zainuddin et al., 2022). Although incorporating game-based functions of an RS might have a positive effect on learning performance, challenges such as technical problems, time stress, fear of losing, and difficulties in catching up have been identified (Wang & Tahir, 2020). Other identified themes in previous RS research relate to increased interaction, instant feedback, and technological benefits and limitations (Wood & Shirazi, 2020).

Drawing on the above, there has been an interest in RSs related to student participation for decades. Although there has been an increasing interest in BSLEs for several years before (Bower et al., 2015) and after the COVID-19 pandemic, one of the challenges that remain is to encourage both onsite and, in particular, online students to participate (Hamad, 2022; Raes et al., 2020b; Salas-Pilco et al., 2022). Since using RSs to promote student participation has been studied in both onsite and online contexts previously, we want to add to the research field by exploring if RSs affect how online and onsite students participate in BSLEs.

3 Methods

3.1 Research setting

Seventeen students were enrolled in a course about ICT-supported teaching and learning for language teachers as part of a teacher training program during the fall of 2022. The course was given by a Swedish higher education institution, with seminars on two campuses (campus 1 and campus 2 in the text). There were 14 seminars in total, of which six were full day blended synchronous seminars (referred to as "seminars" below), seven were Zoom video conferences, and the final one was a seminar on campus. Before each seminar, the students attended a video conference where the educator usually informed them about and discussed the content of the upcoming seminar. For each seminar, the educator alternated between being onsite at either campus 1 or 2. When the educator was onsite at campus 1, the students from campus 1 were expected to be onsite, while those from campus 2 participated remotely via video conference, and vice versa. The purpose of the seminar was for the students to practically test, reflect upon, and discuss how to use different digital tools for learning.

During the seminars, the educator chose to use a free plan of an RS, already familiar to the educator, a web-based platform for creating presentation slides, sharing them across students' devices rather than only to a classroom screen. The educator combined an equally distributed amount of responsive activities, such as free-text questions and multiple choice questions, with some collaborative workspaces, quizzes, and game-based activities throughout the blended synchronous seminars for all students to participate. The educator presented slides and posed prepared and spontaneous activities related to the content presented repeatedly during the seminars. At times, students were encouraged to submit questions or comments through the free text function in the RS. According to the educator, the purpose of using the RS was to promote and encourage student participation.

To start the seminar, the educator invited all online and onsite students to a video conference meeting, to which they logged in individually. The educator had their web camera on, and the students who only attended via video conference were asked to have their cameras on. In the seminar room on campus, there was a camera that captured all students participating in the study who were present on campus. A combined microphone and speaker system was used to capture and play audio from the campus and the video conference meeting. After approximately 1.5 h, the educator presented a group assignment, whereafter, they divided all students into breakout rooms in the video conference with 3–4 students in each room to work for approximately 1.5 h. The onsite students were mixed with the online students during the breakout room sessions. During the breakout sessions, the onsite students left the seminar room for a quieter space. Thereafter, all students returned to the main room in the video conference, and the onsite students returned to the seminar room.

At the end of each seminar, the students spent approximately ten minutes reflecting on two free-text questions in the RS, where they provided examples and reflected upon their participation and contributions during the seminar. Their reflections were displayed anonymously to the rest of the students through the RS.

3.2 Participants

At the time of the study, 15 of the 17 students who participated in the study were studying their third semester of a 4.5-year English teacher training program. The students ranged in age from 21 to 27 years old. They all had English as their primary subject, while their second subject differed: History, Physical Education, Psychology, Arts, Swedish, and Swedish as a second language. Although most students had previous experience with online seminars during the pandemic years, a majority had little or no previous experience with blended synchronous seminars and using RSs. The educator had used RSs in teaching for several years and had previously conducted online seminars with lower secondary school students but had no previous practical experience with blended synchronous seminars in higher education. However, since the course was part of the teacher training program, in which the students are supposed to understand how to use digital tools to enhance learning (Swedish National Agency of Education, 2018), the educator aimed to provide the students with examples of how to use digital tools in teaching, for instance, by using an RS to encourage participation during the seminars.

3.3 Data collection

To address the research questions, we determined that observing the blended synchronous seminars, collecting the students' written reflections, and interviewing the students was a suitable combination of data collection methods. Participation was monitored and documented through observations. However, to understand the students' perceptions of their participation, they reflected upon that in interviews and through written reflections. We focused on observing how the students participated through oral, written, and, to some extent, non-verbal (neither oral nor written, such as facial expressions and emojis) communication with each other and the educator during three seminars. Since the educator explicitly planned on using the interactive functions of the RS more actively during three specific seminar, we chose to observe those seminars. According to the educator, the three other seminars were planned to be of more informative character with no use of the RS, which would not generate any data related to the use of the RS. One observation was conducted on-site with two authors present, while the other two observations were carried out via Zoom with one author present, as presented in Table 1.

Before the course, the first author met the students on two occasions via video conference to inform them about the purpose of the study and how the data collection, storage, and analysis of the study would be implemented following the ethical guidelines related to the demands on information, consent, confidentiality, and usage set by The Swedish Research Council (2017). Fifteen of seventeen students agreed to participate in the observations and provided written consent. We excluded the two students who declined to partake in the observations from the data collection by not recording them or including their written reflections. They were placed outside the camera angle, capturing the students on site, and they did not have their cameras on in the video meetings.

Table 1 Distribution of observed blended synchronous seminars

Blended synchronous seminars	Participants	
	On-site	Online (video conference via Zoom)
Seminar 1 on campus 1	Educator + 8 students from campus 1 + 2 observers	7 students from campus 2
Seminar 2 on campus 2	Educator + 7 students from campus 2	8 students from campus 1 + 1 observer
Seminar 3 on campus 2	Educator + 4 students from campus 2	11 students (3 from campus 2 + 8 from campus 1) + 1 observer

Since we did not know what kind of student participation to expect, we chose to carry out unstructured observations instead of using an observation schedule. Unstructured observation is a flexible, rich, and detailed method that allows researchers to gain a more in-depth understanding of the phenomena under study and generate new insights for further investigation (Bogdan & Biklen, 1997; Fetterman, 2010; Merriam, 1998). Further, observations are often combined with other data collection forms since the combination can enable researchers to access interactions in a social context and highlight the participants' definitions of the situation and their behavior (Cohen et al., 2018; Simpson & Tuson, 2003). The observations initially allowed us to gather first-hand, live data in situ from the seminars, and we took the "observer as participant" role and documented the observation data through descriptive and reflective field notes continuously throughout all seminars (Creswell & Creswell, 2017; Merriam & Tisdell, 2015). All observed seminars were recorded via video conference, with an extra camera set up to capture the students who agreed to participate in the study in the onsite seminar room. Setting up video cameras to record during seminars might create a reactivity problem since the students' behavior might change if recorded (Jewitt, 2012; Lee et al., 2017). For instance, the students may behave in a socially desirable or deliberately satisfactory way. Considering this, we still found it necessary to record the seminars to further analyze the data after the observations (Cohen et al., 2018). Due to technical limitations and a lack of observers, we did not observe the breakout room sessions. However, the breakout room sessions were addressed in the interviews. We gathered the students' written reflections in an RS using free-text questions to enable them to write free accounts in their own words and avoid the limitations of pre-set response categories.

About a month after the course had finished, the first author conducted semi-structured interviews with eleven of the students who attended the course. The interviews aimed to gain a more in-depth understanding of how they experienced the observed seminars and cast further explanatory insight into their written reflections (Hochschild, 2009). Even though not all students in this study participated in the interviews, the participants constituted a distinct majority and exhibited diversity in terms of gender, age, and subjects of study. Therefore, we considered the number and the persons enough for us to gather answers to our follow-up questions. Due to geographical distance, the interviews were conducted and recorded via Zoom. Based on our observations and the students' written reflections in the RS, a semi-structured interview guide containing 11 open-ended questions was prepared beforehand. For instance, the questions related to why and how the students participated in the seminars and

how they used the RS in the BSLE. All questions in the guide were composed to allow the participants to elaborate on their answers.

3.4 Data analysis

In this study, we wanted to explore how online and onsite students participate in blended synchronous seminars where an RS is being used and how the students reflect on their participation in the seminars. Recognizing the complexity and subjectivity inherent in qualitative research, we grounded our methodological approach in Braun & Clarke's reflexive thematic analysis to familiarize ourselves with the data, generate initial codes, and thereafter create, review, define, and name themes (Braun & Clarke, 2006, 2019). This perspective acknowledges that coding is not a mere extraction of a fixed reality but a interpretative process that values the subjective insights of the researcher. A combination of deductive and inductive approaches was used to analyze the data to align with the study's explorative approach while also considering insights from previous research.

Our methodological framework encouraged a collaborative and iterative analysis among all co-authors, starting with gathering our shared field notes from the observations. Then, the first author reviewed all seminar recordings to complete the field notes with significant interactions and communication. All students' written reflections were collated and structured in a table, and the interviews were transcribed in Swedish. Initial ideas, impressions, and observations were noted while structuring the data in the first phase of the thematic analysis. In the second phase, the first author performed preliminary coding by organizing short phrases or words related to particular concepts, such as interactivity, cooperation, anonymity, and motivational issues. Through rigorous discussion and collaboration in the third phase, the codes were analyzed to create meaningful themes. This process was enriched through discussions and feedback from experienced qualitative researchers and external group meetings, enhancing the credibility and validity of our findings. This led to the identification of distinct themes regarding student participation - spontaneous and silent participation differing between online and onsite students, and written, anonymous, and game-based participation shared across both modalities.

4 Results

In this section, we present the findings of the thematic analysis, organized to align with the research questions. We elaborate on five key themes from the analysis, highlighting observed similarities and differences in Sect. 4.1 and 4.2. Additionally, we present the students' reflections on their participation related to the themes in Sect. 4.3.

4.1 Similarities

Three somewhat overlapping themes related to the online and onsite students' ways of participating: written, anonymous, and game-based participation.

4.1.1 Written participation

This theme describes how all students engaged in written participation through the RS. We observed that the educator primarily chose to pose free-text questions in the RS rather than, for instance, multiple-choice questions, which enabled all students to participate in writing. Several times during the seminars, it was noted that no one responded when the educator posed spontaneous questions orally to the students. For instance, about one hour into the first seminar, the educator asked the students if they had any practical concerns about using the RS. Upon receiving no answers, the educator spontaneously opened a free-text question in the RS to encourage all students to pose their potential questions. Six students (two onsite and four online) posted questions within three and a half minutes. The queries mainly involved the practical use of the RS.

At the end of the seminars, the educator posed two free-text questions in the RS. The students were asked to provide examples of activities that made them participate the most during the seminar and to provide examples of activities when they contributed the most during the seminar and try to explain why. Several students answered that the free-text function in the RS made them participate and contribute during the seminar, mainly because everyone was given the opportunity to think and formulate themselves. Connected to the written participation, we observed that even though it was not explicitly communicated, the Zoom chat was exclusively used for administration, such as attendance and technical issues.

4.1.2 Anonymous participation

The theme of anonymous participation describes how anonymity enabled students to answer and ask questions in the RS. During the observations, it was clear that using the RS to allow students to ask questions or share thoughts without revealing their identity contributed to the online and onsite students' participation.

We observed that the anonymous free-text questions were also used to evaluate. For example, at the end of the students' second seminar in the course, the educator posed a free-text question and asked the students to post feedback related to the course content and planning so far. Some students expressed themselves very openly, presumably because of the anonymity.

> It feels as if we're not learning anything but instead just listening to a lot of things that don't feel relevant. (Student written reflection, BSS 2)

4.1.3 Game-based participation

The theme of game-based participation describes how the students participated during game-based activities in the RS. When the educator or the students used the game-based functions in the RS, we observed significantly increased student participation onsite, in terms of amusement, expressed through both the students' activities in the RS and their interaction with each other by laughing and giggling. Although

the online students also participated in the game-based activities in the RS, we did not notice any difference in their facial expressions or body language. However, the online and onsite students addressed the game-based activities in the written reflections and claimed they actively participated.

> I loved the team quiz exercises because I got to test how well I had paid attention – and win! Seeing the whole class's results at the end was also great. (Student written reflection, BSS 1)

4.2 Differences

Two themes were uniquely related to either online or onsite students' ways of participating: silent and spontaneous participation.

4.2.1 Silent participation

The silent participation theme represents the students' periods of silence during the seminars, where they did not speak or write, which was initially interpreted as a lack of participation. However, a closer examination of students' written reflections revealed that many online students considered these silent periods times of active learning. Despite spending a relatively long time silently listening to the educator or other students without any visible or audible contributions, these students claimed that they did not experience that they were passively participating. Instead, the online students emphasized in the written reflections how they, through listening and thinking, participated in the seminars by absorbing information and interacting with the content, which was often displayed via the RS. Several online students described how the educator's spontaneous use of the interactive functions in the RS throughout the seminars "kept them on their toes", had them "listen to and process information", and encouraged them to participate during the entire seminars. Thus, they claimed that their silence was not passive but rather a form of cognitive participation, a less visible but still form of participation.

> Being an active listener, trying to listen to the ideas that everyone had behind their presentations and activities, and learning how to use them. (Student 2 written reflection addressing how they participated during seminar 1)

4.2.2 Spontaneous participation

The theme of spontaneous participation relates to how the onsite students frequently interacted spontaneously physically and orally with the educator and other students in the classroom, often supported by the RS. One of the most apparent ways of participating that we observed was that the onsite students often interacted with the educator and the other onsite students spontaneously through body language such as facial expressions, smiling, laughing, giggling, frowning, and nodding their heads. Further,

the onsite students were more orally active and more eager to comment spontaneously on the educator's informal questions than the online students.

> I think that it's much harder to participate and contribute online than meeting in a real classroom. (Student written reflection, Seminar 1)

4.3 Students' reflections

In the interviews, the students reflected upon their participation in blended synchronous seminars. Their reflections highlighted how the incorporation of the RS affected their participation related to the different themes.

Concerning written participation, students reflected on the accessibility the RS provided. They particularly valued the option to type responses rather than speaking aloud in a crowded virtual or physical room. In the interviews, the students explained that whether they were participating onsite or online, the free-text function in the RS facilitated participation since they considered it more accessible to write a comment, an answer, or a question than to raise their hand (either onsite or online) to answer or ask a question orally.

> It's not that I'm silent because I don't have anything to say, but it's probably more that I feel that it's a bit difficult to participate when you have a "full room" on Zoom, but I think that probably has more to do with me than Zoom itself. I can definitely talk more in break-out rooms, but if we go back to [the RS] and the [free-text] questions, you can say what you think in a different way. (Student interview 7)

In the interviews, several students explained that being able to post anonymously in the RS was seen as lowering barriers to participation, especially when asking questions that could be perceived as embarrassing or straightforward. Several students also commented that students might act differently depending on whether they are aware that they are anonymous or not.

> I thought the [free-text] function in [the RS] was very good since it allowed you to be anonymous. Because if you have a question that is a bit embarrassing – you might even feel a bit stupid – you can easily ask it. So that's very good. (Student interview 3)

The aspect of game-based participation introduced through the RS brought forward mixed feelings among the students. While some students found game-based activities engaging and motivating, others perceived them as more suited to younger learners. Most students suggested that the game-based activities increased their motivation to participate. However, several students referred to the game-based activities as diversions and expressed that they were "playing". They commented that the experience of "playfulness" might be associated with a more childish and unserious learning experience and perhaps be more suitable for younger students. The students reasoned

that while gamification undoubtedly encouraged participation, its effectiveness, and appropriateness might depend on the audience's maturity level.

> I think some of the game features, like the Monster quiz [a team-based quiz where correct answers increase the fighting abilities of a monster associated with the team] and such, are a little better suited for younger students. (Student interview 3)

Several online students claimed that the RS played a significant role in facilitating silent participation, a prevalent form of participation among the online students. This indetectable type of participation first became visible through the students' written responses. The students then expanded their reflections during the interviews, where students who participated online explained that the RS provided an interface allowing them to engage with the content in real-time without necessarily vocalizing their inputs. Several online students addressed the difference between participating onsite or online and emphasized how using the RS was an essential enabler for participation.

> I would say that I used [the RS] more and more actively when I was participating remotely because it felt like a tool needed to engage in the lesson in a way that you do not in the classroom. When you are in the classroom, you get that contact right away. (Student interview 4)

The online students claimed to process the information, piecing together perspectives from different contributors in the RS. They stated that participation was not always about submitting their opinions or asking questions in writing or speaking; it was equally about listening, understanding, and internalizing the shared content. As the students silently participated, they claimed to make connections, draw parallels, and formulate responses in their minds, which might be shared later or used for personal comprehension. According to the students who participated online, listening intently, and processing the information presented was in itself a form of participation, albeit not always readily apparent.

The students' reflections on spontaneous participation shed light on the blend of physical and virtual environments. Students found that being physically present in the seminar allowed more spontaneous interactions. Yet, the presence of the RS was crucial in both settings to encourage this type of participation. Several students emphasized that they preferred to participate onsite in a blended synchronous environment, where they claimed it was easier to spontaneously interact and communicate with the educator and the other students. However, they claimed that the RS was necessary during the seminars to promote more spontaneous participation. Further, they explained that their spontaneous participation was often directly connected to their reacting and commenting on activities or posts in the RS.

> So, if you are going to have hybrid teaching, [the RS] is much better than just using Zoom. If you were only to have Zoom teaching, I believe [the RS] would be better, too, because it kind of feels like you become more involved, not only more interactive. (Student interview 9)

5 Discussion

What are the similarities and differences between online and onsite student participation in blended synchronous seminars where an RS is being used?

5.1 Similarities

Our study established three themes relating to both the onsite and online students' participation: written, anonymous, and game-based participation.

Using free-text questions in the RS enabled online and onsite students' written participation. Students reported that the free-text function facilitated their participation by allowing them to write comments and questions instead of raising their hands to pose them. This finding supports the notion that offering different modes of participation can be valuable for encouraging online and onsite student participation in BSLEs (Bower et al., 2015; Raes et al., 2020b; Kyei-Blankson et al., 2019). The educator's decision to primarily use free-text questions in the RS during the seminars, rather than multiple-choice questions, demonstrates the importance of providing opportunities for students to express themselves in their own words. This finding highlights the potential value of integrating free-text questions into educational activities to expand classroom communication (Einum, 2020) and focus on developing questions that trigger the students' critical and higher-level thinking (Hunsu et al., 2016; Liu et al., 2017), as well as their cognitive engagement (Anderson et al., 2013; Shi et al., 2021).

The RS's free-text questions were also used to anonymously gather student feedback and evaluation. Our findings showed that the anonymous feedback option allowed students to express their concerns and opinions more openly, regardless of the comments being positive or critical of the course content or structure. Our observations and interviews showed that the ability to post anonymously in the RS contributed to increased participation among both online and onsite students. Students reported that asking questions or sharing thoughts in writing through the RS without revealing their identity lowered the barriers to participation, allowing them to engage more actively in the discussions. This finding indicates the positive effects of anonymity on student participation, particularly in encouraging shy or hesitant students to contribute to discussions. This has been established in previous research conducted in online and onsite learning environments (Caldwell, 2007; Hunsu et al., 2016; Morales-Martinez et al., 2020; Stowell & Nelson, 2007) and is important to consider in blended synchronous contexts as well.

Our observations indicated that game-based activities in the RS primarily increased onsite student participation in terms of amusement and interaction. However, both online and onsite students participated in these activities, as evidenced by the activity in the RS, their interaction with each other, their written reflections, and their reasoning during the interviews. Previous research suggests that game-based activities (Ranieri et al., 2021; Zainuddin et al., 2022) can foster student participation and promote active learning in different educational contexts. Our study confirms that game-based activities can promote student participation, also in the blended synchronous setting. Although we did not observe any technical problems in the BSLE, which, according to previous research (Bower et al., 2015; Wood & Shirazi, 2020), might be

an issue, we discussed other potential challenges of integrating game-based activities, such as the possible distraction of the eagerness to win the game rather than to understand the questions. This adds to previous research in which time stress and fear of losing are common challenges with game-based activities (Wang & Tahir, 2020).

5.1.1 Differences

The main differences between online and onsite student participation in the blended synchronous setting were that onsite students participated more spontaneously, usually orally, while online students emphasized how the RS facilitated silent participation. The distinction between online and onsite student participation were drawn from the qualitative data collected through the observations, written responses, and the student interviews. Specifically, the students themselves did not report instances of silent participation in the onsite context, whereas they frequently mentioned silent participation as a significant aspect of their online learning experience. This discrepancy in student narratives led us to delineate between the two forms of participation.

Onsite students demonstrated more spontaneous participation in response to the educator's informal questions, both the orally posed questions and the free-text questions posed in the RS, with several students attributing this to the ease of engaging in face-to-face conversations. We observed that when the educator posed a spontaneous free-text question in the RS, an additional opportunity for everyone to participate was added, and several students participated by asking questions through the RS. This finding implies that creating a comfortable and inclusive atmosphere where students feel at ease participating in discussions, for instance, through an RS, is recommendable for promoting participation in both online and onsite contexts.

The online students described how the RS facilitated silent participation in the BSLE, which, although not explicitly visible or audible, was characterized by active listening and reflection and considered an essential aspect of their learning experience. The students' reflections on silent participation underscore the importance of considering alternative forms of participation in BSLEs, for instance, by using an RS.

The notion of silent participation as a valuable form of participation challenges conventional metrics that equate participation with overt oral or written contributions. The presence of silent participation, as identified in our study, resonates with previous research, emphasizing that learning takes place not only through explicit interaction but also through internal cognitive processes that can occur in silence and that participation must be understood as a spectrum that includes active listening and reflection, not merely visible activity (Hrastinski, 2009; McKendree et al., 1998; Romiszowski & Mason, 2004). The silent periods initially assumed to be indicative of passivity, were, according to the students, periods of cognitive activity where the students engaged with the material, contemplation, and mental dialogue with the presented content. These events seemed to facilitate the internalization process, described as "the internal reconstruction of an external operation", by Vygotsky (1978, p. 56). To further explore the complexities of silent participation in digital higher education settings is crucial, especially given the past few decades' steady increase of online learning (Salas-Pilco et al., 2022). This shift challenges traditional views on academic participation, which typically emphasize verbal or written contri-

butions. Instead, silent participation, including not using cameras in online classes, pausing videos for reflection, and silently engaging with materials, reveals a less visible form of student participation. The results of this study contribute to previous research (Apostolidou, 2020; Sørum et al., 2021), highlighting the importance of recognizing non-verbal forms of participation and suggesting a need for educators to adopt new strategies to measure and foster participation beyond conventional metrics (Bond et al., 2020; Laufer et al., 2021; Berei & Pusztai, 2022).

As noted by the students, the use of the RS provides an interface that supports diverse forms of participation and suggests that such systems alleviate the pressure to constantly express thoughts orally, allowing students to participate in different ways. The educator's spontaneous use of interactive functions within the RS was noted to keep students "on their toes", suggesting that educators play a crucial role in fostering an environment where silent participation is possible and productive. By interacting with the content via the RS - even in the absence of direct communication - students were kept active and prepared to participate when they felt ready. This might be particularly important when considering the inclusion of introverted students or those who need more time to process information before they feel ready to contribute. This finding indicates a need for pedagogical strategies that recognize and encourage different forms of participation, supporting more inclusive teaching practices that cater to the students' various needs (Tomlinson, 2001).

How do students reflect on their participation in blended synchronous seminars where an RS is being used?

Although most students in this study claimed the blended synchronous setup to be fully functional with regards to the learning outcomes of the course, they concurred that a functional blended synchronous setup depended on the combination of activities and digital tools designed for student participation, an engaged educator, and reliable digital equipment. While a few students preferred the blended synchronous setup, mainly due to the convenience of not having to travel, several students preferred having seminars either entirely onsite or online. However, almost all students claimed the use of an RS in the blended synchronous context to be crucial since the combination of integrating the functions for anonymous and written participation though free-text questions, game-based activities, and mixed break-out rooms was essential for involving all students in the group, regardless of if they were participating onsite or online. This claim aligns with the notion that BSLEs need to provide diverse interaction modes to stimulate participation (Bower et al., 2015; Szeto, 2015; Raes et al., 2020a). Most students considered integrating the RS in the BSLE as a facilitator for participation in the seminars and claimed it significantly contributed to their active participation. Similar results have been indicated in several studies related to the use of RS in onsite (Stowell & Nelson, 2007; Owiny et al., 2018), both in online and onsite (Diaz et al., 2023; Einum, 2020) and in online contexts (Chan et al., 2019; Pichardo et al., 2021).

Most students advocated using RSs in BSLEs within the context of teacher education and believed that RSs could potentially increase student participation during higher education seminars, particularly when used throughout the entire seminar and not just initially or towards the end. In addition, they viewed it as a valuable tool to stimulate discussions about theories regarding the relationship between student

participation and learning, which, according to the students, is crucial to apply in their future teaching roles. Furthermore, a noteworthy aspect of the teacher students' reflections on how they participated during the seminars and how the RS was integrated with the educational activities was that they often reflected upon implications for their future work as teachers. These implications include understanding and recognizing the value of different forms of participation and ensuring that they consider the diverse ways in which their future students may engage with and participate in educational activities. For instance, by drawing parallels between their silent participation in the seminars and their future teaching practice, students demonstrated an awareness of the need to be inclusive and attentive to different participation modes, which aligns with previous research (Hrastinski, 2009; McKendree et al., 1998). The students reasoned that incorporating an RS in educational activities could help them better understand and support the diverse ways their future K-12 students participate. Offering their students various modes of participation could enable them as teachers to identify and address potential barriers to participation, for instance, by letting the students anonymously answer free-text questions or participate in game-based activities. The students did, however, express mixed opinions about using game-based activities in the learning process. Some regarded them as diversions associated with a more childish and unserious learning experience and perceived game-based activities as more suitable for younger students. Further, they expressed considerations regarding technical issues and maintaining order in the classroom if they implemented these activities in their own teaching, which correlates to identified issues in previous research (Wang & Tahir, 2020). Despite these concerns, a majority of the students acknowledged the potential of game-based activities as a motivational and "fun way of learning". They suggested that a balance between engaging in game-based activities and maintaining a structured learning environment might enhance active participation and intrinsic motivation, which aligns with related research (Bower et al., 2015; Fotaris et al., 2016; Wang et al., 2016; Premarathne, 2017). These findings indicate that embedding RSs into blended synchronous seminars improves the opportunities for student participation.

5.2 Limitations and further research

Our study focused on a teacher education course on ICT-supported teaching and learning for language teachers, which was conducted in a BSLE where an RS was used. A limitation of the study is the fact that it is confined to a specific educational context. However, to confirm the trustworthiness of our research, we have outlined the study's context, research design, and methods as transparently as possible. Additionally, we compared our results with previous research and noted findings that were supported by previous research.

Further, the teacher students in this study, who are not only students but also prospective teachers, might have had a heightened awareness of their own learning processes and participatory methods. This could potentially make them more active and thoughtful contributors in the blended synchronous seminars. Their status as teacher students may also have influenced the results, as they could have been more reflec-

tive or critical about their own participation and learning, thereby affecting their responses.

Additionally, despite the study comprising a relatively small group of students enrolled in a Swedish higher education institution, we consider their experiences and context pertinent for addressing the research questions. Future research could explore the themes in this study further, focusing on how educators can use RSs to enhance student participation in BSLEs within different academic subjects and at varying education levels. Related to one of the key findings of this study, future research can explore how silent participation in BSLEs influences the retention and application of knowledge and how it affects collaborative learning dynamics. Furthermore, studies could examine how to recognize silent participation within BSLEs and also how to encourage silent participants to participate in various, more interactive, ways.

6 Conclusion

This study aimed to explore how teacher students participate in blended synchronous seminars where an RS was being used. The study contributes to the growing body of research on BSLEs and student participation using RSs. It underscores the importance of recognizing and supporting diverse modes of student participation in BSLEs. Our results confirm previous research and extend it by revealing that using an RS can contribute to increased student participation, not only in online and onsite but also in blended synchronous contexts. In this study, the students participated in both similar and different modes when an RS was used in the BSLE. The observed participation in this study highlights some potential advantages of incorporating RSs into BSLEs. By facilitating diverse modes of participation, RSs might allow students to participate in different ways. Our study highlights "silent participation" as an emergent and perhaps underestimated mode of participation facilitated by the RS. This silent participation taps into the non-verbal reflection and internal processing that many students engage in, which might not always be visibly evident but remains instrumental in the learning process.

The implication for educators is to adopt a broader view of participation when designing educational activities in BSLEs, where silent participation is acknowledged and strategically supported through RSs and pedagogical approaches that cater to a wide array of students' needs and preferences. Providing particularly online students, but also onsite students, with diverse modes of participation can encourage student participation, suggesting that educators should consider varying their teaching methods and choice of digital tools to adapt their teaching to students' needs. Using RSs to foster an inclusive atmosphere is recommendable since it can encourage both online and onsite students to participate in BSLEs. The results are relevant to educational practice and instructional design in blended synchronous contexts, where student participation is claimed to be essential for students' learning.

Data availability The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Disclosure statement/Competing interests The authors report there are no competing interests to declare.

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Publisher's Note Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

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