

ABSTRAK

Tri Andoni. NIM 4222331001 (2026). Pengembangan Media Pembelajaran *Flashcard* Dengan *Dual QR-Code* Berbasis *Augmented Reality (AR)* Dan *Liveworksheet* Pada Materi Ikatan Kimia. Penelitian ini bertujuan untuk mengembangkan media pembelajaran *Flashcard* dengan *Dual QR-Code* berbasis *Augmented Reality (AR)* dan *Liveworksheet* pada materi ikatan kimia serta mengetahui tingkat validitas, respon guru dan siswa, serta efektivitas media dalam meningkatkan hasil belajar siswa. Penelitian ini merupakan penelitian pengembangan (*Research and Development*) yang menggunakan model pengembangan 4D (Define, Design, Develop, Disseminate). Penelitian dilaksanakan di MAN 2 Model Medan dengan subjek penelitian terdiri dari validator ahli media dan ahli materi sebanyak tiga dosen kimia, tiga orang guru kimia untuk respon guru, serta siswa kelas X sebanyak 34 siswa yang terlibat dalam uji coba terbatas. Instrumen penelitian yang digunakan meliputi lembar validasi ahli, angket respon guru dan siswa, serta tes hasil belajar berupa pretest dan posttest. Hasil penelitian menunjukkan bahwa media pembelajaran *Flashcard* dengan *Dual QR-Code* berbasis *Augmented Reality* dan *Liveworksheet* memiliki tingkat kelayakan yang sangat baik berdasarkan hasil validasi ahli yaitu 96% hasil validasi media dan 91% hasil validasi materi sehingga dinyatakan layak digunakan dalam proses pembelajaran. Respon guru terhadap media pembelajaran memperoleh persentase sebesar 96% dengan kategori sangat menarik, sedangkan respon siswa 78% menunjukkan kategori menarik. Hasil analisis efektivitas media menunjukkan adanya peningkatan hasil belajar siswa, dengan nilai rata-rata pretest sebesar 42,35 meningkat menjadi 88,97 pada posttest. Hasil perhitungan N-Gain sebesar 0,81 yang termasuk dalam kategori tinggi. Berdasarkan uji paired sample t test karena data tidak berdistribusi normal maka dilanjutkan uji wilcoxon signed rank test dengan nilai Asym. Sig. (2-tailed) $0,000 < 0,05$. Artinya ada pengaruh penggunaan media pembelajaran *Flashcard Dual qr code* berbais *Augmented Reality* dan *Liveworksheet* terhadap hasil belajar siswa kelas X. Berdasarkan hasil tersebut dapat disimpulkan bahwa media pembelajaran *Flashcard* dengan *Dual QR-Code* berbasis *Augmented Reality* dan *Liveworksheet* valid, menarik, dan efektif digunakan untuk meningkatkan hasil belajar siswa pada materi ikatan kimia.

Kata kunci: Media pembelajaran, *Flashcard*, *Dual QR-Code*, *Augmented Reality*, *Liveworksheet*.



ABSTRACT

Tri Andoni. NIM 4222331001 (2026). Development of *Flashcard* Learning Media with *Dual QR-Code* Based on *Augmented Reality (AR)* and *Liveworksheet* on Chemical Bonding Material. This study aims to develop *Flashcard* learning media with *Dual QR-Code* based on *Augmented Reality*(AR) and *Liveworksheet* on chemical bonding material and to determine the level of validity, teacher and student responses, and the effectiveness of the media in improving student learning outcomes. This research is a development research (Research and Development) that uses the 4D development model (Define, Design, Develop, Disseminate). The research was conducted at MAN 2 Model Medan with research subjects consisting of media expert validators and material experts totaling three chemistry lecturers, three chemistry teachers for teacher responses, and 34 grade X students involved in limited trials. The research instruments used include expert validation sheets, teacher and student response questionnaires, and learning outcome tests in the form of pretests and posttests. The results of the study indicate that the *Flashcard* learning media with *Dual QR-Code* based on *Augmented Reality* and *Liveworksheet* has a very good level of feasibility based on expert validation results, namely 96% media validation results and 91% material validation results so that it is declared suitable for use in the learning process. Teachers' responses to the learning media obtained a percentage of 96% with a very interesting category, while 78% of student responses showed an interesting category. The results of the media effectiveness analysis showed an increase in student learning outcomes, with an average pretest score of 42.35 increasing to 88.97 in the posttest. The results of the N-Gain calculation were 0.81 which was included in the high category. Based on the paired sample t test because the data was not normally distributed, the Wilcoxon signed rank test was continued with an Asym. Sig. (2-tailed) value of 0.000 <0.05. This means that there is an effect of using Dual QR code *Flashcard* learning media based on *Augmented Reality* and *Liveworksheet* on the learning outcomes of class X students. Based on these results, it can be concluded that the *Flashcard* learning media with *Dual QR-Code* based on *Augmented Reality* and *Liveworksheet* is valid, interesting, and effective to be used to improve student learning outcomes in chemical bonding material.

Keywords: Learning media, *Flashcard*, *Dual QR-Code*, *Augmented Reality*, *Liveworksheet*.

