



## Development of REACT-Based E-Module to Improve Students' Scientific Literacy Ability in Buffer Solution

Aroma Karmila\*, Desy Kurniawati, Hardeli, Umar Kalmar Nizar

Department of Chemistry Education, Universitas Negeri Padang, Indonesia

**Abstract:** The buffer solution e-module based on the REACT strategy (Relating, Experiencing, Applying, Collaborating, Transferring) has been developed and analysed for its validity and practicality levels to assist the learning process of students to train students' scientific literacy skills. This research belongs to the type of EDR (Educational Design). Research) with the Plomp model. The research tools used were interview forms, validity questionnaires, and practicality. This e-module has been verified by six expert reviews, and 9 students became research subjects in this development research. Data were analysed using Aikens'V formula, and practicality percentage. Analysis of the validity of the questionnaire data showed an Aikens' V average score of 0.89 (for construct validity). Analysis of the practicality questionnaire data showed an average score of 83% and 83% (for small groups and field practice tests). Data analysis shows that the e-module has a high level of validity and practicality. Therefore, it can be concluded that the buffer solution e-module teaching material based on the REACT strategy is valid and practical so that it is feasible to use it in learning to train students' scientific literacy skills.

**Keywords:** e-module, REACT strategy, buffer solution, scientific literacy

**Abstrak:** E-modul larutan penyangga berbasis strategi REACT (Relating, Experiencing, Applying, Collaborating, Transferring) telah dikembangkan dan dianalisis tingkat validitasnya serta tingkat praktikalitas untuk membantu proses pembelajaran peserta didik agar melatih kemampuan literasi sains peserta didik. Penelitian ini tergolong jenis EDR (Educational Design). Research) dengan model Plomp. Alat penelitian yang digunakan adalah formulir wawancara, angket validitas, dan kepraktisan. E-modul ini telah diverifikasi oleh enam expert review, dan 9 peserta didik menjadi subjek penelitian dalam penelitian pengembangan ini. Data dianalisis menggunakan rumus Aikens'V dan persentase kepraktisan. Analisis validitas data angket menunjukkan skor rata-rata Aikens' V 0,89 (untuk validitas konstruk). Analisis data angket kepraktisan menunjukkan skor rata-rata 83% dan 83% (untuk kelompok kecil dan uji praktik lapangan). Analisis data menunjukkan bahwa e-modul memiliki tingkat validitas dan kepraktisan yang tinggi. Oleh karena itu, dapat disimpulkan bahwa bahan ajar E-modul larutan penyangga berbasis strategi REACT adalah valid dan praktis sehingga sudah layak digunakan dalam pembelajaran untuk melatih kemampuan literasi sains peserta didik.

**Kata kunci:** e-modul, strategi REACT, larutan penyangga, literasi sains.

### ▪ INTRODUCTION

Education can and need to make a contribution to a brand new imaginative and prescient of sustainable international improvement (Rieckmann, 2017). Science and generation may be discovered with the aid of using getting to know literacy capabilities literacy and speech (Batooli et al., 2018). High literacy capabilities can inspire the improvement of technology and generation for the better. The position of literacy is likewise a benchmark for the development of a society that has an extended effect in growing competitiveness (Laksono, 2018). One a part of literacy is clinical literacy.

According to James Rutherford clinical literacy refers to all styles of literacy associated with technology (Roberts, 2013). Students are stated to be literate to technology or literate to technology whilst they may be capable of observe ideas or records received at faculty with herbal phenomena that arise in regular life (Anggraini, 2014). Scientific literacy may be very critical to be mastered with the aid of using college students with regards to the manner they apprehend the environment, health, economy, and different issues of current society that rely upon generation and the development and improvement of technology (Hayat & Yusuf, 2011). Therefore, measuring clinical literacy may be very critical to decide the volume to which college students have clinical literacy in order that efforts to enhance the pleasant of training in Indonesia may be achieved and might compete with different countries.

Science and generation have skilled very fast improvement on this 4.zero revolution era. The discipline of training is carefully associated with the Industrial Revolution 4.zero which may be used to guide getting to know styles and wondering styles in addition to increase innovative and revolutionary improvements from students, that allows you to produce the following technology of the state this is advanced and capable of compete. Therefore, the sector of training have to adapt to present day technological advances (Riswandi & Hanum, 2013; Gilbert et al., 2019). One attempt to guide this adjustment is to apply generation-primarily based totally or digital coaching substances withinside the getting to know technique. In addition, for the reason that the start of 2020 the sector has been stunned with the aid of using the emergence of virus outbreaks in diverse international locations together with Indonesia. This hassle has an effect at the training zone which caused the issuance of on-line faculty rules. However, presently the offline faculty coverage has been applied once more thinking about the decline withinside the quantity of unfold of the virus. In pandemic situations that don't recognize whilst it's going to give up like this and rules are nonetheless changing, digital coaching substances are greater wished withinside the getting to know technique due to the fact they may be accessed every time and anywhere (Zhang et al., 2021; Kumar et al., 2021). One version of those coaching substances is e-module (Nanto et al., 2017).

E-module is a shape of offering self-examine substances which are systematically organized into sure mastering units, which might be supplied in an digital layout, wherein every mastering hobby in it's far related with the aid of using a hyperlink as a navigation that makes college students extra interactive with the program, ready with an e-module. with the aid of using offering video tutorials, animations and audio to enhance the mastering experience (Harden et al., 2011; Kemendikbud, 2017). The digital module presentations facts codecs in ee-e book layout electronically that is loaded onto a difficult disk, diskette, CD or flash disk and is examine the usage of digital gadgets which includes computers, etc. (Nanto et al., 2017; Permana, 2017). The improvement of e-modules ought to be according with the 2013 curriculum which expects college students to be professional in the usage of media, technology, facts and communication (ICT) wished withinside the twenty first century (Kemendikbud, 2017). The 2013 curriculum emphasizes that scholars are the middle of mastering, wherein college students ought to searching for and discover principles from the fabric being studied. The needs of the 2013 curriculum are to make college students extra important and creative. Therefore, it's far important that the e-module evolved ought to be according with the needs of the curriculum, which ought to be student-centered.

Buffer solution is a material that is studied in the even semester of class XI where this material includes the dimensions of factual, conceptual and procedural knowledge. Buffer solution material is contextual material and has many examples in everyday life. The contextual approach or contextual teaching and learning can be used to study buffer solution material, because this approach connects the subject matter with real-life application (Sheppard, 2006; Sariningsih, 2014).

The contextual approach is a learning design that involves the experience of students in real life with subject matter (Johnstone, 2000; Crawford, 2001; Handini, et al, 2016). The contextual approach of this study was followed by the REACT strategy (Relating, Experiencing, Applying, Collaborating, Transferring) which included learning steps. This strategy uses hands-on activities, encourages students to think and explain their reasons instead of just memorizing and reciting facts, and helps students to see the relationship between themes and concepts rather than presenting them separately. The REACT learning strategy is based on constructivism, a learning strategy that can be used to encourage students to build their own knowledge (Handayani, 2015). The results of the research that have been carried out reveal that contextual learning with the REACT strategy is able to improve chemical literacy and scientific literacy skills of students in chemistry learning (Hadinugrahaningsih et al., 2019; Srikandi et al., 2020).

Following up on the explanation, it is necessary to develop teaching materials based on contextual approaches that exist in real life. The teaching materials are in the form of electronic modules equipped with pictures, animations and videos that can be used via mobile phones and laptops. Based on the explanation of the background above, this study aims to reveal that it is necessary to innovate teaching materials in the form of a buffer solution e-module based on the REACT strategy to improve students' scientific literacy skills.

## ▪ **METHOD**

The type of research used is instructional improvement research (Educational Design Research). Educational Design Research can be abbreviated by means of the abbreviation EDR. EDR is a scientific review of designing, developing, and comparing learning interventions. The improved version used by the Plomp version consists of an initial study, a prototype layout stage, and an assessment stage (Plomp & Nieveen, 2013). The digital module is designed in Microsoft phrases and the Flip PDF Professional application. At the evaluation stage, the researcher conducted a trial of improving the e-module product to determine the level of effectiveness and practicality of learning. The details of the development procedure carried out by the researcher include: (1) the initial investigation stage, (2) the development stage or prototyping, (3) the assessment stage. The development of coaching materials starts from the initial study level, which is carried out through desire analysis, context analysis, literature review, and refinement of the conceptual framework. The prototyping level is achieved through product design, which results in 4 prototypes. For each prototype produced, a formative assessment and revision of the prototype was carried out. The formative assessment was carried out mainly on the basis of the proposed formative assessment with the help of Tessmer, specifically self-assessment for prototype I, one-on-one assessment and professional assessment for prototype II, small institutional assessment for prototype III, and disciplines. tried prototype IV (Lawshe, 1975; Plomp & Nieveen,

2013). The evaluation level is the level at which the product is evaluated semi-summatively through a disciplinary test. This study was most effectively achieved for the level of validity and practicality by using the creation of a valid and reasonable electronic module.

The instruments used in this study were the validation sheets used to validate the instruments in the research, namely the validation of the self-evaluation instrument, the validity of the e-module, the practicality of the teacher and the practicality of the students, the student interview instruments and the question instrument to see the students' scientific literacy skills, the sheet self-evaluation, e-module validation instrument, and practicality questionnaire. The topics in this remedial study consisted of 3 lecturers, 3 chemistry teachers, and class XI science students at SMAN 14 Padang. Students were selected by purposive sampling technique, namely the sampling technique based on the consideration of the researcher.

The approach to evaluating the information obtained from this research is in the form of quantitative information and qualitative information. Quantitative information turned out to be obtained from the results of filling out validation and practicality questionnaires, while qualitative information turned into being obtained from validator guidelines. The validity of the advanced e-module is obtained through information from the evaluation results provided by means of a validator on content validation and assembly validation sheets. Information obtained from the content material and assembling validation questionnaires can be analyzed using Aiken's V. The validator's assessment of each statement is analyzed using the Aiken's V formula with the following formula:

$$V = \frac{\sum s}{n(c - 1)}$$

Notes: s = r – Io, r = value given by validator, Io = lowest validation value, n = number of expert validators, and c = highest validity score

**Table 1.** Classification of validity levels

<b>Interval</b>	<b>Category</b>
V < 0.8	Invalid
V ≥ 0.8	Valid

Furthermore, practical information is analyzed using the percentage of practicality. The validator's assessment of each statement was analyzed using the Aiken's V formula with the following formula:

$$P = \frac{f}{N} \times 100$$

Information: P = final value, e = score, and N= maximum score

**Table 2.** Practicality level categories

<b>Interval</b>	<b>Category</b>
0 – 20	Very impractical
21 – 40	Not practical
41 – 60	Less practical
61 – 80	Practical
81 - 100	Very Practical

## ▪ **RESULT AND DISCUSSION**

This take a look at pursuits to expose that it's far important to innovate coaching substances withinside the shape of a buffer answer e-module primarily based totally at the REACT approach to enhance students' clinical literacy skills. The improvement version utilized by the Plomp version consists of initial research, the prototype layout stage, and the assessment stage.

### **Preliminary Research**

At this degree, identity and evaluation can be executed had to increase a buffer answer digital pupil worksheet (e-module) primarily based totally at the CTL technique with the REACT method and examine the bounds of the situation depend to be developed. The reason of this degree is to decide and outline the necessities for the education of a buffer answer digital module (e-module) primarily based totally at the CTL technique with the REACT method on buffer answer fabric for sophistication XI excessive college chemistry learning. The outcomes of this identity are considered in designing and growing a product. The making of coaching substances starts with the initial studies degree, that's executed thru wishes evaluation, context evaluation, literature, and the improvement of a conceptual framework.

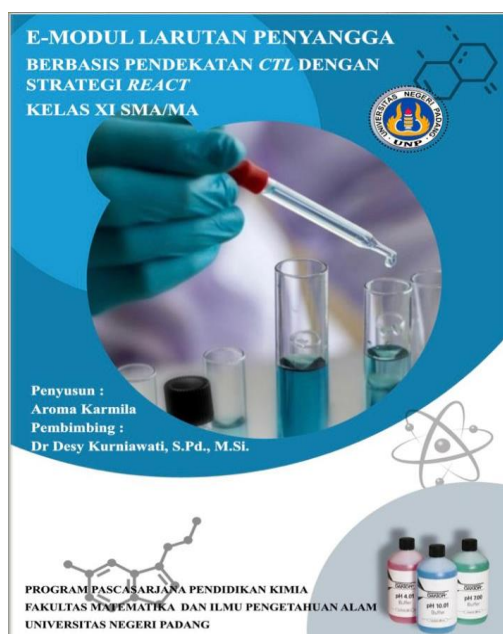
In the desires evaluation stage, the facts acquired withinside the field, specifically facts acquired via interviews with chemistry instructors at SMAN thirteen Padang, SMAN 14 Padang and SMAN three Padang confirmed that withinside the technique of gaining knowledge of chemistry approximately acids and bases the substances utilized by instructors had in no way carried out gaining knowledge of chemistry with the assist of e-modules, the common rating of scholar tests at the buffer answer fabric nevertheless does now no longer meet the minimal completeness and the trainer has now no longer carried out literacy techniques in gaining knowledge of in enhancing students' literacy abilities. In addition, the consequences of the desires evaluation additionally discovered that withinside the 2013 curriculum gaining knowledge of is scholar middle via way of means of using era in gaining knowledge of. The presence of the COVID-19 pandemic influences each thing of life, specifically education, prompting the authorities to launch have a look at at home. Home gaining knowledge of coverage packages withinside the Industrial 4.zero Revolution generation additionally require digital gaining knowledge of system consisting of digital modules. Electronic modules can help unbiased gaining knowledge of and may enhance students' clinical literacy abilities and gaining knowledge of outcomes (Kimianti & Prasetyo, 2019; Raharjo et al., 2017; Warlinda et al., 2022).

At the degree of context evaluation, curriculum evaluation and syllabus evaluation have been performed withinside the 2013 curriculum. Based at the curriculum evaluation, it became observed that the 2013 curriculum calls for college students to actively seek, system, and expand know-how withinside the studying system and elegantly use media and technology. This may be executed via way of means of enforcing a contextual-primarily based totally model of studying and the use of coaching substances withinside the shape of digital modules while sporting out studying. As nicely as on the idea evaluation degree, the researchers identified, detailed, and systematically compiled the primary ideas wished and used as references withinside

the improvement of e-modules primarily based totally on a contextual method with the REACT strategy.

### Prototype Stage

The 2d degree withinside the Plomp improvement version is the prototyping degree. At this degree, the layout turned into achieved to increase an acid-base e-module primarily based totally on incorporated clinical literacy problem-primarily based totally studying and acid-base demonstration motion pictures to enhance studying outcomes. This degree produces 4 prototypes wherein every prototype is evaluated formatively. This studies is simplest restrained to product validation and sensible stages. The first degree is prototype I, specifically the prototype constituted of the layout and cognizance of the initial studies. The e-module coaching substances which have been designed the use of Microsoft Word, the researcher makes the e-module show beginning from the quilt, content, and exercise questions on different e-module components. This e-module turned into advanced to enhance students' clinical literacy skills. The shape of the quilt show e-module may be visible in Figure 1



**Figure 1.** Electronic module cover design

The buffer solution e-module design was also designed with the REACT strategy (Relating, Experiencing, Applying, Collaborating, Transferring). At the Relating stage, which contains learning instructions, learning objectives, perceptions, motivations, and introductory materials. An example of the display of the e-module at the relating stage can be seen in Figure 1. The relating/linking process is a learning process in the context of real-life experiences or prior knowledge (Rizka, 2014). The teacher uses this strategy when he associates a new concept with something that the students already know. The teacher begins learning by asking questions that can be answered by almost all students through life experiences outside the classroom. So that in this process students are trained to identify a problem and provide a simple explanation, where the explanation

will encourage students to issue their ideas (Herlina & Ilmadi, 2022). Furthermore, in the experiencing stage as a supporter, the first stage is the stage for students to explore and carry out problem solving activities. Students are guided to conduct experiments so that students experience the concepts they are learning for themselves. The concepts that have been learned or the ideas that have been trained can be used to build students' basic skills when they are experiencing. At this stage students are given animation supporting material along with guiding questions and practical activities to find concepts. Examples of stages can be seen in Figure 2 and Figure 3.

**E-MODUL LARUTAN PENYANGGA**

**01 RELATING**

**Bacalah fenomena di bawah ini dengan cermat**

Berbicara mengenai makanan, Pempek merupakan makanan yang terkenal dari Palembang. Pempek merupakan olahan makanan yang terbuat dari ikan dan tepung serta di makan menggunakan kuah cuko. Cuko yang merupakan kuah dari empok-empok memiliki rasa asam dan pedas. Tauhkah anda bahwa cuko terbuat dari asam cuka, air dan berbagai rempah lainnya.

**Gambar 3. Cuko pempek**

Pernahkah anda amati hubungan rasa asam tersebut dengan email gigi kita? Gigi tersusun atas unsur kalsium. Jika email gigi bereaksi dengan asam, contohnya, asam cuka, maka email gigi itu akan terurai sehingga kuman masuk ke dalam gigi dan menyebabkan gigi keropos. Tetapi, mengapa gigi tidak keropos? Hal ini dikarenakan, di dalam mulut kita ada zat yang dapat menetralkan sifat asam tersebut yaitu air ludah atau air ludah. Air ludah atau air ludah dapat mempertahankan pH pada mulut sekitar 6,8 hal ini dikarenakan air ludah mengandung larutan penyangga yang dapat bereaksi dengan asam maupun basa sehingga dapat menetralkan asam yang terbentuk dari fermentasi sisa-sisa makanan. Larutan penyangga memiliki kemampuan untuk mempertahankan perubahan pH ketika ditambahkan sedikit asam, sedikit-basa dan sedikit pengenceran.

Nah, bagaimanakah membedakan larutan penyangga dan bukan penyangga? Apa saja komponen asam dan komponen basa pada larutan penyangga? Bagaimana larutan penyangga pada air ludah dapat mempertahankan pH pada mulut sehingga gigi tidak keropos? Untuk mengetahui jawaban dari pertanyaan-pertanyaan tersebut mari kita lakukan langkah pembelajaran selanjutnya.

**4. CHEMISTRY** Kelas XI SMA/MA

Figure 2. Relating Stage

**E-MODUL LARUTAN PENYANGGA**

**02 EXPERIENCING**

**Membedakan Larutan Penyangga dan Bukan Penyangga**

Untuk memahami Konsep dan Komponen Larutan Penyangga, perhatikanlah gambar di bawah ini!

**pH meter pH = 5**

**Keterangan larutan 1: Larutan yang memiliki pH = 5**

**pH meter pH = 5,01**

**Keterangan larutan 2: Larutan 1 yang telah ditambahkan sedikit larutan asam sehingga pH-nya menjadi 5,01**

**pH meter pH = 4,99**

**Keterangan larutan 3: Larutan 1 yang telah ditambahkan sedikit larutan basa sehingga pH-nya menjadi 4,99**

**Gambar 5. Penambahan Sedikit Asam dan sedikit basa ke dalam Campuran Larutan 1 yang memiliki pH awal 5**

**Perkaya Pengetahuamu!**

pH meter adalah sebuah alat elektronika yang ber-fungsi untuk mengukur pH suatu cairan

**Ingat Kembali!**

pH pada larutan penyangga cenderung tetap atau hanya mengalami sedikit perubahan ketika ditambahkan sedikit asam, sedikit basa dan sedikit pengenceran.

Untuk menjawab pertanyaan berikut, amatilah gambar pada halaman 5, 6 dan 7!

- Berdasarkan pengamatanmu pada gambar halaman 5,6 dan 7, gambar berapa yang pH nya cenderung tetap atau mengalami sedikit perubahan setelah di tambahkan asam dan basa?
- Berdasarkan pengamatanmu pada gambar, gambar berapa yang pH nya mengalami perubahan yang cukup besar setelah di tambahkan asam dan basa?
- Pada gambar nomor berapa yang disebut dengan larutan penyangga dan bukan penyangga? Mengapa demikian?
- Berdasarkan hasil pengamatan yang telah anda lakukan, kesimpulan apa yang anda dapat tentang larutan penyangga?

**Klik disini untuk menjawab**

**8. CHEMISTRY** Kelas XI SMA/MA

Figure 3. Experiencing Stage

The practice and taking part levels are levels for college students to use the principles which have been acquired on the level in level (Karsli & Yigit, 2017; Ultay,



2012). Learning with the aid of using conditioning college students to paintings together, reply and speak among college students. At this level college students are given sporting activities which might be finished in organizations. When discussing, college students are predicted if you want to offer similarly factors and manipulate techniques and approaches in making use of the principles being studied in making use of and in moving college students if you want to speak their thoughts orally, along with expressing critiques in organizations and giving recommendations or complaint throughout discussions. While in writing, college students can compose arguments and may make conclusions (Arifin, 2014). In the REACT method, the maximum crucial function in developing self-assurance is the moving phase. In the moving phase, college students should have excessive self-assurance if you want to speak or give an explanation for their thoughts each written and unwritten. This may be visible in scholar sports throughout organization discussions and presentations. This is supported with the aid of using research (Sapto et al., 2015) that the communicate abilities and self-assurance of experimental elegance college students who use the REACT method are better.

An instance of the utility level may be visible in Figure 4. The switch level is the level in which college students use the understanding they have already got in a brand new context (Bilgin et al., 2017; Jelatu & Ardana, 2018). At this level college students are given extra various exercises. An instance of the switch level show may be visible in Figure 5.

E-MODUL LARUTAN PENYANGGA

03 APPLYING AND COOPERATING

Apakah ananda menyukai sirup jeruk? Sirup jeruk memiliki rasa yang cukup asam bukan? Tahukah ananda bahwa di dalam sirup jeruk terdapat zat pengatur asam yang berfungsi untuk mengendalikan pH larutan tersebut. Zat pengatur asam adalah suatu jenis zat aditif makanan yang bekerja sebagai penyangga (*buffer*). Salah satu zat yang sering digunakan adalah campuran asam sitrat dengan natrium sitrat. Asam sitrat biasanya terkandung pada beberapa jenis minuman seperti sirup. Asam sitrat adalah asam lemah yang dapat mengion sebagai berikut.

$$C_3H_5O_3CO_2H_{(aq)} \rightarrow C_3H_5O_3CO_2^{-}_{(aq)} + H^{+}_{(aq)}$$

1. Berdasarkan uraian di atas tuliskan komponen penyangga dalam sirup jeruk tersebut! Tuliskan keterangan spesi nya berdasarkan teori asam basa Bronsted Lowry? serta bagaimana peran larutan penyangga di dalam sirup jeruk tersebut?

Gambar 12. Sirup Jeruk

Klik disini untuk menjawab

17. CHEMISTRY Kelas XI SMA/MA

**Figure 4.** Stages of applying and collaborating



**E-MODUL LARUTAN PENYANGGA**

**04 TRANSFERING**

1. Tabel berikut adalah hasil percobaan beberapa larutan yang di tetesi dengan asam, basa, dan air dalam rangka melakukan analisis larutan penyangga. Siswa diminta untuk menentukan larutan penyangga berdasarkan hasil percobaan pada tabel 1 berikut.

Larutan	I	II	III	IV	V
pH awal	4	5	7	9	12
Ditambah sedikit asam	3,9	2,9	4,5	5,5	5
Ditambah sedikit basa	4,1	8,1	10	11	12
Ditambah sedikit air	4,0	5,5	6,5	8,5	8,5

Berdasarkan data pada tabel tersebut, manakah yang merupakan larutan penyangga? berikan alasan!

Bu Dewi menyediakan 5 macam larutan yang dimasukkan ke dalam beaker glass dengan komposisi yang berbeda-beda. Bu Dewi memberi tugas kepada para siswa untuk mengidentifikasi larutan yang termasuk penyangga dan bukan penyangga. Isi larutan pada beaker glass tersebut disajikan pada tabel 2 berikut:

Nomor beaker glass	Isi Larutan
1	50 mL 0,1 M $\text{NH}_3$ + 50 mL 0,1 M HCl
2	50 mL 0,05 M $\text{NH}_4\text{Cl}$ + 50 mL 0,1 M $\text{NH}_3$
3	50 mL 0,1 M HCOOH + 50 mL 0,1 M HCOONa
4	50 mL 0,1 M HCOOH + 50 mL 0,1 M NaOH
5	50 L 0,1 M $\text{NH}_4\text{OH}$ + 50 mL 0,1 M HF

2. Campuran yang bukan penyangga terdapat pada beaker glass nomor? Jelaskan ananda!

3. Campuran yang dapat membentuk penyangga basa terdapat pada beaker glass nomor? Jelaskan alasan ananda!

4. Campuran yang dapat membentuk penyangga asam terdapat pada beaker glass nomor? Jelaskan alasan ananda!

5. Cairan intrasel merupakan media berlangsungnya metabolisme. Cairan intrasel dapat terganggu dengan adanya asam atau basa yang terlibat dalam proses metabolisme apabila di dalamnya tidak terdapat sistem buffer. Oleh karena itu, di dalam cairan intrasel terdapat larutan buffer fosfat yang berfungsi mempertahankan pH cairan intrasel tetap dalam keadaan optimum. Jika hasil metabolisme adalah suatu basa, maka ion  $\text{OH}^-$  akan bereaksi dengan asam lemah, sedangkan jika hasil metabolisme adalah suatu asam, maka ion  $\text{H}^+$  diikat oleh basa konjugasi. Bagaimana cairan intrasel mempertahankan pH-nya?

Klik disini untuk menjawab

**18. CHEMISTRY Kelas XI SMA/MA**

**19. CHEMISTRY Kelas XI SMA/MA**

Figure 5. Transferring stage

The layout of prototype I within the shape of a buffer answer e-module primarily based totally at the REACT approach become made the use of seasoned flipbook maker software. E-modules which have been evolved may be provided the use of a pc or smartphone. Prototype II become produced after carrying out a formality evaluation within the shape of a self-assessment of Prototype I. The prototype II which become the end result of the self-assessment become then demonstrated with the aid of using 6 specialists known as validators, such as UNP chemistry academics and excessive college chemistry teachers. The units used have been assemble validation questionnaire sheets and e-module content material validation questionnaire sheets primarily based totally on REACT approach. Based at the consequences of self-assessment, it become observed that prototype I had to be revised. Revisions have been made to prototype I within the shape of including an e-module factor, specifically the addition of a scoring manual factor and the addition of medical literacy questions at every assembly within the e-module. The revisions have been made to enhance the first-rate of the prototype if you want to produce a legitimate prototype III. Prototype III become produced after formative assessment and revision of prototype II become performed.

Formative assessment is performed within the shape of private evaluation and professional review. Expert critiques are performed with the aid of using content material specialists and constructivists, with the aid of using assessing and reviewing merchandise performed both without or with the presence of the researcher (Tessmer, 1993). Validation become performed with the aid of using four chemistry academics and a couple of teachers. Validation is performed primarily based totally at the pointers of a legitimate validation sheet. In this process, numerous recommendations have been acquired from the validator, which have been then revised into input. After the revision, an evaluation become acquired from every validator. The validator thing of the validator is measured the use of the Vaiken formula. The assemble validation questionnaire

carries 4 components such as components of assessing content material components, linguistic components, presentation components, and photograph components (Muljono, 2007). The consequences of processing the buffer answer e-module assemble validity records may be visible in Table 3.

**Table 3.** The results of the validity of the buffer solution e-module construct by the validator

No	Category	V	Category Validity
1	Content Eligibility	0.89	Valid
2	Construction Feasibility (Serving Component)	0.84	Valid
3	Language Component	0.92	Valid
4	Graphical Component	0.89	Valid
<b>Average</b>		0.89	Valid

Notes: V = Aiken Index

Based on the validation results, it can be seen from Table 1 that the e-module shows a valid category. The e-module has been well structured in terms of content validity and construct validity. A product development research is said to be feasible if the product is adequate in terms of content and construct validity Nieveen (1999).

**Assessment Stage**

The next stage that is tested is a small group trial. The small group saw the changes made to 9 students of SMAN 14 Padang. The number of students used in small group evaluations can be done at least eight to twenty people (Walter, 2014). Sampling was based on the chemistry teacher's recommendation. Students observe and understand the material in the e-module and fill out small group test questionnaires. The results of the practicality questionnaire test are summarized in Table 4.

**Tabel 4.** Practical results of small group students

Rated aspect	Practicality (%)	Category
Ease of Use	83%	Very Practical
Study Time Efficiency	82%	Very Practical
Benefit	83%	Very Practical
<b>Average</b>	83%	Very Practical

Table 4 shows student responses to each component of the practical assessment in terms of ease of use, time efficiency, and benefits. Based on Table 2 and it is known that the average practicality value of students is 83%. This is in line with Adriyani (2018) that the implementation of learning when the practicality value is more than 61%, it can be said that e-modules are very practical to be applied and used by students in learning chemistry.

The next assessment is to see whether the resulting product can be used in practice in the field. This assessment step is carried out using testing on high school students to see the practicality (field trials) and effectiveness of the developed e-module. However, this research only stops at the practical level. The practicality assessment is carried out

by filling out the e-module practicality instrument by students. The results of the evaluation of the practicality of the e-module are shown in Table 5.

**Tabel 5.** Practical results of field test students

<b>Rated aspect</b>	<b>Practicality (%)</b>	<b>Category</b>
Ease of Use	84%	Very Practical
Study Time Efficiency	81%	Very Practical
Benefit	83%	Very Practical
<b>Average</b>	83%	Very Practical

Table three indicates that the common rating is 83% with a completely sensible category, this proves that the REACT method-primarily based totally e-module makes it less complicated for college students to apprehend the buffer answer cloth. This ease of use pertains to the language and cloth withinside the e-module which is apparent and smooth to apprehend due to the fact the e-module ought to offer textual content that is straightforward for college students to apprehend (Laili, 2019). From the effects of discipline tests, in general, e-modules primarily based totally at the REACT method are sensible and capable of manual college students in locating cloth standards in line with studying goals so one can enhance college students' medical literacy.

The REACT method lets in college students to locate significant relationships among summary thoughts and their software in actual-global contexts. By making use of the REACT method in studying, college students are taught in order to join the cloth they're studying with their studies in ordinary existence via pertaining to and experiencing steps. In addition, college students also are taught to use the standards they've found out into mathematical issues in companies via making use of and cooperating steps. Then college students can switch their information in fixing mathematical issues via the moving stage (Saputri et al., 2019). REACT method-primarily based totally coaching substances are orientated in the direction of contextual studying, integration in coaching substances the usage of the subject of using stress in existence, coaching substances utilized in technology studying. This is in step with the intention of medical literacy, particularly to be "literate in technology" or to have the ability to narrate standards to context and be capable of make choices from issues withinside the actual global or the encircling environment (Khairani et al., 2017). In the studying system the usage of the REACT method college students can exercise their 4C talents and medical literacy.

#### ▪ **CONCLUSION**

Based on the research conducted, the buffer solution e-module based on the REACT strategy (Relating, Experiencing, Applying, Collaborating, Transferring) has been developed to be valid (according to the results of material expert validity, namely content validity and construct validity) and practical. So it is feasible to use in learning to train students' scientific literacy skills. For further researchers, in order to test the effectiveness of the REACT (Relating, Experiencing, Applying, Collaborating, Transferring) strategy-based e-module on the buffer material.

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